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A Game-Theoretic Approach of Self Governance in Communal Areas: A Case of Moepel Farms in Limpopo Province, South Africa



MSc Thesis by Mmapatla Precious Senyolo

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**A Game-Theoretic Approach of Self Governance in Communal Areas: A Case
of Moepel Farms in Limpopo Province, South Africa**

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DEDICATION

To my daughter Lebogang Mmatladi Rachel Senyolo and my granny Phahle mosadi Dikotla

In memory of my aunt Nnyana Rosina DiKotla

I am blessed to have and had you in my life and will forever be indebted to you

KUDUMELA MOEPATHUTSE GOBANE GAGO LEHUMO LE TSWAGO KGAUSWI!!!

Sepedi Proverb

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ABSTRACT

Tourism is a booming industry emerging as an alternative land use to traditional farming. It is seen by many development organisations as a potential source of economic development and poverty alleviation, particularly in marginal rural areas where agricultural potential is limited. However, tourism directly competes with existing land uses. Moepel Farms which are communally owned have been earmarked for conservation despite the fact that there were devoted to crop and cattle farming. The area is found to possess great tourism development potential. The three claimant communities namely: Legata, Molekwa and Motse want to realize the optimal benefits of their restored land by pursuing tourism or livestock development. Analysis of the interaction amongst these communities and other stakeholders when deciding on land use is crucial to determine optimal land use option. This study used game theoretic approach to analyze the use of communal land for tourism.

The potential income from three types of tourism; fully developed game, 5-star hotels and model mega reserves were compared with that of livestock among the three communities. The discount rate of 10 % with a waiting period of 0 and 4 years for tourism and livestock respectively were assumed. The results showed that on a reasonable assumption the tourism income is 7 times higher than that of livestock; hence the community will opt for tourism as long as they want to maximize the net present value. Furthermore the results showed that tourism through a strong cooperation among the communities could constitute a good option for the community development. However, despite the potential benefits of tourism some community are sceptical to pursue it due to its long time period to materialize. The implication for the results of this study is that information ahead all the decision on land use is essential and will enhance understanding of communities on benefits of different land uses, hence not to jeopardize tourism development in this case.

Key Words: Tourism, Moepel Farms, Game Theory, Cooperation, Communal land, South Africa

Contents

DEDICATION.....	i
ACKNOWLEDGEMENTS	ii
ABSTRACT.....	iv
FIGURES AND TABLES.....	vii
CHAPTER 1: INTRODUCTION.....	1
1.1. Background.....	1
1.2. Problem Statement and Justification.....	2
1.3 Purpose of this study and Method used	3
1.3.1 Objectives.....	3
1.3.2 Research Questions	3
1.3.3 Method.....	4
1.4 Structure of the thesis	4
CHAPTER 2: RURAL POLICY AND INSTITUTIONAL BAKGROUND AND TOURISM IN SOUTH AFRICA	5
2.1 Institutional Structures and functions in rural South Africa	5
2.2 Conservation versus local people and their livelihood.....	7
2.3 Tourism in South Africa	7
2.4 Tourism in Waterberg District	7
CHAPTER 3: METHODOLOGY	9
3.1 Background of Game theory.....	9
3.2 History of Game theory.....	9
3.3 Other studies which used Game theory	10
CHAPTER 4: STAKEHOLDER ANALYSIS AND CURRENT SITUATION.....	12
4.1 Moepel Development Initiative Stakeholders	12
Limpopo Regional Land Claims Commission (LRLCC)	12
Limpopo Tourism and Parks (LTPs).....	12
Limpopo Department of Economic Development and Tourism (LEDET)	12

Communities (Motse, Molekwa and Lagata)	13
Non-Governmental Organisation (Khulile Africa).....	13
4.2 Stakeholders' physical and legal strength.....	15
CHAPTER 5: GAME DESIGNS IN PERSPECTIVE OF THIS STUDY	17
5.1 General setting of the farms of the three communities.....	18
5.2 Three Communities Independently: No minimum income.....	22
5.2.1 The Structure of the Model.....	22
5.2.2 Results of the model and discussion	23
5.3 Three Communities Independently: With minimum income	24
5.4 Interactions of the three communities	27
5.4.1 Interactions between Molekwa and Legata.....	28
5.4.2 Interactions between Molekwa and Motse.....	30
5.4.3 Interactions between Motse and Legata.....	31
5.4.4 Discussion of the interaction results	32
CHAPTER 6: CONCLUSION AND POLICY RECOMMENDATION.....	34
REFERENCES	36

FIGURES AND TABLES

List of Figures

Figure 1: Study area is located in the Waterberg Limpopo Province of South Africa.....	8
Figure 2: Moepel Farms; and Communities.....	19
Figure 3: Motse or Molekwa's utility function.....	27
Figure 4: Legata's utility function.....	27

List of Tables

Table 1: Stakeholders for Moepel Development Initiative	14
Table 2: Total hectares of land for the three communities.....	18
Table 3: Carrying capacities of Moepel Farms.....	20
Table 4: Possible Income from different land use options.....	21
Table 5: Income from the farms of the 3 communities and potential land uses option... ..	24
Table 6 Income from Moepel farms at 10% discount	26
Table 7: Interaction between Molekwa and Legata without minimum income constraints... ..	29
Table 8: Interaction between Molekwa and Legata with minimum income constraints.....	29
Table 9: Interaction between Molekwa and Motse.....	30
Table 10: Interaction between Motse and Legata without minimum income constraints.....	31
Table 11: Interaction between Motse and Legata with minimum income constraints.....	32

CHAPTER 1: INTRODUCTION

1.1. Background

Most rural South Africans still live on communal land where land is registered in the name of the state. The communal tenure systems constitute 12.2% of South African land with 83% of the rural population living on this communal tenure land (Isaacs and Mohamed, 2000). The typical character of land rights regimes in the communal areas of South Africa arises from socially and politically embedded practices within historically specific contexts and conjunctures (Cousins, 2007). Tenure insecurity in communal areas leads to problems such as inadequate legal recognition of communal tenure systems, abuse by powerful elites, breakdown of the old permit-based system, etc. These problems result in conflicting claims to land and bitter disputes over authority. Consequently, development efforts including infrastructure and service provisions are severely constrained by lack of clarity on land rights and tensions that result. According to Cousins (2007) “the tensions normally occur between local government bodies and traditional authorities over the allocation of land for development such as: housing, irrigation schemes, business centres, and tourist infrastructure.

In most rural areas including communal areas, livestock is the primary land-use and contributes in some way to most households needs (Ashely, 2000). Grazing land is regarded as communally owned with the state being the primary owner and its administration rests with the tribal authorities. The traditional authorities hold the derivative or secondary rights and they are the ones that administer this land on behalf of the people. Corruption in land and other matters is often present when local administration is by traditional authorities (Delius et al., 1997, Levin and Mkhabela, 1997, Ntsebeza, 1999, Claassens, 2001, Oomen, 2000) as cited by Cousins (2007). Many traditional leaders assume that the authority over jurisdiction in communal areas gave them control in the designated areas and tend to abuse their power. According to Claassens (2003), types of abuse include: “(a) allocating land to or making private business agreements with outsiders, that have the effect of depriving community members of land; (b) selling plots to outsiders for private gain, these plots often being located on the common property areas of communal land; and (c) refusing to allow land to be used for development projects led by government”.

Land is used by different stakeholders for diverse purposes in order to meet a variety of human and environmental needs. In most cases when these stakeholders who are using land decide to utilize its resources towards different purposes, land use change occurs resulting in both advantageous and detrimental impacts. The problem of conflicts as a result of land use is more prominent in communal areas because of, among others, tenure insecurity and lack of well-defined property rights. Analysis of institutional frameworks, arrangements and decision-making in communal areas will help in improving the situation. This will also include the definition of rights and obligations of different stakeholders involved.

It is important for those who are responsible for initiating rural development to create the financial, institutional and regulatory framework that will enable rural communities to handle and manage their land in a comprehensible manner. Understanding the institutional processes and supra-local agencies that determine access to natural resources will be helpful as it could establish solutions that are grounded in local actor’s realities and their

perceptions of constraints and possibilities. In addition to these, good governance at a local level could also lead to better development of strategies for sustainable natural resource, improved livelihood and higher economic activity in the area.

The possible stakeholders that are usually found in situations where conservation and agriculture are competing include local communities, government and private officials, non-governmental organisations (NGO), parastatals and tribal authorities. These stakeholders pursue different strategies to obtain benefits either directly or indirectly, e.g. if government establishes a certain project to alleviate poverty in one of the communal areas, by benefiting the rural communities, government also reduces its burden of supporting very poor people. Another example is that within these communal lands, other community members are in favour of conservation and tourism over traditionally practiced agriculture, hence this result in conflicts within the community.

1.2. Problem Statement and Justification

Tourism is a booming activity adopted by a minority of rural households so far, including some communal areas. Tourism is seen by many development organisations as a potential source of economic development and poverty alleviation, especially in marginal rural areas where agricultural potential is limited. Establishment of tourism in rural areas has impacts on the local people, which are both negative and positive. These impacts depend not only on its direct costs and benefits, such as profits and jobs generated but on a range of indirect positive and negative impacts.

Among the main issues of concern about tourism is that it presently competes for land with existing land use practices and it also exacerbates existing conflict over whether or not marginal lands should be used for agriculture or conservation. As a result the authority over land matters and the design of appropriate institutional frameworks for land administration becomes a key issue. The other issue of concern is the existence of multiple stakeholder interests on communal land which usually lead to conflict over the use of these communal lands. This thesis used Moepel Farms in Limpopo Province of South Africa as a case study.

Moepel Farms are communally-owned farms and form part of the Waterberg mountain range. Waterberg is one of the six districts of Limpopo (formerly Northern) Province of South Africa. Furthermore, Moepel has been earmarked for conservation purposes despite the fact that for centuries the area was largely devoted to cattle and crop farming. This area is found to possess great eco-tourism development potential. The area is rich in biodiversity, and forms an integral part of the Waterberg catchment area. As a result of land-use change during the last fifteen years, there is an up-and-coming nature-based industry (both consumptive and non-consumptive) in the area which ranges from tourism to hunting.

