Dissonance in Social Learning

Towards Maintenance of Natural Resources in the Kouga Catchment, South Africa





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"*Education is the most powerful weapon which you can use to change the world*"

Nelson Mandela

Preface

This research was driven by my personal and academic interests which are very well reflected in the quote stated on the previous page. The survival of modern human society directly depends on natural resources because without those humans are incapable to meet the development needs. However, human activities have a huge negative impact on the planet resources. Therefore, the current trends in the world, in particular natural resource management principles, require fundamental changes.

Change should happen, but *where is the profound of change? What is the initial step in order to start to question the existing structures of thinking and acting?* The answer and the inspiration to do this research come from education. The education - all the possible types of learning - is the initial step towards change. Learning could influence and question the current thinking and acting patterns and potentially lead to a more sustainable future. Furthermore, Röling (2002) states that sustainable human society *emerges from interaction.* This society recognizes its interdependency. It is going beyond individual level and tries to address collective thinking and acting with a concern to ecology and environment.

As a result, it becomes clear that learning has to be combined with collective interaction in the context of sustainability building in the future. Nowadays, one type of alternative learning which combines these two aspects has gained recognition worldwide. In the book *Social learning towards a sustainable world*, Wals and Van der Leij (2007) point out that the Google hits for the term *social learning* in the 16 months increased more than twice from 400,000 to 900,000 hits. Google hits for the combined terms *social learning* and *sustainability* almost tripled in the same period from 53,000 to 151,000 hits. After 4 years these numbers were even more impressive. The term *social learning* reached 54,200,000 hits (increase of 60.2 times). The combined terms *social learning* and *sustainability* had 5,250,000 hits[1] (increase of 34.8 times). These booming numbers illustrate its growing potential to be a useful tool in order to inspire the changes in the current principles of nature management.

In this way, I approached the topic of the thesis research. This research was a valuable learning journey which I experienced in the last year. My journey started in Wageningen where I developed the ideas leading to South Africa where I learned, experienced and received a lot of input and stimulation for my research. The journey ended in Wageningen again where I reflected and combined my old and new knowledge to something that I can share and discuss with others.

I am very grateful for everyone who I met in my journey, for the people who guided me, gave me inspiration and motivation to finish this challenging research. First of all, I would like to thank my supervisors Dr. Rico Lie and Jasper de Vries. They guided me for an extensive time and gave me a lot of valuable and critical comments. I would like also to thank Living Lands and PRESENCE Learning Network team for the opportunity to do an empirical research in the Kouga Catchment, South Africa.

[1] The terms are googled 5 August 2011.

Special thanks for people in the PRESENCE Learning Network for the inspiring ideas and nice memories. Thank you specifically to Dieter Van den Broeck for giving me a lot of alternative thinking insights. Furthermore, I am very happy that I shared my learning journey in the Kouga Catchment with Clara Veerkamp. I could not expect a better company for the data collection. Thanks to ECPTA, E2A and GIB representatives for sharing their knowledge. Thanks for the people in the Kouga Catchment who shared their knowledge and understandings. I would like to give special thanks to Sam Van der Merwe who helped me to orientate and feel welcome in the Kouga Catchment area. Your help was very precious. Thanks to Barnard Steyn who gave an insight to social challenges of the area. Many thanks for the farmers for such a warm and open welcome. Without your collaboration and sharing your experiences, this thesis research would not have been possible. Finally, I would like to thank everyone who helped and supported me in achieving my goals. You all made this learning journey to be an unforgettable life experience!

Egle Draugelyte
Wageningen, 3 December 2012

Summary

This research analyses the role of dissonance in the initiation of the social learning process. Social learning is defined as the sharing of different knowledge regarding natural resource management (NRM). This type of learning may inspire a new way of thinking and acting which support the maintenance of natural resources. One of the main conditions in order to initiate the social learning process is dissonance. Dissonance refers to all differences among stakeholders' knowledge regarding NRM. Therefore, understanding the characteristics of dissonance in the initiation of the social learning process is crucial.