Moepel comprises 14 specific farms which are referred collectively as Moepel Farms throughout this report. Twelve of these specific farms are owned independently by the three claimant communities, namely: Molekwa, Motse and Legata. Currently there is a project going on at Moepel Farms to develop the area into a conservation and tourism business. This development initiative is said to work best on large areas like Moepel farms, meaning that the project will be more beneficial if Moepel Farms could be developed as one unit, hence the economics of scale can be realized. The size of the land for the three

communities is not equal. This has implications for the three communities particularly with profit and benefits sharing. Conflicts amongst the three communities could arise with regards to profit sharing once the Moepel Development Initiative is fully established. The three communities need to agree on how the benefits and profits are going to be shared amongst them at the initial stages of the project. These kinds of agreement need some form of knowledge and certain level of capacity which these communities might not have; hence involvement of other stakeholders is vital. Furthermore, the degree of agreement with regards to benefits and profit sharing will determine to a greater extent, the kinds of resolutions that each community will make. However, the community resolutions are the prerequisite for the declaration of the Moepel farm as protected areas and for further development of the areas since the three communities are now the legitimate owners of the area. The other challenge which is likely to be experienced by these communities is to decide on the type of land use to be pursued on their communal lands (i.e. whether tourism or livestock farming).

1.3 Purpose of this study and Method used

1.3.1 Objectives

This study intends to analyze the interactions amongst the different stakeholders (i.e. agents within Moepel Development Initiative). Specifically this study aims to:

- Identify the stakeholders (i.e. agents) involved in the development of Moepel Farms; their rights, objectives, obligations as well as their power to decide on land use.
- Determine the economic benefits of livestock versus tourism in Moepel Farms.
- Determine strategies and the pay-offs of the three communities of Moepel Development Initiative with regard to their communal land uses by analyzing their objectives and interests, rights obligations and power relations using game theory.

1.3.2 Research Questions

This study intends to answer the following questions:

1. What opportunities are available for Moepel communities with regard to their communal land uses?
2. What are the economic benefits of the opportunities?
3. Which agents are involved or need to be involved for Moepel communities to get hold of these opportunities? What do they want? What can they do? How do they interact?
4. What are the current legal or institutional settings that exist within Moepel Development Initiative?
5. What externalities and dependencies would exist as a result of different land uses in Moepel?
6. What conflicts could arise, given the rights, obligations, objectives, and powers (i.e. with regard to land use decisions) of the agents involved in Moepel Development Initiative?
7. What is the prospect of each of the identified opportunities to improve the livelihoods of Moepel communities?

1.3.3 Method

Research questions 1 to 4 were investigated via the interaction with the identified stakeholders using semi-structured interviews and focused group discussions. The objective was to understand the current institutional setting and the opportunities that are available in the area through the identified stakeholders. Research questions 5 to 7 were answered by means of a game theoretic approach using the following steps. Firstly, this study looked at each community and its best available options separately (e.g. livestock or conservation and tourism independent of the other communities). This looked at what these communities want and what they can do, assuming no interactions. Secondly, the assumption of interaction was considered, to see the actions of each community given the behaviour of other communities (e.g. what will one community do if the other develop tourism). Lastly, this thesis analyzed the co-operative scenarios of the three communities and the possible payoffs associated with their coalitions.

1.4 Structure of the thesis

Chapter 2 further explains the policy and institutional background of rural areas and land use in South Africa in general Chapter 3 describes game theory and the related theories as well as its applications. Chapter 4 conveys the stakeholder analysis and their perceptions regarding the opportunities in Moepel, taking into account the present and future status of Moepel (e.g. current institutional setting). Furthermore, Chapter 5 defines the design of games in relation to this study including the analysis and discussions. Chapter 6 conclude the study and suggest some recommendations

CHAPTER 2: RURAL POLICY AND INSTITUTIONAL BACKGROUND AND TOURISM IN SOUTH AFRICA

This chapter describes the typical institutional structure that is likely to prevail in communal areas of South Africa. This includes the common way of making decisions and the legislation which exists for dealing with matters of communal areas in South Africa. Next, the conservation concept is explained with regards to its relation and impact on livelihoods of local people of South Africa. Furthermore, tourism in South Africa is presented. Moreover, this chapter outlines tourism in Waterberg District with motivation for Moepel Development Initiative.

2.1 Institutional Structures and functions in rural South Africa

Most literature reported increasing problems with natural resources in communal areas as regarded by Chenje *et al* (1998), Du Toit and Campbell (1989), Hamandawana (2002), Moyo *et al* (1991), Whitlow (1985) and Whitlow (1980) cited in Hamandawana *et al* (2005) and Cousins *et al* (2007). This problem is experienced not only in South Africa but in but also in other African Countries. The literature reported that resources are being unsustainably utilised by outsiders and local people, sometimes in the name of development and job creation. During apartheid in South Africa, land was demarcated, allocated and verified through a mix of customary and bureaucratic practices, in which agricultural officers, Tribal Authorities and magistrates all played a role. The tenure for homesteads, and sometimes fields, was run officially as a permit system, evidenced through the Permission to Occupy, or PTO certificate. All such permit systems were officially prohibited after 1994, but have continued in some way in many areas. Today, land administration reform is both behind schedule and contested, such that the authority for it is unclear. In some cases Local Government officials are of the opinion that they can allocate land although this is not legally the case (Cousins *et al.*, 2007).

The Tribal Authority control over land and natural resources weakened significantly after democratisation in 1994. This system was well understood by the residents despite the fact that it was associated with the apartheid regime. Subsequently, the weakening of Tribal Authorities has led to the collapse of Natural Resource Management (NRM) which is an official government body responsible for management of natural resource such as land, water and plant, since these Tribal Authorities comprised the administrative arm of NRM. These changes have been held responsible for the governance void that exists in many rural, communal areas as well as for the makeover of common-property regimes to open access regimes (Cousins and Claassens, 2004, Kepe, 1997, Shackleton *et al.*, 1995).

Nevertheless, in communal lands it is clear that the local rules are in effect the governance system and in the absence of state capacity, they are the only system (Cousins *et al.*, 2007). Furthermore, Cousins *et al* (2007) argue that changes in policies and statutes together with the associated planning instruments are the consequences of state and society transition. These changes include land reform programmes, which comprises restitution, redistribution and tenure reform and which will subsequently bring with it changes to governance and

management. On the other hand some attitudinal shift in communities whose livelihoods depend directly on natural resources will prevail.

In efforts to address the situation in communal lands of South Africa, two laws which were designed to go hand in hand were enacted in 2003 and 2004. They are the Traditional Leadership & Governance Framework Amendment Act (41 of 2003; TLGFA) and the Communal Land Rights Act (11 of 2004; CLRA). These two pieces of legislation have a direct and profound relevance on local governance of natural resources, particularly for common property resources in communal areas. The main goal of these two acts is to have impact on the manner in which rural people living in communal areas hold land rights and how these rights are administered.

According to Cousins *et al* (2007), the stated intentions of government, through these two laws, are to:

1. *Secure property rights, especially in the homelands;*
2. *Facilitate development;*
3. *Extend democracy through balancing recognition of customary practices while transforming them; and*
4. *Ensure sustainable land use into the future*

Cousins *et al* (2007) argues that the two important players in communal lands are local government and traditional leadership. Local government includes the municipalities, divided in Category A (metropolitan municipalities), Category B (local municipalities), and Category C (district areas or municipalities). Local governments are now seen by most community members as important agents of delivery. However, areas of jurisdiction, or wards, are new and there is frequent tension between traditional areas of jurisdiction and the new democratic demarcations.

The other important player is the traditional leadership. Traditional leadership is operative in land held under communal tenure. Generally it consists of chiefs and indunas who administer customary laws, supported by a traditional court of elders. With the incorporation of the former-lands into South Africa, the role of traditional leadership has been contested but politically it has been incorporated into democratic structures.

Officials have a different understanding of the communal lands situations but they all agree that the situation is unclear. One of the consequences of the fact that the situation is unclear is poor enforcement (Cousins *et al.*, 2007). Thus, a number of procedures had not been carried forward and adequate practices still needed to be developed for communal land, within the homelands of South Africa. It is clear from the literature that the erosion of traditional authority powers in communal lands presents some severe problems particularly for law enforcement. Some of the Statutory and Non-Statutory bodies that one can find in communal areas of South Africa in particular include: Ward Committees which are responsible for community participation in local government; Land Administration Committees (LAC) which are liable for making decisions regarding land administration on communal lands on behalf of communities; and Communal Property Associations (CPA) which are statutory institutions associated with representing communities and their communally held assets on communal lands.

2.2 Conservation versus local people and their livelihood

Conservation areas are alleged to contribute towards the protection of certain landscapes through the sustainable use of natural resources. However, conservation cannot be successful if it is conducted for its own sake; hence the benefits felt at the community level are vital. Furthermore, rural livelihoods are complex and different; thus interventions could generate specific perceptions of conservation to local people. Part of the reasons for this is that natural resources act as safety nets for the poorest households or to prop up households if they lose certain sources (Shackleton et al., 2000) and rural people also harvest natural resources to complement their livelihood strategies (Ashely, 2000). The example of interventions impact was noted by Whande (2007), where the extension of the Kruger National Park into the Pafuri triangle, homelands/bantustan consolidations and militarised state security approaches impacted on local African residents. Whande (2007) further notes that the local people along the Madimbo corridor in South Africa and within the Great Limpopo Transfrontier Conservation Area (GLTFCA) are hesitant of protected-areas management and biodiversity conservation approach. These people oppose every form of conservation interventions regardless of its emphasis (i.e. whether strict protection or sustainable use of resources). Therefore, the relations between conservation efforts, on the one hand, and local people and their livelihoods, on the other, are vital for the success of rural development.