The research addresses dissonance from theoretical and empirical perspectives. First, the theoretical model of dissonance in the social learning process initiation was created. Second, the empirical research was done guided by this model. The theoretical model specifies that the degree of dissonance (*high*, *optimal* and *low*) determines the initiation of the social learning process. The *optimal dissonance* degree is necessary for the successful initiation of the social learning process. This degree refers to the situation when a variety of stakeholders' knowledge supports a *common goal* concerning the maintenance of natural resources. Therefore, the degree of dissonance in the context of a *common goal* creation was the focus of the empirical research. The empirical research was conducted in the Kouga Catchment study area, South Africa.

The degree of dissonance was analyzed within and between stakeholders' knowledge. In order to investigate the degree of dissonance, interviews were done in the study area. The qualitative and quantitative data were gathered by means of unstructured, semi-structured and structured interviews. The results indicate that dissonance has three characteristics in the initiation of the social learning process. First, dissonance has two opposite effects on the initiation - dissonance has a potential (1) to activate and (2) to block the social learning process. Second, the degree of dissonance is higher when more categories of stakeholders are involved. Third, the combination of the *high* and *optimal dissonance* is most likely to be present. These three characteristics result in the domination of the *high dissonance* in the initiation of the social learning process. Therefore, it underlines that the *optimal dissonance* has to be seen as a continuous focus point in practice in order to successfully initiate the social learning process. Consequently, it implies the importance to facilitate the *optimal dissonance* situation.

Other findings of this research show that the degree of dissonance is influenced by the socio-economic state of involved stakeholders. It indicates that the facilitation of the *optimal dissonance* should pay special attention to the socio-economic state. Finally, from the practical point of view, the possibilities and recommendations to start the social learning process in the Kouga Catchment study area are made.

Keywords: *common goal*, *dissonance*, *degree of dissonance*, *optimal dissonance*, *knowledge*, *natural resource maintenance*, *natural resource management, social learning*, *stakeholders*.

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Acronyms and Abbreviations

BMR	Baviaanskloof Mega Reserve
DAFF	Department of Agriculture, Forestry and Fisheries
E2A	Eden to Addo
ECPTA	Eastern Cape Parks and Tourism Agency
GIB	Gamtoos Irrigation Board
NRM	Natural Resource Management
PRESENCE	**P**articipatory **R**estoration of **E**cosystem **SE**rvices & **N**atural **C**apital, **E**astern Cape
WfW	Working for Water

I. INTRODUCTION

Problem Definition

Nowadays a large number of problems related with natural resources are faced by modern human society, for instance, pollution, environmental degradation, deforestation, land erosion, climate change, biodiversity loss, natural catastrophes, overpopulation, food and water scares, poverty etc. (EC Commission, 2000; MEA Board, 2005). These problems are the symptoms showing that humans lost a balanced connection with nature. The Earth's capacity is overused. According to the *Millennium Ecosystem Assessment Board,* humans are living beyond their means: "*human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted*" (MEA Board, 2005). Humans "*have made unprecedented changes to ecosystems in recent decades to meet growing demands for food, fresh water, fiber, and energy*" (MEA Board, 2005). Furthermore, humanity's needs are expanding each day, which implies the necessity to use more natural resources in the future.

The need for changes in natural resource management is stressed more and more by several authors. Beck (1992) reveals this situation in the context of *reflexive modernization* when the central point is not to master nature, but to deal with the issues created by modernization itself. In some cases modernity "*threatens its own foundations*" (Beck and Grande, 2010). Or according to Röling (2002), "*until now, man has fought nature. From now on, he will fight his own nature*". Humans have managed nature in a way which threatens their well-being. Therefore, it is no longer possible to manage nature in the same way as in recent decades.