2.3 Tourism in South Africa

Tourism is said to be considered an imperative component of South Africa's National Economic Strategy. The indicators of tourism estimate and anticipate increasing figures in South Africa and this attractiveness lies in the country's diversity. There are a number of factors which favour tourism development in South Africa and these include the facts that the country has some of the world's most beautiful unspoiled scenic attractions, impressive wildlife heritage, diversity of plant and animal species and the excellent climate which gives it the potential to be a year-round tourist destination (De Klerk, 2002). Although the tourism business is the largest export earner and the booming industry in the country it is a very competitive business. Therefore, not only the stock of the natural resources of South Africa will determine its competitiveness in tourism but also the manner in which these resources are managed and the extent to which they are complemented with man-made innovations.

2.4 Tourism in Waterberg District

Moepel Farms which is the focus of this study is located in the Waterberg District Municipality. Waterberg District Municipality is located in the western part of Limpopo Province and it shares its five border control with Botswana namely; Groblersbrug, Stockpoort, Derdepoort, Zanzibar and Platjan. This municipality covers 4 951882 ha of land with a population of 596 104 thousands (Waterberg District Municipality, 2010). Moreover, Waterberg District Municipality is endowed with natural resources which give it a competitive advantage in agriculture, tourism and mining. Figure 1 below indicates location of the area of this study with reference to South African Map.

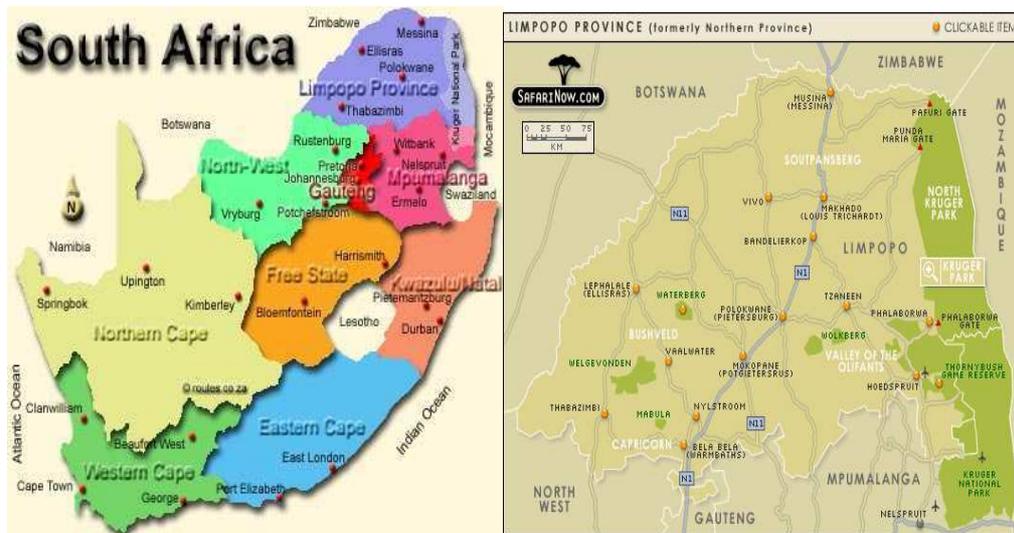


Figure1: Study area is located in the Waterberg Limpopo Province of South Africa

Although the Waterberg District Municipality is gifted in terms of natural and cultural heritage resources, it is noted that communities in the area do not participate and take tourism competitive advantage. Waterberg Savanna Biosphere area was officially proclaimed by UNESCO in 2001 as the first Savanna Biosphere Reserve in Southern Africa. The Biosphere was formed in 1996 and with vision of maximizing conservation, sustainable development and social upliftment. This has allowed the communities to participate in issues of development and conservation through the assistance by the government agencies. Core areas of this biosphere are Marekele National Park, Masebe National Reserve, Moepel Farms, Wonderkop National Reserve and Mokolo Dam Nature Reserve. According to De Klerk (2002), Moepel is more diverse than most of the other reserves and farms, hence it is alleged that Moepel has a potential tourists carrying capacity in the high order. De Klerk (2002) further noted that despite these claims, the sustainable management basis of the reserves which are compared with Moepel is not yet proven.

CHAPTER 3: METHODOLOGY

3.1 Background of Game theory

Natural resources, environment, and even development problems are complex and usually involve more than two stakeholders and therefore necessitate the multi-stakeholder analysis in a strategic fashion. The complexity is explained by the fact that typically, each of these stakeholders have an interest in the use of the resource, hence they want to enhance or maximize but also to conserve it for future periods. In most cases the interests of stakeholders or agents are conflicting hence game theoretic applications are crucial (Sumaila *et al.*, 2008). Game theory is an approach intended for situations where decision makers are affected by interactions of others' behaviour with their own (Horowitz *et al.*, 1996) Furthermore, game theory has earned recognition as an analytical tool for modelling of strategic behaviour of agents in the field of economics. The agents may be persons, firms, stakeholders, or nations (Turocy and Von Stengel, 2001). According to Sumaila *et al* (2008) a game is defined as "any activity involving two or more individuals, each of whom recognizes that the outcome for her/himself depends not only on her/his own actions but also those of others". Sumaila *et al* (2008) further describe a game as strategic interaction that includes the constraints on the actions that players in the game can take. Hence they define game theory as a multi-person decision theory or the analysis of conflicts and rivalry. Game theoretic applications have been used mainly in the area of development, natural resources, and the environment.

Smith (2003) noted that game theory can help in explaining and addressing social-economic problems since games often reflect or share characteristics with real situations, particularly competitive or cooperative situations. Understanding the strategy of players in a game could also assist in predicting how people, political factions, or states will behave in a given situation. The rationale of this theory is that it can also provide an insight devoted to strategic alternatives and the likely outcomes available to participants in particular situations. Based on this insight, agents can better consider the potential effects of their actions, and therefore make decisions that will more likely produce the desired goals and evade conflict.

3.2 History of Game theory

Formal conception of game theory as part en parcel of economic theory was established after the publication of *Theory of Games and Economic Behavior* by von Neumann and Morgenstern (1944), quoted by Turocy and Von Stengel (2001). Horowitz *et al* (1996) and Ciani (2007) state that game theory can be generally divided into two broad categories: non-cooperative (or strategic) games and co-operative (or coalitional) games. According to Horowitz *et al* (1996), non-cooperative games comprise not only strategic games but also extensive games with or without information. Co-operative games offer a framework to discuss concerns of fairness in distributing costs and benefits of the shared resources. Consequently, these games only describe the products which result when agents come together in different amalgamations. Non-cooperative games are concerned with the analysis of strategic choices (Turocy and Von Stengel, 2001). Basically, these games entail a detailed model of all the moves available to the players. Moreover, both these games entail co-operation aspects. The only difference is that cooperation within the co-operative

games is enforceable by an outside third party whereas within the non-cooperative games any cooperation must be self-enforcing Ciani (2007).

Graboś (2005) observed that there are two modules in game theory namely: formal language describing the interaction among players; and solution concepts. In the former module the game is formally represented as follows Graboś (2005):

$G = \{N, A_i \in N, Y_i \in N\}$ where:

- $N = \{1, \dots, n\}$ is the set of players in a game
- A_i is the set of strategies available to player i ,
- $u_i: A_1 \times \dots \times A_n \rightarrow R$ is the utility function of player $i \in N$ called his strategy profile

Given the fact that game theoretic analysis has two solution concepts, it is important to give some explanations of these two concepts, namely: cooperative/coalitional game and non-cooperative game. The analysis of coalitional games is typically based barely on the payoff opportunities available for each coalition and takes into account the likely coalitions which can result during interaction among players. The coalition games are also based on some assumptions which according to Kroupa (In Press) include the following:

- Communication amongst the players before or during game is permissible and they can also be allowed to redistribute their final payoffs through side payments.
- Coalitions act in the common players' interest on specific issues.
- The value of the coalition is the total amount that players from the coalition can together assure themselves of, and is measured in abstract units of utility.

In a cooperative game theoretical analysis two important questions are likely to prevail: (1) to find out which coalitions are likely to form and (2) to determine the manner in which the joint payoff of the coalition can be allocated among the members of coalition. The former question is concerned more with the behavioural aspects of the games (i.e. the strategy and actions of the players) whereas the latter is particularly concerned with the cooperation of the players in terms of benefit sharing from their joint payoffs.

Unlike in cooperative games which assume cooperation among players, in non-cooperative solutions, players take the expected strategies of other players into account. Basically, in non-cooperative games each player involved pursues his or her own interests which are partly conflicting with others (Basar and Olsder, 1995). Furthermore, in non-cooperative games players don't make any commitments to coordinate their strategies whereas in cooperative games, players are making possible commitments to coordinate their strategies (Ferrero *et al.*, 1997). The implication of this is that in non-cooperative games, as some players are selecting strategies others are trying to identify best responses to those strategies.

3.3 Other studies which used Game theory

Basaran and Bolen (2005) used game theoretic approach to analyze the strategic decisions of different agents and furthermore to develop a better understanding of the decision making process as well as its consequences on a drainage basin. They concluded that environmental degradation and industrial pollution cannot be solved in the long term; hence

the problem shows the importance and necessity basin scaled planning. Furthermore, they noted that water basins are ecological systems and decisions for one spot can affect the whole basin. Moreover, their conclusion states that game theoretic approach will make it easier for the agents to cooperate if the conflicts in the planned areas are clearly defined, and game theory provides evaluation strategic decision. They further state that it is possible to achieve cooperative bargaining solutions where all agents are winners; hence this is the target planning because sustainable development of the river basin depends on bargaining space where all agents are winners.

Schmeidler (1969) used game theory to suggest an additional answer to the question of how the agents in cooperation divide the value of their coalition among themselves. More precisely, the author wanted to which point of the outcome of the game is accepted as a compromise between agents. Furthermore, the author described the procedure in which the can choose the more acceptable payoff among them given different payoffs.

Graboś (2005) proposed a qualitative counterpart of the game theory in the context of logic programming with ordered disjunction (LPOD). The author used an LPOD for representing the game structure, thus, possible actions and players of a game including preferences of those players. In place of a payoff function that reflect a player's preferred strategy, ordered disjunction was applied for encoding a priority among the possible strategies, given the actions of the remaining players. This study investigated concepts of dominant, Nash and Pareto equilibrium as well as defines several new types of qualitative equilibria.