Human priorities and values have to change towards maintenance of natural resources. Humans are the only organisms on Earth that have equal power to create and save nature as well as to destroy it. Human-nature interdependence is broadly recognized (Liu et al. 2007; Chapin et al. 2009). Moral commitment has to exist in humans' actions (Kirchmann et al. 2008). This is reflected in *the Earth Charter Initiative*: "*the choice is ours: form a global partnership to care for Earth and one another or risk the destruction of ourselves and the diversity of life. Fundamental changes are needed in our values, institutions, and ways of living*" (EC Commission, 2000). Given this reality it is obvious that nature management cannot be disconnected from human management any longer. Röling (2002) is stressing that nature management on its own is not anymore enough to face interrelated natural resource management

> *"The significant problems we face cannot be solved at the same level of thinking we were at when we created them"*
> Albert Einstein

problems. Environmental management should contain people management. The idea of *human management* emphasizes changes in humans' knowledge regarding natural resource management in order to meet future existence necessities. Knowledge embodies theoretical and practical understanding of natural resource management (adapted from Oxford Dictionaries, 2012). It refers to humans' thinking and acting patterns. Consequently, humans' knowledge is shaping the way how natural recourses of Earth are perceived and used.

Knowledge is a social construct (Engel, 1995) which is acquired through the learning process (Knowles et al. 2005 cited in Muro and Jeffrey, 2012). As a result, learning influences humans' thinking and acting. Learning creates conception of reality and shapes the way how natural recourses are and will be managed in the future. Moreover, learning in the context of environmental and human management cannot be restricted to its traditional forms, as classrooms, universities or other kinds of education centers. In this context alternative forms of learning are playing important role, for instance, transdisciplinary learning, transformative learning, anticipatory learning, collaborative learning and social learning (Wals, 2010). Nowadays one of the most popular among them is ***social learning***.

> *"If we don't do anything about thought, we won't get anywhere. We may momentarily relieve the population problem, the economic problem, and so on, but they will come back in another way"* (Bohm and Edwards, 1991)

Social Learning

Social learning has gained wide recognition as a tool which can be used to improve natural resource management (Reed et al. 2010; Leys and Vanclay, 2011). However, in the literature of social learning there are still significant differences in defining the concept. Social learning is used together with participation and collaboration approaches (Bizikova et al. 2011; Muro and Jeffrey, 2012; Von Korff et al. 2012) or confused with its conditions and facilitation methods (Reed et al. 2010). Therefore, several distinctions have to be made in order to structure the definition of social learning more precisely: (1) conditions of social learning, (2) social learning process and its outcomes, and (3) facilitation of social learning. The general focus of this research is the conditions of social learning, but firstly the social learning process and its outcomes have to be defined in order to reveal the main conditions of social learning. The facilitation is not the focus of this research.

The sharing of different knowledge regarding natural resource management (NRM) is treated as the social learning process (adapted from Mostert et al. 2007; Beers et al. 2010; Leys and Vanclay, 2011; Muro and Jeffrey 2012). Participants (stakeholders) are learning collectively: "*from and with one another*" (Wals et al. 2009). This sharing process is structured by three building blocks: (I) *common goal,* (II) *mutual trust* and (III) *commitment to maintain natural resources*.

The social learning process is initiated when a *common goal* concerning the maintenance of natural resources is created (adapted from Baggett et al. 2006). Stakeholders could differ enormously, but according to Röling (2002), each stakeholder with his/her own cognition is able to develop *distributed cognition*. During communication and negotiation practices stakeholders could understand each other better and find out a *common goal.* A *common goal* creation could be described as move from strategic (egocentric) to communicative action (Habermas, 1984 cited in Rist et al. 2006). Stakeholders are able to engage successfully to knowledge sharing process when a *common goal* is present. This is defined as a *mutual trust* situation. Stakeholders are enabled to learn, collaborate and work together regardless their differences. Finally, stakeholders are empowered to maintain natural resources in an atmosphere of *mutual trust*. They are able to commit to the realization of a *common goal* regarding the maintenance of natural resources. This is the main desired outcome of the social learning process.

Consequently, social learning embodies the changes in stakeholders' knowledge regarding NRM (adapted from Keen et al. 2005; Cundill et al. 2011; Reed et al. 2010). This learning process inspires a new way of thinking and acting which support the maintenance of Earth resources.