Ansink and Weikard (2009) used game theory to introduce the concept of (overlapping) claims in non-cooperative bargaining problems. The bargaining game was analysed with probabilistic outside options. The results of the game were that if an agreement is reached, water rights are allocated according to the agreement, production takes place and payoffs are realised. If either country opts out, a third party is asked to intervene. However, whether or not intervention will settle the conflict is uncertain. If intervention is successful, water is allocated by the third party, production takes place and payoffs are realised. However, intervention failure or bargaining breaks down result in conflict. Moreover, their results show that, for certain model parameters, countries prefer not to bargain and efficient allocation. Rather, they may prefer to stick to their claims, hoping for a favourable settlement for the bargain by a third party. Furthermore, the authors' states that as intervention might not occur or fail, conflict may emerge. Countries in this case invest in fighting to secure part of the contested water, production takes place and payoffs are realised. Thus, the prospect of the third party intervention can cause persisting conflict and thereby obstruct water trade.

CHAPTER 4: STAKEHOLDER ANALYSIS AND CURRENT SITUATION

This chapter outline the different stakeholders which were identified within Moepel Development Initiative. First the brief explanation of these stakeholders is presented. Next, the role of these stakeholders, their interests, impacts and relative priorities of their interests with regard to this initiative is explained. Subsequently, this chapter shows what each of these stakeholders can do both physically and legally to realize their objectives and how they interact with each other.

4.1 Moepel Development Initiative Stakeholders

Limpopo Regional Land Claims Commission (LRLCC)

LRLCC is the arm of the Department of Land Affairs. Land Affairs is one of the government departments in the Limpopo Province of South Africa and controls both the registration of deeds and the survey of land. However, LRLCC is responsible for the development of land and their targets are claimants of land, mainly being rural communities and they want to see those communities benefiting. LRLCC is subdivided into two sections namely; pre-settlement which deals with land claims investigations and give back land to the rightful owner and the post-settlement which deals with the support of the claimants after the claim settlement (i.e. the support includes finance and advices).

Limpopo Tourism and Parks (LTPs)

LTP is a parastatal organisation and its mandate is “to promote, foster and develop tourism to and within the Limpopo Province”. This organisation is mainly interested in the development of tourism and land irrespective of whether the land is communally or privately owned (i.e. unlike private investors who only invest much on the privately owned land). Furthermore, LTP plays a role in bringing together the different stakeholders that are needed for tourism and land development (e.g. government, communities, conservationists, etc.). During the interview with LTP, it came out that while “it has too many responsibilities, it responds to the call of communities who seek assistance and advice”.

Limpopo Department of Economic Development and Tourism (LEDET)

LEDET is one of the government departments in the Limpopo Province of South Africa. Its mandate is to develop the province’s economy and to promote and manage the environmental and tourism activities. One directorate in LEDET is Biodiversity and Natural Resource Management and its mandate is conservation development. Currently LEDET has done some developments which are mainly on infrastructure and conservation development, e.g. R10 million spent on: construction of 79km game fence, removal of some internal fences, removal of disused buildings and other structures, clearing of roads for management access, training of members of community on-game ranges, first aid, and fence construction, and R400 000.00 was set aside by LEDET to develop master plan this financial year. LEDET is willing to coordinate the activities of the task team and to provide secretariat as well as to coordinate conservation development part of the project.

Communities (Motse, Molekwa and Lagata)

There are three communities namely; Motse, Molekwa, and Legata. These communities are the claimants of the lands in which the development initiative is to take place. The three communities currently work as separate entities with no shared planning or decision making even though their lands are fenced as one unit of land. Furthermore, these communities are represented by their respective communal Property Associations (CPAs). The study area which is the area of the project is Moepel farm and consists of 14 specific farms. Each of the three communities owns some specific farms within Moepel independently, thus that community can do whatever activity in those farms independent of the other communities. The three CPAs of these communities have indicated the desire to draw community resolutions to set aside all their farms in the project for conservation and tourism development. They have draft resolutions and need to adopt them. Moreover, these resolutions are needed in order to declare the area as a protected one.

As the three communities are currently working as separate entities, a need for a joint committee to represent these communities has been discussed and agreed to by all the three CPAs. Despite this proposed arrangement, the CPAs will remain legal structures representing the communities. However, certain roles and responsibilities will be assigned to this committee to carry out on behalf of the CPAs. This Committee will then work with involved participating stakeholders to draw action plan for the outstanding work and its implementation. Furthermore, a task team consisting of some committee members and involved stakeholders is needed. LEDET is said to facilitate the functioning of the task team.

Non-Governmental Organisation (Khulile Africa)

Khulile Africa is an NGO which deals with rural community development. Its role among others is rural community economic development facilitation to establish a sustainable program. This NGO builds on existing initiatives because they believe people are good at what they started themselves. They intend to add value to the community Project e.g. Moepel project/research, what is needed to be funded. Furthermore, Khulile Africa guaranteed mentorship of the clients (i.e. communities) throughout the project.

Table 1: Stakeholders for Moepel Development Initiative

	Interests/Objectives	Impact	Priorities
Key Stakeholder			
LEDET	<ul style="list-style-type: none"> • Responsible for the management of Moepel Farms. • Shall coordinate the activities of the task team and provide secretariat. • Shall coordinate the conservation development part of the project. 	+	High
Primary Stakeholder			
Communities (Motse, Molekwa and Legata)	Want to develop their land for conservation and tourism purposes, in order to improve their welfare	+	High
Secondary Stakeholders			
LTPs	Will coordinate the commercial development and marketing of the product (i.e. since LTP is the tourism development and marketing wing of LEDET)	+	Medium
LRLCC	<ul style="list-style-type: none"> • Responsible for settlement of land claims • Can provide funding for planning and implementation of approved plans 	+	High
Potential Stakeholder			
NGO (Khulile Africa)	Involvement on the basis of the role they can play	+	High

Table 1 shows the stakeholders identified for Moepel Development Initiative. The positive signs in the table show potential impact of these stakeholders towards the project. The last column in the table explains the relative priorities of interest of the stakeholders. Besides, the LTP stated that they have a long list of project with a limited budget and that they cannot guarantee the full involvement in the project but they are willing to give advices and support as much as possible. LEDET has been identified as a key stakeholder because it has taken the decision to assist the three communities in implementing this of this project. Hence LEDET shall coordinate many activities of this project. LRLCC has been identified as a secondary stakeholder since they will work with LEDET and Interim committee of the project during the implementation of the project. LTP has also been identified as a secondary stakeholder since it is interested in developing land irrespective of whether the land is communal or privately owned. Molekwa, Motse and Legata have been identified as primary

stakeholder since they are targeted group for developmental efforts. One NGO (Khulile Africa) has been identified as a potential stakeholder since they have shown interest in taking part to assist the three communities on the basis of the role they can play.

4.2 Stakeholders' physical and legal strength

Although the identified stakeholders have some objectives to realize through this project, their strength differ physically and legally. LEDET intend to work with legitimate land owners (i.e. three communities) of Moepel Farms to ensure that the farms are given formal protection status they require and to assist these communities to develop the land to its full potential for the benefits of these communities. LRLCC intends to give these communities the advice and some grants for the development of plans and implementation of the project to ensure that the restored land is fully developed. LTP aims to help the communities to develop the restored land (e.g. into property development, wildlife, ecotourism) it believes that this project could be a catalyst of transformation for rural development and small business development. The three communities intend to develop their restored land to realize its full potential. Khulile Africa was not yet involved but its intention is to capacitate and mentor the communities to realize full potential in projects like this one. So they can assist in terms of advises and funds. These communities have limited skills and lack funds to realize their objectives. Hence, there is a need for the other stakeholders to assist them. These stakeholders will interact through the Interim Committee as communication forum for implementation of the project.

From the workshops, semi-structured interviews and focused group discussion with the identified stakeholders it was clear that the issue of different land use practices per se is not the major problem. Thus almost all the identified stakeholders tend to agree that land in Moepel Farms is not viable for agriculture (particularly livestock production), mainly because the area is too mountainous and also that the grazing area is very limited within those farms. According to LRLCC, land use options available at Moepel Farms are conservation and tourism development with very little livestock farming. This department though, recommended the former as a viable land use practice for the welfare of the three communities. With LEDET, it was clear that the viable land use practice recommended was conservation and tourism development for the protection of the area and above all for the benefits of the three communities. Moreover, for LTPs three types of businesses [i.e. property development, wildlife (.e.g. hunting, selling animals), and ecotourism] as land use practices were recommended which also boils down to conservation and tourism development. Additionally, Legata community thinks that although conservation and tourism development are viable land use practices, a bit of agriculture (particularly livestock production) can be practiced on some flat land within the area. The argument given by some members of this community was that the benefits of tourism materialize in the long run whilst livestock production could be giving them some benefits now and contributing already to their livelihoods. This community further mentioned the concern that if they go for conservation and tourism development, then the profit will have to be shared amongst the three communities whereas when they go for livestock the profit is only for them. As for Molekwa and Motse, conservation and tourism development are the only viable land use practice, although a few of them mentioned that agriculture can also do but they really

stressed that the former is worth more consideration in trying to improve their livelihoods as well as optimising their benefits given the current and future situations.

Based on the responses of the stakeholders above, it is evident that they agree that the economic benefits of conservation and tourism development far outweigh the economic benefits of agriculture particularly livestock in the area. Therefore these stakeholders see the former as the better land use practice over the latter. Moreover, estimation data on the potential benefits of tourism and livestock projects was obtained from LTP and this was used to make further comparison on the potential of two land uses. Hence, an overview of economic benefits of conservation and tourism development versus that of livestock production was made in this study.

Having found that the choice of land use option was not the actual problem in this area and amongst these stakeholders, since they tend to have agreed on which land use practice is viable in the area; it was then ideal to analyse the strategic interactions at a community level amongst the three communities (i.e. Legata, Motse, Molekwa) rather than amongst all the agents (i.e. stakeholders). The reason for this was that the conflict was thought to likely arise amongst the three communities rather than amongst the communities and other stakeholders (i.e. LEDET, LTP, LRLCC, NGO, etc.). However if the study analysed only the strategic interactions amongst the three communities it was not going to fully realise its aim as it required the analysis of the strategic interactions amongst all the stakeholders involved in Moepel Development Initiative. Nevertheless, analyzing strategic interactions of three communities collectively against the other group of stakeholders might have given results which are very far to the real situation as these communities do not have the same objectives. Therefore it was ideal to analyze the three communities independent of each other, followed by the analysis of their interaction and finally the coalition of these communities taking into account the role of the other stakeholders. These scenarios are presented in the following chapter.

CHAPTER 5: GAME DESIGNS IN PERSPECTIVE OF THIS STUDY

This chapter presents the analysis and discussion of the three communities namely: Motse, Legata and Molekwa in four scenarios. The main distinction between the scenarios is how income is treated in the first few years before tourism and the fact that tourism benefits materialize in the long run whereas livestock farming yields income right away. First, the general setting (i.e. description) of farms is given. Second, the first scenario is presented where the three communities choose maximum Net Present Value independently. For this scenario, the assumption was that each community maximizes its Net Present Value irrespective of any minimum income restrictions during the waiting time. Third, the scenario is presented where the three communities maximize their Net Present Value subject to the condition that the income must be greater or equal to an assumed minimum income at all times. Fourth, the scenario is analysed and discussed where these communities interact with each other. Lastly, the possible coalition and the likely outcomes from the coalition was analyzed and discussed in detail.

5.1 General setting of the farms of the three communities

The three communities own 12 farms within Moepel Farms. Table 2 below shows which communities own which farm. Figure 2 shows the location of these farms:

Table 2: Total hectares of land for the three communities

Community	Farms	Hectares
Legata	St George	2353
	Lusthof	2280
		Total = 4633
Motse	Klipbank	2360
	Schurwepoort	2110
	Varkfontien	2195
	Hottentots Holland	2791
	Baklyplaats	2488
	Riebeek West	2204
		Total = 14148
Molekwa	Zandput	2304
	Zuurfontein	2070
	Rhenosterhoek	2324
	Hopefield	2753
		Total = 9449
		Grand Total = 28230

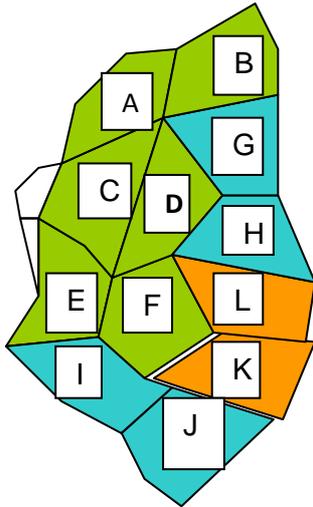


Figure 2: Moepel Farms; - Communities (Legata = orange, Motse=green; Molekwa=blue):

where: A = Schurwepoort E= Riebeek West I= Rhenosterfontein
 B= Klipbank F= Baklyplaats J= Hopefield
 C= Hottentots Holland G= Zandput K= St.George
 D= Varkfontein H= Zuurfontein L= Lusthof

The infrastructures of these farms are underdeveloped and roads are considerably damaged. The access road to St. George can only be accessed through 4x4 vehicles. Several places of the road right through most of its reach are badly eroded. Moreover, Lusthof road is also in a bad state as it has been washed away by the 2001 floods of the area. It currently can also be accessed through 4x4 vehicles. The dams (Lusthof D9 and St George D10) within these farms are also dysfunctional at the moment, hence they need to be rebuilt or upgraded if there are to be used. Farm access road to most of Motse's farms is also difficult currently, hence upgrading is needed for them to serve as management and access roads. Two dams (i.e. Hottentots Holland D2 and Varkfontein D1) that are also found within these farms need to be rebuilt or upgraded. Of the farms of Molekwa community, a short access road to north-eastern portion of Rhenosterhoek exists and can be used to reach the largest part of the farm. Besides, the rest of access roads to those farms need upgrading and maintenance. There is also one dam (Rhenosterhoek D10) in the western areas of Rhenosterhoek.

The grazing capacities of these farms as observed in De Klerk (2002) were calculated based on the vegetation communities and the topographies. The consequences of this are that the carrying capacities were not calculated per farm but for several farms that share the same topography or vegetation. As a result the LSU which were calculated were not specified according to each farm but were calculated jointly among the farms having the same topography and vegetation. In some cases it was a combination of 2, 3 or 4 farms. In some cases one farm appeared more than once but in different cases. The drawback of this is that it is difficult to know exactly the carrying capacity of each farm as it is not mentioned how many hectare of the total hectares were used to calculate LSU belongs to which farm. To

elaborate the aforementioned paragraph further the Table 3 below summarizes the carrying capacities of the different farms as noted in De Klerk (2002):

Table 3: Carrying capacities of Moepel Farms

Vegetation Type	Farm	Carrying capacity
Southern Sour Plains Veld	St George Rhenosterhoek Baklyplaats	8 ha/LSU = 606 LSU for cattle 11 ha/LSU = 441 LSU for game
Central High Lying Sour Veld	Lusthof Varkfontien Zuurfontein	13 ha/LSU = 298 LSU for cattle 17 ha/LSU = 228 LSU for game
Western Sweet Thorn and Valley Veld	Riebeek West Hottentots Holland	12 ha/LSU = 369 LSU for cattle 15 ha/LSU = 295 LSU for game
The Nothern Bush-Willow Mixed Bushveld	Schurwepoort Klipbank Zandput Hottentots Holland Varkfontein	28 ha/LSU = 181 LSU for cattle 30 ha/LSU = 169 LSU for game
The Eastern Sourish Mixed Veld	Zandput Zuurfontein Lusthof	28 ha/LSU = 256 LSU for cattle 36 ha/LSU = 200 LSU for game
The Southern Mountanious Sourveld of Hopefield	Hopefield	30 ha/LSU = 134 LSU for cattle 40 ha/LSU = 80 LSU for game

The data in Table 3 will not be used in the game theoretical analysis because it is not clear what part of a given farms has which carrying capacities but it is presented here to give an overview of the farms' carrying capacities. Therefore, this thesis used a fixed income per ha based on personal communication with Mr. Du Toit Malan of LTP. LTP1 stated the following comparison which can be deduced from different land use options (Table 4): the incomes per ha of livestock, fully developed game farm, 5-star fully developed eco-tourism and model mega reserve are less than R100, less R700, R2000 and up to R10000, respectively. The above comparison shows that income from tourism starts from 7 to 100 times higher as compared with income from livestock. Given this comparison, it is clear that the ideal way would be to go for conservation and tourism related businesses. Model Mega Reserve is the

¹ Limpopo Tourism and Parks (LTP), Personal communication with Mr. Tu Toit Malan, 29—1-2010.

potential land use which gives the highest income as compared to other tourism land uses. However, in order for the model mega reserve to be of use the land should be at least 20 000 ha (LTP¹) which means the three communities individually do not qualify for this type of venture.

Although almost everyone including Legata community are in accord that tourism income is much higher than livestock, this community prefer livestock over tourism. The reason for this is that tourism benefits takes time. Some community members argue that tourism can be coupled with a bit of livestock farming on flat land, but the results (i.e. carrying capacity versus income) above still show that livestock production is not economically feasible. For example, St George together with two farms from other communities (i.e. Rhenosterhoek and Baklyplaats) has a capacity of 8 ha/LSU for cattle and 11 ha/LSU for game which is likely to be even lower when only the Legata portion (i.e. St George) alone is considered. Moreover, this community mentioned that one of the basic needs they are trying to achieve with whatever land use they will pursue is job creation. Choosing livestock production given the above situation will not contribute much to this objective.

Table 4: Possible Income from different land use options

Land use option	Rand per hectare (R/ha)	Minimum size hectare required
Livestock	< 100	1500 (½ a farm)
Fully Developed Game	< 700	2000 ha (1 farm)
Five-star Hotel	2000	6000 ha (3 farms)
Model Mega Nature Reserve	Up to 10000	20000 ha

Source: Personal communication with Du Toit Malan (LTP)¹. The minimum ha required for livestock, fully developed game and five star hotels is the author's assumptions.

Based on the cattle carrying capacity of Motse's land and information from LTP¹ about the incomes per ha of different land use alternatives, it makes socio-economic sense for Motse to choose conservation and tourism development as viable land use. This option is likely to contribute significantly to their objectives of job creation and increased income provided it is done properly. Despite the fact that also Motse community alone do not qualify for a model mega reserve, they can do a lot of conservation and tourism businesses within their 14148 ha. Furthermore, the location of Dam 2 on the Hottentots Holland adds an advantage for tourism as it is said to be located at a site suitable for a lodge and this would enhance the scenic appeal and game viewing opportunities for tourists substantially (de Klerk, 2002). As for Molekwa community, the only viable land use practice at Moepel Farms is conservation and tourism development. The grazing carrying capacity of the land of this community is very low and some farms like Hopefield are too mountainous. These limit the potential of the area more especially for livestock production. Although the potential of these farms are limited in terms of livestock production, game species adapted to mountains veld like mountain reedbeek and klipspringer will utilize this habitat and grazing (De Klerk, 2002). Molekwa community (alone) also do not qualify for the model mega reserve which is the most profitable type of business in lands like this, because it allow a diversity of complementary land use options (e.g. from tourism to conservation). Nevertheless, with the amounts of lands accruing to this community some considerable benefits (e.g. fully developed game farm, 5-star fully developed eco-tourism) can still be enjoyed with their 9449 ha.

5.2 Three Communities Independently: No minimum income

For this scenario, the study assumed that each community maximized its Net Present Value, assuming that communities are willing and able to temporarily forgo consumption in the short term if it is compensated by higher income in the long term. In other words, there is no minimum income that the communities need to have while wait for tourism income to develop. This scenario was analysed using the model which is presented in 5.2.1.