Focus of the Research

Pluralism is taken as the main trigger to enhance the social learning process (Beers and Sol, n.d. Koppen, 2007; Beers et al. 2010; Arnold, et al. 2012). Stakeholders learn more in heterogeneous groups than in homogenous ones (Wals et al. 2009). Therefore, differences among stakeholders in variety of areas, such as knowledge, interests, values, etc. regarding NRM are indispensable conditions of the social learning process. In particular, different types of knowledge are important because it is the essential material for learning. All differences among stakeholders' knowledge regarding NRM are defined as **dissonance**.

Dissonance gives continuous energy for the social learning process. Dissonance could destroy existing structures and new forms of thinking and acting could emerge (adapted from Wals, 2010). However, the main obstacle for the realization of the social learning process could be dissonance as well. Multiple differences among stakeholders are potential source for conflict (Arnold et al. 2012; Muro and Jeffrey, 2012) which could block the learning process. It enables to state that dissonance have an ambiguous character in the social learning process. Nevertheless dissonance could trigger social learning to begin; it could be the main obstacle for the learning process realization. Therefore, dissonance is a crucial condition of social learning which is especially important in the initiation phase of the process - dissonance determines its beginning or its end, its success or its failure: "*there is no learning without dissonance, and there is no learning with too much dissonance*" (Wals and Noorduyn, 2009). Consequently, it is essential to focus on **the role of dissonance in the initiation of the social learning process** in order to ensure its successful continuation.

However, dissonance in the social learning process lacks coherent theoretical model and empirical research. Social learning studies are done in several domains. First, the research in learning sciences

is based on practical application: a lot of attention is paid to workshops, courses, training programs, seminars (Ducrot, 2009; Gonzalez-Gaudiano and Meira-Cartea, 2010; Scheltinga and Geene, 2011; Von Korff et al. 2012) or to the training resources (Lotz-Sisitka, 2010). Second, theoretical models are built which characterize the social learning process or its context (Brown et al. 2005a; b; Keen et al. 2005), especially in the tradition of sustainability science (Beers et al. 2010). Third, social learning is widely used in NRM (Reed et al. 2010; Leys and Vanclay, 2011) and in sustainable NRM (Schusler et al. 2003; Pahl-Wostl, 2006; Collins et al. 2007; Ison et al. 2007; Hayward et al. 2007; Newig et al. 2008). Nevertheless, dissonance is not the attention point in these studies. Fourth, several studies have been done from the conflict management perspective (Jiggins et al. 2007; Leys and Vanclay, 2011). Lastly, a study by Baggett et al. (2006) was focused on dissonance but in the context of participatory planning. It enables to state that dissonance in social learning is not very widely covered by academic literature. This statement is supported by Leeuwis (2000) and Wals (2010) who emphasize the necessity to better understand the role of dissonance. Therefore, it is crucial to fill these knowledge gaps by providing theoretical model and empirical research regarding dissonance in the initiation of the social learning process.

Research Objective and Guiding Research Question

The purpose of this research is **to reveal the role of dissonance in the initiation phase of the social learning process from both theoretical and empirical perspectives**. First, the theoretical model of dissonance in the social learning process with a focus on initiation will be created. Second, the empirical research will be done guided by the theoretical model. The empirical research will be conducted in the Kouga Catchment study area in the context of a social learning project initiation. Stakeholders' knowledge regarding NRM will be investigated and the role of dissonance will be evaluated. The theoretical dissonance assessment will bring more clarity to social learning conceptualization. The empirical dissonance assessment will contribute to a more successful initiation of the social learning process in the Kouga Catchment area.

The guiding research question is: **What is the role of dissonance in the initiation of the social learning process?** Three blocks of the research questions have to be answered in order to answer the guiding research question. These blocks of the research questions will be presented at the end of Chapter II after further theoretical elaboration.

Methodology

First, an analysis of current scientific literature will be carried out in order to create a theoretical model of dissonance in the initiation of the social learning process. Second, the qualitative and quantitative data will be gathered in the research area in order to identify stakeholders' knowledge regarding NRM and evaluate the role of dissonance. The qualitative data by means of doing 10

unstructured interviews, 25 semi-structured interviews; and the quantitative data by means of doing 23 structured interviews will be used in the research.