5.2.1 The Structure of the Model

This study built a model to analyze and to examine a scenario where the three communities make their decisions independent of each other. The model intended to give optimal solutions and the actual behaviour assuming there are no externalities (i.e. from other communities). The main objective of this model was to find out what the three communities will do to maximize their incomes given their farms and their particular land uses in each farm. Moreover, the model was used to perform a sensitivity analysis to see under what conditions these three communities would allocate their land for livestock and under what conditions they will allocate for tourism. Furthermore, a sensitivity analysis was used to determine the conditions under which a mix of land uses will exist in the study area. The sensitivity analysis of these scenarios would possibly depend on various factors such as revenues of the land use types, the discount rate, the waiting period, or the combination of the three. This study focused the analysis on the discount rate and waiting time. This is largely explained by the fact that farms of these communities are not yet fully developed, hence the time consideration is vital.

Therefore, the model includes two equations. The first equation is the objective function that aims to maximize the benefits of each community where the benefits depend on land use in each farm. This equation is given by the sum of the areas of all farms and land uses multiplied by the sum of the profits from all farms and land uses of these communities. The second equation states that the land uses are mutually exclusive. As a result, this equation explicates that for each farm the sum of the areas of farms for a certain land use practice must be less or equal to one. The two equations are mathematically presented as follows:

$$Max: I_c = \sum_{f \in S_c} \sum_l A_{fl} * \Pi_{fl} \dots\dots\dots (1)$$

Subject to:

$$\sum_l A_{fl} \leq 1 \dots \forall farm \dots\dots\dots (2)$$

where f represents the different farms; S_c is the set of farms owned by the communities; and l symbolizes type of land use. Next, A_{fl} denotes the area of a farm f employing a certain land use and π_{fl} signifies the present value of profits associated with a particular farm employing a particular land use. Livestock benefits are enjoyed immediately, whereas tourism benefits only occur after a period of a few years.

5.2.2 Results of the model and discussion

As it was mentioned earlier in this paper that time has been identified to be an important aspect in making decisions regarding whether to consider some development or project initiative over the other, time was incorporated in this analysis. The incorporation of the time dimension provided a way to compare the net benefits of these land uses received in different time periods. This comparison was done through the process of discounting. This study used the discount rate of 10% which is the current prime interest rate in the country. Given the fact that the time period might influence the behaviour of some players (the three communities), the study did a sensitivity analysis by varying the discount rate in order to see its influence on the behaviour of communities independently.

The study simulated the sensitivity analysis at 10% as well as below and above 10% discount rate. The main reason to do sensitivity analysis with different discount rate was to try and find a situation where members of the communities are having different decisions; thus, a discount rate where some community members will allocate their farms for tourism whilst others allocated theirs for livestock. The revenues used in this study were calculated by multiplying the area of the farms by the income per hectare of a particular land use. The waiting time was assumed to be fixed at 4 years for tourism and 0 years for livestock whilst the discount rate was varied from 10% to 0% and 10% to 20%.

The results of the model showed that on a reasonable assumption, the income from tourism is far higher than the income from livestock. In this case all farms of the three communities were allocated for tourism. This explains that all communities wanted to maximize their Net Present Value ignoring the forgone income during the waiting time since waiting time for tourism was assumed to be four years. Although the income from tourism was higher than from livestock, it was observed that community income decreased with an increase of discount rate. Ideally, the increase in discount rate would lead to changes in farms allocation, thus not all farms would be allocated for tourism anymore. This is in line with the literature, where high interest rates reflect that future is less important at the moment when a particular decision is taken, in this case, the choice of land use. Although, the income from tourism was observed to be high, the waiting period was also higher as compared with the one for livestock and as the discount rate increases the chances of communities to allocate their farms for tourism declines since it will not make economic sense to wait 4 years in this case for less income. Since all the results of the sensitivity analysis cannot be put on this chapter, therefore, Table 3 below present only results at 10% discount rate . The differences in income were even larger and smaller with lower and higher discount rate respectively. Moreover, only tourism income of R700 per ha was considered in this case because logically if the tourism income is preferred over livestock income; with higher income per ha (i.e. R2000 & R10000) and *ceteris paribus* the tourism preference will be even stronger.

Table 5: Income from the farms of the three communities and potential land uses option. The used income per hectare was R700 for tourism and R100 for livestock in all farms

Moepel Farms	Tourism Income in Millions of Rand (R) and waiting time of 4 years at 10% discount rate	Livestock Income in Millions of Rand (R) and waiting time of 0 years at 10% discount rate	Land use: Tourism	Land use: Livestock
St_George	1.23 mln	0.24 mln	1.00	0
Lusthof	1.22 mln	0.23 mln	1.00	0
Klipbank	1.26 mln	0.24 mln	1.00	0
Schurwepoort	1.13 mln	0.22 mln	1.00	0
Varkfontein	1.17 mln	0.22 mln	1.00	0
Hottentots_Holland	1.49 mln	0.28 mln	1.00	0
Baklyplaats	1.33 mln	0.25 mln	1.00	0
Riebeek_West	1.18 mln	0.22 mln	1.00	0
Zandpunt	1.23 mln	0.23 mln	1.00	0
Zuurfontein	1.11 mln	0.21 mln	1.00	0
Rhenosterhoek	1.24 mln	0.23 mln	1.00	0
Hopefield	1.47 mln	0.28 mln	1.00	0

5.3 Three Communities Independently: With minimum income

For this scenario, this study assumed that three communities maximize their Net Present Value with the condition that their income will be greater or equal to their minimum income at all times. This would ideally mean that this community will opt for tourism if they are having alternative ways to obtain the minimum income whilst waiting for tourism income in four years or if they can receive some form of incentives for waiting such as some social grants. From the interviews and focused group discussions with the three communities it was clear that Molekwa and Motse communities opt for conservation and tourism irrespective of the waiting time. On the contrary, Legata was described by the LRLCC as having been 'adamantly' opposed to pursuing conservation and tourism as land use option initially. This was also confirmed during the interview with the community. It was clear during the interview that the community members are aware that the benefits of conservation and tourism are

greater than that of livestock but the time scale and sharing of benefits (i.e. in case of partnership with other communities) was making them sceptical about former land use practice. They raised their concerns that conservation and tourism take time to show benefits in contrast to livestock benefits which can be enjoyed now. Based on the above facts, this community is likely to opt for livestock if they don't want to wait or for tourism if they are given some incentives (like grants) to wait. This is because they mentioned unemployment as a challenge and if they don't have alternative means to get some income waiting might not be very good.

Motse community, unlike Legata community, declared that conservation and tourism development is the only viable land use option in their farms. They expressed that they used to think of various land use options within Moepel Farms including farming with crops and livestock, conservation, tourism and residential. This community stated that their perception towards different land use practice was changed after the research and presentation of De Klerk which reflected the unsuitability of agriculture in the area. The reasons for this was that only the small areas in Moepel have some grass which is suitable for cattle and the fact that the area is also mountainous and "cattle don't like that". Therefore this community is opting to go for conservation and tourism development as they think it is the only viable land use at Moepel which can help them realize their objectives such as creation of employment, income generation and poverty alleviation. However, during the interview with LRLCC it was mentioned that this community together with Molekwa community have removed their livestock on the concerned farms after their agreement with LEDET to pursue conservation and tourism development. As a result, waiting time for tourism did not seem to be a problem with this community. The explanation to this could be that they have alternative land outside Moepel where they can still practise their livestock farming whilst waiting for tourism to materialize or just another source of income which gives them incentive to wait.

As for Molekwa community, livestock was not mentioned as an option in Moepel farms. Generally, the community members believe that they can derive a number of opportunities by pursuing conservation and tourism as land use. Those opportunities include job creation, and increased income. Moreover, their preference for tourism can be explained by the fact that besides farms in Moepel, this community had restored other farms. As a result they did not solely abandon their livestock but rather they kept them in their other farms they restored outside Moepel Farms (e.g. Gemsbok Farm). This also means that they could still have some income from their livestock whilst waiting for tourism benefits hence the question of minimum income at all times is not really an issue for this community.

Therefore Table 6 below gives summary of possible incomes for the first four years of tourism development where there is no income from tourism, the potential income from tourism in the beginning of year 5 and the this potential income in present value terms. As a result the second column of Table 6 shows potential income for Legata assuming they will pursue livestock and no exact income figure for both Motse and Molekwa community. However, both Motse and Molekwa are presumed to have alternative income somewhere to give them incentives to wait for tourism. The second column shows the potential income from both livestock and tourism at the beginning of year 5 and the third column presents the present value terms of the estimated potential income.

Table 6: Income from Moepel farms at 10% discount rate and waiting period of 0 and 4 year(s) for livestock and tourism respectively. Incomes were calculated based on R100, R700 and R2000 per ha for Legata, Molekwa and Motse respectively.

Community	First 4 years: R/ha	From 5 th year: R/year	Net Present Value (NPV): R
Legata	R463 300.(livestock)	R463 300.	R4 633 000
Molekwa	0 (alternative income e.g. Gemsbok farm)	R 6 614 300	R45 176 558
Motse	0 (alternative income)	R28 296 000	R193 265 487

Since there are different waiting periods of the two land use types in this study, we can distinguish two different periods for tourism: a waiting time between the introduction of tourism and the first income of tourism and the time horizon. However this study assumed 0 waiting years for development of livestock. The implication of this is that when a community opt for tourism then there will be no income from tourism for the first 4 years. Although this implies to the three communities, Legata community is one which showed much consideration to this point. They mentioned that having minimum income at all times could be better than waiting for a long time before any income, hence they would rather opt for livestock over tourism. Therefore, based on these arguments, the utility functions of these three communities is likely to differ, however the Motse and Molekwa are likely to have the same utility functions. This depends mainly on the possible behaviour/preference of the three communities and hence their chosen land use given the income from a particular land use and waiting period for that land use. Since Motse and Molekwa 'state of decisions is more or less the same as they both showed a relatively high preference on tourism and conservation despite the waiting period, their utility function is presented by equation 3 below. On the other side Legata showed a high preference to rather earn minimum income throughout than to wait for higher income in the future and therefore their utility function differ with the one for Motse and Molekwa and is presented by equation 4 and 5 below.

$$U_m = I_1 + \delta I_2 \dots\dots\dots (3)$$

$$U_L = \text{If } I_1 \geq I_{min} \text{ and } I_2 \geq I_{min} \therefore I_1 + \delta I_2 \dots\dots\dots (4)$$

$$\text{If } I_1 < I_{min} \text{ or } I_2 < I_{min} \therefore -\infty \dots\dots\dots (5)$$

Where I_1 is discounted income for the first four years of no tourism and I_2 is present value of infinite income stream from tourism. I_{min} represent the minimum income required by Legata at all times. δ is a discount factor of year 4.

Figures 3 and 4 show the indifference curves for these utility functions. Figure 3 illustrates either Molekwa or Motse situation and Figure 4 depicts Legata's situation or rather their utility functions. As can be seen from the two figures below; Figure 3 shows that there are perfect substitutes of income for either Molekwa or Motse community, hence their budget line starts and ends at any point on the original vertical or horizontal axis of the Figure 3. This is because either Motse or Molekwa can choose to allocate their land for tourism and have zero income I_1 and all the I_2 at the end of year four or beginning of year 5 or vice versa. On the contrary, Legata does not have the perfect substitutes of income hence for them a condition in which a minimum income at all times should be addressed and maintained prior

any decision of land use. Therefore, Legata community will opt for the land use which will allow them to earn a minimum income at all times, hence their indifference curves start and end at any point on the broken vertical or horizontal axis of the Figure 4.

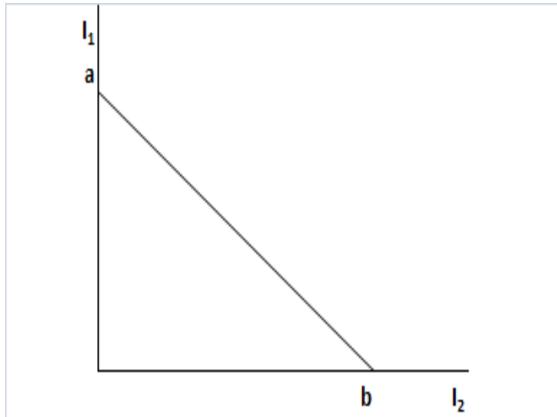


Figure 3: Motse or Molekwa’s utility function

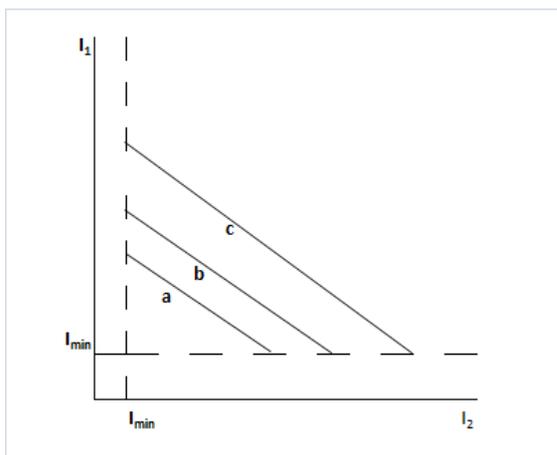


Figure 4: Legata’s utility function

5.4 Interactions of the three communities

Some decisions taken by these three communities may have an impact on other communities. Moreover, although they might still attain some benefits from their farms by acting alone, the full potential of their lands would not be realized. As a result it is interesting to see how the behaviour of one community would influence the others. Finally, this analysis of the interaction amongst these communities is advocated by the way in which their farms are located. For example, the locations of the farms of Molekwa and Legata community demonstrate this aspect. Since Molekwa farms are not located next to each other, it is difficult to develop them as one unit independent of the farms of either Motse or Legata. Therefore, this study analyzed their interaction.

Furthermore, the fact that these three communities reallocate their land use practise when are subjected to the condition of minimum income has implications for several things. For

instance, externalities of diseases and predation when different land uses are chosen, choosing livestock option for providing security reasons while waiting for tourism and increasing returns to scale for similar land use. For example, whilst pursuing conservation and tourism as land use practice will be ecologically and economically beneficial, the specific farms of Molekwa community are not located next to each other. This will pose some challenge when this community wants to fence its farms, especially if both Motse and Legata communities opt for livestock. The location of these farms might call for cooperation between the two communities, Legata and Molekwa. Considering the preference of the Legata community for livestock, Molekwa community might have to pay Legata community to go for tourism. Alternatively, Motse and Molekwa could both opt for tourism and then further decide to disregard Legata or to pay Legata to go for tourism. Of the potential businesses or development that can be pursued in Moepel Farms, the model mega reserve gives the highest income. However, for the model mega reserve to be of use the land should be at least 20 000 ha (LTP1) which none of these communities have on its own. Therefore, through interaction analysis this study first established how one community's decisions impact the others' payoffs for any two land use options; next the Nash Equilibria that comes out of that, third if the Nash Equilibria outcomes are not the best how can the problem be solved and maybe in this case the last step may involve payments from one community to another. The payment decision depends on three questions: how much will Motse and Molekwa pay maximally to persuade Legata to go for tourism, how much will Legata have to be paid minimally to go for tourism instead of livestock and can Molekwa and Motse afford the payment?

5.4.1 Interactions between Molekwa and Legata

The analysis of the interaction between these two communities, was based on the following assumptions: livestock income per ha of R100 and tourism income per ha of R700 and R2000 if 3 farms or more are employed as one unit; minimum income of R1500 per month; waiting period of 4 years for tourism and no waiting period for livestock. Furthermore, interest rate of 10% was used in this analysis. The rules of this game are either to opt for tourism or to opt for livestock. Opting for tourism in the context of this study means to combine farms of your community with those of the other communities with the intention of getting more benefits from tourism than you would get alone and opting for livestock means choosing to pursue livestock. Given these assumptions and rules, the two-way interactions with and without minimum income constraints were performed using the utility functions explained in section 5.3. Therefore, Table 7 and 8 present the outcomes of the interactions between Molekwa and Legata with and without minimum income constraints respectively.

Table 7: Interaction between Molekwa and Legata without minimum income constraints

		Molekwa	
		Tourism	Livestock
Legata	Tourism	L= R63.2 mln M= R129.2 mln	L= R22.2 mln M= R0.9 mln
	Livestock	L= R0.5 mln M= R45.2 mln	L= R0.5 mln M= R0.9 mln

Table 7 shows that regardless of what the other community chooses, each community always receives a higher payoff (or income) by choosing tourism. Hence tourism is strictly a dominant strategy. For instance, Molekwa can say that no matter what Legata does, we are better off pursuing tourism. As can be seen in the matrix above, if the two communities opt for tourism their total income from the 6 farms will be R192.4 million where the incomes will be R129.2 million and R63.2 million for Molekwa and Legata respectively, presuming their incomes are proportional to their land area. However if Molekwa pursue tourism whilst Legata opting for livestock, Molekwa will not have the 3 farms (6000 ha) as one unit since not all its farms are adjacent to each other. The implication of this is that Molekwa will get R700/ha instead of R2000/ha. Therefore Molekwa will earn R45.2 million and Legata R0.5 million. However, the minimum condition of Legata needs to be taken into account as it to a great extends influence their preference and choice of land use option. Therefore, still using the same assumptions and rules as above Table 8 below reflects the outcomes of the interactions of these two communities with minimum income constraints.

Table 8: Interaction between Molekwa and Legata with minimum income constraints

		Molekwa	
		Tourism	Livestock
Legata	Tourism	L= -∞ M= R129.2 mln	L= -∞ M= R0.9 mln
	Livestock	L= R0.5 mln M= R45.2 mln	L= R0.5 mln M= R0.9 mln

Table 8 reflects that Molekwa is better off choosing Tourism whereas Legata is better of choosing livestock if they cannot be paid a minimum income or an incentive grants to wait for

tourism. From the first pay-off matrix it is clear that Tourism gives the highest possible income but failure of Legata community to get minimum income will cause them deviate opting for tourism and to rather opt for livestock which do not have the waiting period. Consequently, when Legata community does not choose tourism Molekwa community also do not get the highest income from tourism since Molekwa will not have 3 farms as one unit therefore will earn R700/ha instead of R2000/ha when Legata does not opt for tourism. The main difference between the two scenarios of the first and second matrix is that when Legata community opt for tourism the two community both get reasonable incomes but with Legata community having no income for four years. In order for Legata not to compromise their requirement, it is reasonable to choose a land use option which will allow them to earn income which is equal or greater than their minimum income at all times, hence in this case it is livestock. Alternatively, Molekwa community can pay Legata to cooperate in order to get R2000/ha from the 5-star hotels.

Furthermore, Legata community realize that the worse off situation is for temporary, (i.e. for four years), and that they will also be better off in future by cooperating now. However, they have no alternative income and therefore 'trapped' in livestock farming. Furthermore, Legata might just use this opportunity to bargain with Molekwa, hence, Legata needs at least R72 000 to pursue tourism as a land use option or somewhat to have an income while waiting for the tourism benefits to take off. Of course Molekwa might be willing to pay the Legata the difference between the income that they get when they both do tourism and the income when Legata is doing livestock (i.e. R129.2 mln - R45.2 mln) and this depends if they can afford it of course or if they are able. However, if Molekwa can know beforehand that Legata needs only R72000 to cooperate, it will rather pay that instead of R84 million.

5.4.2 Interactions between Molekwa and Motse

The analysis of the interaction between these two communities was based on the same assumptions and rules as in 5.4.1. These two communities have an incentive to pursue tourism and conservation anyhow, so the conflict may not results. However things like income sharing can still induce conflicts among these two communities. In that case, given those assumptions and rules, Table 9 reflects their four possible scenarios:

Table 9: Interaction between Molekwa and Motse

		Molekwa (2)	
		Tourism	Livestock
Motse (1)	Tourism	M ₁ = R966.3 mln M ₂ = R645.4 mln	M ₁ = R193.2 mln M ₂ = R0.9 mln
	Livestock	M ₁ = R1.4 mln M ₂ = R45.2 mln	M ₁ = R1.4 mln M ₂ = R0.9 mln

Table 9 shows that each of this community receives higher pay off by opting for tourism regardless of the strategy of others. The matrix shows that if they choose tourism, the total income from the 10 farms of the two communities will be R1611.7 million where the incomes will be R966.3 million and R645.4 million for Motse and Molekwa respectively, assuming their incomes are proportional to their land area. Conversely, if for any reason Motse opt for livestock whilst Molekwa is doing tourism, incomes will be R1.4 million and R45.2 million respectively which is far less than what they can earn if they both use their land for tourism. Following the highest payoff resulting from tourism and the fact that these two communities have high incentives to pursue tourism and conservation, it is likely that they will opt for tourism unless income sharing becomes an issue. Furthermore, if Motse and Molekwa cooperate, they would have the needed 20000 ha for model mega reserve which is the most potential land use with highest income of all the three categories of tourism in this study.