Overview of the Research

The thesis research consists of VII chapters. Chapter I introduces the research. Chapter II describes the theoretical framework. The process, outcomes and conditions of social learning are presented. Chapter II concludes with the focus of the empirical research and elaboration of three blocks of the research questions. Chapter III includes a detailed description of materials and methods used in the research. The case study, strategy of respondents' selection, data collection and data analysis methods are presented. Chapters IV, V and VI answer the research questions. Each chapter is devoted to one block of the research questions. Chapter VII closes the research. First, the results of the previous chapters are combined and conclusions are formulated. Second, a reflection of the whole research is made. Lastly, practical conclusions and recommendations for the Kouga Catchment study area are drawn.

II. THEORETICAL FRAMEWORK

This chapter covers the first purpose of the research: **to reveal the role of dissonance in the initiation phase of the social learning process from a theoretical perspective**. For that reason, theoretical model is created in order to structure the social learning process and identify the role of dissonance in it. The chapter concludes with the focus of the research and elaboration of three blocks of the research questions and sub-questions.

Academic literature does not reach consensus about the definition of social learning which leads to confusions among its conditions, process, outcomes and facilitation methods (Reed et al. 2010; Bizikova et al. 2011; Muro and Jeffrey, 2012; Von Korff et al. 2012). Therefore, several distinctions are made in order to structure the definition of social learning: (1) conditions of social learning, (2) social learning process and its outcomes, and (3) facilitation methods of social learning. The focus of this research is **the conditions of social learning**, but firstly **the social learning process and its outcomes** have to be defined in order to reveal the main conditions of social learning. The facilitation is not the focus of this research.

1. Outcomes of Social Learning

The *social learning* concept derives from sustainability sciences (Beers et al. 2010) and has numerous interpretation and application types in various disciplines, for instance, political science, public participation, education, human psychology, sociology, communication science and management studies (Alcalay, 1983; Koppen, 2007; Zouwen et al. 2010). The term *social learning* is often used in the context of sustainability which is stressed as the main outcome of social learning (Dyball et al. 2007) or even the same process: "*sustainability is essentially an on-going social learning process*" (Tilbury, 2007). Nevertheless, *sustainability* is a concept with a wide range of applications which needs specification in order to define where exactly the social learning process intends to lead.

Originally, around the 1950's, sustainability primarily meant protecting endangered species which could diminish or become extinct due to human activities. Later, sustainability took on a broader meaning taking into account whole ecosystem[2] services. Finally, it was extended to a more varied definition, including people's livelihoods and a government's economic policy (Wilson, 2010) which

[2] Ecosystem – "*a natural system that represents the interactions between plants, animals, insects, micro-organisms and the non-living environment (e.g. soil, air, water). Ecosystems can operate at different scales – from very small (a pond) to whole landscapes (an entire water catchment area)*" (Vromans et al. 2010).

could be called a socio-economic sphere. The *sustainability* concept in most cases is embedded in these three dimensions (Keen et al. 2005; Wals and Kieft, 2010):

- Environmental/ecological which includes the issues of natural resource[3] management and its consequences.
- Social/socio-cultural which mainly touches the problems related to human social status in daily life, such as human rights, security, health, etc.
- Economic which is closely related with poverty reduction and ethics in the market economy.

Sustainability must at least contain these three dimensions; nevertheless the environmental dimension takes the lead before social and economic ones. Human survival directly depends on natural resources, because without these elements human beings are incapable of meeting their development needs. Proper natural resource management, for instance, biodiversity[4] protection, pollution management, measures against land degradation, deforestation, and desertification, is directly influencing the social and economic dimensions. This dependence is illustrated in Figure 1.