5.4.3 Interactions between Motse and Legata

The analysis of the interaction between these two communities is still based on the same assumptions and rules as in 5.4.1 and 5.4.2. Again here like in section 5.4.1, the two-way interactions with and without minimum income constraints were performed and the results are presented below in Tables 10 and 11 respectively.

Table 10: Interaction between Motse and Legata without minimum income constraints

		Motse	
		Tourism	Livestock
Legata	Tourism	L= R63.3 mln M= R193.2 mln	L= R22.2 mln M= R1.4 mln
	Livestock	L= R0.5 mln M= R193.2 mln	L= R0.5 mln M= R1.4 mln

Similarly to the above interactions, Table 10 also shows that each of this community receives higher pay off by choosing tourism regardless of the strategy of others. If both communities practice tourism, their total income will be R256.5 million where the incomes are R193.2 million and R63.3 million for Motse and Legata respectively. Interaction between Motse and Legata does not add value to Motse community as it does to Molekwa. This is because Motse has already have 6 farms of more than 6000 ha which means in any case they can manage to get income of R2000/ha from 5-star hotel alone. However, Motse is willing to cooperate to get up to R10000/ha from model mega reserve. Nevertheless, combination of Motse and Legata's farms will not make the 20000 ha (i.e. 4633 ha + 14148 ha) required for model mega reserve and for this reason Motse will rather opt to do tourism with Molekwa community over Legata community. Furthermore, when the minimum income requirement is taken into account still Legata will maintain its preference and choice as it did with Molekwa. The difference is that Molekwa is more likely than Motse to bargain with

Legata since Motse's cooperation with Legata does not increase Motse's pay-off. Following below is Table 11 showing the outcomes of the interaction between Motse and Legata with minimum income constraints.

Table 11: Interaction between Motse and Legata with minimum income constraints

		Motse	
		Tourism	Livestock
Legata	Tourism	L= $-\infty$ M= R193.2 mln	L= $-\infty$ M= R1.4 mln
	Livestock	L= R0.5 mln M= R193.2 mln	L= R0.5 mln M= R1.4 mln

5.4.4 Discussion of the interaction results

Based on the results above, it can be seen that all the three communities are better off doing tourism, provided they have alternative income to compensate the waiting period for tourism. Pursuing livestock basically gives the lowest income as compared to tourism, but on the other hand it gives highest income to Legata community in the waiting period if they are not compensated with a minimum income since they don't seem to have alternative source of income. Lack of compensation or minimum income will induce Legata community to opt for livestock.

As can be noted from the results, the three communities can manage to get R700/ha just by practising tourism irrespective of what others choose as their strategies if minimum income is compensated. However getting R2000/ha depends on what others are choosing for both Molekwa and Legata. For Molekwa the reason is that their farms are not located next to each other whereas for Legata their farms are only 4633 ha. As a result only Motse community does not depend on the decisions by the other communities to get R2000/ha since their farms are more than 6000 ha and the farms are situated next to each other, hence easy to run as one entity. Nonetheless, Motse also need others to cooperate in order to reach 20000 ha which is a requirement for model mega reserve. However, only Molekwa can merge this need. Therefore it is likely that Motse and Molekwa would cooperate and leave Legata to their farming. From the analysis it is evident that the deviation of Legata pose the biggest challenge to Molekwa community than it does to Motse. This is challenging since the 3 communities might not possess sufficient capital to pay others to cooperate. Maybe Molekwa community can persuade Legata community to cooperate by making an agreement to share income equally rather than using pro-rata principle. Similarly, Motse could make the same agreement with Molekwa in order to opt for model mega reserve.

Information about different possible outcomes is crucial for the decisions which these communities have to make. The information prior to decision will strengthen their bargaining

spaces against each other. For instance, if Legata knows how much Molekwa is willing to pay it might bargain for high income than their actual required minimum income. On the same coin, if Molekwa knows how much is the minimum income of Legata they will not expose their willingness to pay rather, they would pay Legata only what they require to wait. Although the Motse community does not need cooperation to get an income of R2000/ha they do need some cooperation to fully optimize their farms through a model mega reserve. This is because the model mega reserve requires at least 20 000 ha to be operational which none of these communities, including Motse, have. Moreover, with a model mega reserve income per ha can be as high as up to R10 000/ha.

CHAPTER 6: CONCLUSION AND POLICY RECOMMENDATION

This study intended to analyze the interactions amongst the different stakeholders involved (i.e. agents) within the Moepel Development Initiative. This thesis has achieved this objective by answering several questions. First stakeholder analysis was done which showed that two departments (LEDET and LRLCC) are working hand in hand to assist the three communities through developmental efforts. LEDET's mandate is conservation and LRLCC's mandate is to ensure communities restore their disposed and then develop it after all. Other stakeholder involved is LTPs which is a tourism marketing wing for LEDET. Khulile Africa NGO was also identified as the potential stakeholder to be brought on board in terms of the role they can play. Each of the three communities has a registered CPAs which are operating as independent entities. According to the identified stakeholders the opportunities that are available in Moepel Farms are conservation and tourism and bit of livestock farming. All the stakeholders seemed to have agreed that the economic benefits of tourism are higher than the one of livestock. They also agreed that the tourism benefits materialize in the long term and this has shown implication to their choice of land use.

Furthermore, the empirical results from game theoretic analysis of the study have shown that the development of tourism through a strong cooperation among the communities could constitute a good option for the community development. Opting for tourism would allow the communities to earn 7 times more than by opting for livestock farming. Despite the existing tourism potential, there is scepticism among the communities due to the fact that tourism is profitable only in the long run. These findings pose some policy implications for the government and other main stakeholders. First, it is important to enhance the participation of the main beneficiaries (i.e. communities); particularly making them to deeply comprehend the benefits of tourism. Second, it is relevant to empower the communities on alternative sources of income like livestock farming in order to not jeopardize developing tourism.

Looking at the result of this study given the situation of the 3 communities, is logical to think that Motse and Molekwa will likely cooperate and proceed with conservation and tourism and leave Legata to do what they want with their land since the two communities will have their model mega reserve already if they cooperate. However, this would be an ideal situation if these communities would have sufficient information prior to their decision during initial stages of project development. For instance, if these communities are not informed during the initial stage, Motse might think that they have more hectares of land and they do not necessarily need to cooperate with any of the two communities. However, if they do that they will still get benefit of R2000/ha but they can actually get up to R10000/ha if they do cooperate with Motse for establishment of model mega reserve. It should be noted that if Molekwa and Motse cooperate and pursue tourism and conservation Legata might have a challenge in pursuing their livestock farming for number of reasons like predation, wildlife-livestock diseases, etc. resulting in deterioration of livestock as land use option for Motse. Although Molekwa would really need the cooperation of either Legata or Motse, paying them to do so might be a challenge. It is likely that the community themselves would not have money to pay others to cooperate with them if they have to pay from their own meagre incomes. As a result even money to pay minimum income of Legata will be challenging. Therefore, negotiation amongst the three communities through their different CPAs and having sufficient information prior to decision making can ease the situation and increase the possibilities of cooperation. Alternatively, an option can be that Molekwa first develop their

own, tourism and when the tourism money starts flowing, pay the Legata for waiting. This will result into three periods where; Molekwa will be waiting for tourism whilst Legata will be pursuing livestock, then Molekwa will start earning tourism money and then Legata will earn livestock money and then Molekwa can therefore pay Legata to opt for tourism with the money earned from tourism. This will be handier if Molekwa wants to upgrade from fully developed game area to 5-star hotel. Similarly this could apply to Motse if they want to upgrade from a 5-star hotel to model mega reserve. This is still an interesting dynamic aspect to the problem that necessitates further investigation, hence future research is recommended.

Although the notion that tourism and conservation benefits materialize in the long run seemed to be the biggest challenge particularly for Legata community, it can also be looked at from another point of view. For instance, developing underdeveloped land like Moepel Farms to be fully established into tourism requires work like clearing of some bushes, demolishing of older buildings, and renewal of existing infrastructures. In this case the local people from these communities, who are unemployed, can assist in doing this and then get some income to survive while waiting for tourism benefits. As a result, this could already contribute to the problem of minimum income of Legata community and none of the communities would have to pay each other. Moreover, conservation is likely not to be successful if it is done of its own sake, hence there must be felt benefits at the community level. By involving these communities from as the beginning as the clearing of the land and renewing of infrastructure will make them feel the partnership is mutual.

Information ahead of all the decisions is very important. Although for the game analysis of this thesis the study assumed full information of the agents (i.e. three communities), it is most likely the full information on benefits of different land uses is not known amongst the community members hence they will need some advice from experts like LTP, LEDET as well as other communities which were or are involved in similar projects (e.g. Makuleke community). LTP is responsible for development of and marketing of tourism and are more familiar with potential incomes from various activities of tourism. LEDET is more informed with conservation and the benefits associated with it. Makuleke community has used their claimed and restored land to their advantage through tourism and conservation hence they could share their success and failures with these communities. From all the information these communities could be able to make more informed decisions. Moreover, the benefit sharing principles which will be decided upon would also dictate whether these 3 communities will really choose to develop tourism or livestock

Finally, this study is based on case which was an ongoing project. Probably by the time the study finishes, a lot of things mentioned in this study would have changed. However the relevancy of this study would still be significant since Moepel Development Initiative is a long term development effort. Furthermore, although this thesis is based on single case and therefore context bound, it can still be used as a terms of reference in similar situations to understand the dynamic of interactions during land use decision making. Moreover, land restitution in South Africa is still a continuing process and there will still be decision on land use option, hence it is important to understand the dynamics of interactions particularly among communities or beneficiaries.

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