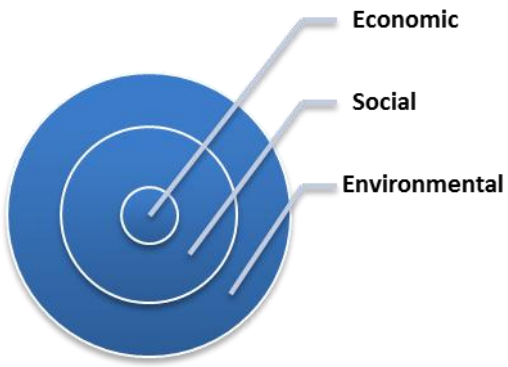

Figure 1. Sustainability dimensions (adapted from Keen et al. 2005; Vromans et al. 2010)

Figure 1 illustrates the social and economic spheres fully embedded within the environmental system. This implies that adequate management of the environmental dimension creates premises for social and economic prosperity of human beings. According to Chapin et al. (2009), sustainability requires economic and social human activities not to exceed the environmental dimension's capacity to "*provide services, which in turn, is constrained by the planet's life-support system*". Therefore, sustainability joins society and its economy to the environment (Wilson, 2010). Probably the most popular and widely used definition of sustainable development is that of the *World Commission on Environment and Development.* This calls for development that "*meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987). The word *needs* contains a combination of environmental and socio-economic goals of people alive

[3] Natural resource - soil, water, air and biodiversity (Balaswamy, 2006; Lefebvre et al. 2005).

[4] Biodiversity – "*the wide variety of plant and animal species in their natural environment. It not only refers to species (plants, animals and micro-organisms), but also to ecosystems, landscapes, and the ecological and evolutionary processes that allow biodiversity to persist over time. It includes the diversity within species, between species, and of ecosystems*" (Vromans et al. 2010).

today, while *future needs* means treating natural resources in a way that future generations will also be able to reach environmental and socio-economic goals. Consequently, the natural resources have to be maintained which safeguards development options for present and future generations.

The maintenance of natural resources defines its positive utilization, for instance, conservation[5] and/or rehabilitation[6] activities. Reduced amount of agrochemicals in agriculture in order to prevent soil degradation (Kirchmann et al. 2008), water saving practices or biodiversity protection (Vromans et al. 2010) are widely stressed examples of natural resource maintenance. It is opposed to non-maintainable uses which are causing depletion or degradation of natural resources (Byers, 1996).

To summarize, the core of the environmental dimension of sustainability is the maintenance of natural resources. The social and economic dimensions of sustainability are dependent on the maintenance of natural resources. It enables to state that **the maintenance of natural resources is the specification of the *sustainability* concept**. Accordingly, the maintenance of natural resources turns out to be the main desired outcome of the social learning process.

2. Process of Social Learning

The sharing of different knowledge regarding natural resource management (NRM) is treated as the social learning process (adapted from Mostert et al. 2007; Beers et al. 2010; Leys and Vanclay, 2011; Muro and Jeffrey 2012). Participants (stakeholders) are learning collectively: "*from and with one another*" (Wals et al. 2009). This process is structured by three building blocks: (I) *common goal,* (II) *mutual trust* and (III) *commitment to maintain natural resources*. **These building blocks happen simultaneously, however this division is especially applicable for the initiation of the social learning process**. The social learning process is started when a *common goal* concerning the maintenance of natural resources is created (adapted from Baggett et al. 2006). The successful creation of a *common goal* leads to *mutual trust* situation and finally *commitment to maintain natural resources* occurs. Therefore, during this process it is possible to inspire a new type of knowledge which support the maintenance of natural resources (adapted from Jiggins et al. 2007; Leys and Vanclay, 2011; Muro and Jeffrey, 2012).

Three building blocks of the social learning process are continuously chaping the social learning process and become the products of the process itself. They are interdependent and both strengthen and weaken each other (adapted from Beers et al. 2010). Figure 2 illustrates this relation.

[5] Conservation – "*preservation, protection or restoration of the natural environment and wildlife* [and] *prevention of wasteful use of a resource"* (Oxford Dictionaries, 2012).
[6] Rehabilitation – "*return* [...] *environmental feature to its former condition*"(Oxford Dictionaries, 2012).

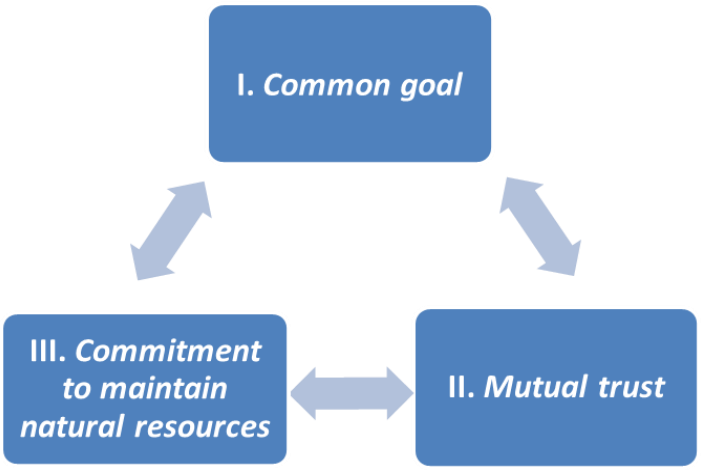

Figure 2. Building blocks of the social learning process (adapted from Beers et al. 2010)

I. Common goal

A *common goal* creation defines the initiation of the social learning process. The process of social learning starts when stakeholders engage with each other (Mostert et al. 2007; Muro and Jeffrey, 2012) to exchange their knowledge regarding NRM (adapted from Beers et al. 2010; Leys and Vanclay, 2011). However, stakeholders can successfully engage with each other when they have the same vision. Therefore, the positive social contexts where "*diverse stakeholders share a common forum, learn about each other's values, reflect upon their own values and create a shared vision and shared objectives*" (Mathur et al. 2008) have to be ensured. Stakeholders could differ enormously, but according to Röling (2002), each stakeholder with his/her own cognition is able to develop *distributed cognition*. During communication and negotiation practices stakeholders could understand each other better and find out a *common goal* concerning the maintenance of natural resources. This could be described as move from individual to common preferences.

II. Mutual trust

Stakeholders are able to engage successfully to knowledge sharing process when a *common goal* is present. This is defined as a *mutual trust* situation. Stakeholders are enabled to learn, collaborate and work together regardless their differences. An environment where participants can trust each other is very important for the further development of the social learning process (Harris and Deane, 2005; Critchley and Scott, 2005; Cundill, 2010). *Mutual trust* grows in various circumstances, for instance, when the willingness to share knowledge and information is high or a common challenge is faced (Beers et al. 2010). The most important aspect is to develop the ability to work "*on some communality in the lived and enacted diversity of ideas, interests, actions and purposes*" (Bouwen and Taillieu, 2004).

III. Commitment to maintain natural resources

Finally, stakeholders are empowered to reach a *common goal* in an atmosphere of *mutual trust*. They are able to commit to the realization of a particular form of natural resource maintenance. Commitment embodies involvement in thinking and acting. This sequence reflects the successful social learning process when: (I) *common goal* is created, (II) *mutual trust* is reached (III) and *commitment to maintain natural resources* is happening.

3. Conditions of Social Learning

Social learning needs several conditions in order to be initiated and carried on. First, social learning is an essentially social practice or event (Loeber et al. 2007; Reed et al. 2010). Therefore, social learning needs participants (stakeholders). Second, social learning needs differences among these stakeholders in variety of areas, such as knowledge, interests, values, etc. regarding NRM. In particular, different types of knowledge are important because it is the essential material for learning. These interrelated conditions of social learning are elaborated in the following sections.

3.1. Stakeholders

Social learning requires active stakeholders' engagement (Chapin et al. 2009) because their thinking and acting are intended to be changed during the learning process. The stakeholder is defined as any form of social entity (organized or unorganized) which has different interests in a particular issue or subject in NRM. This contains entities who can influence decisions and who are affected by these decisions from the positive or negative side (Grimble and Chan, 1995; Grimble and Wellard, 1997; Hemmati, 2002 cited in Sun, 2007). The concept of *stake-holding* is used in order to illustrate the idea that stakeholders "*actively construct, promote and defend their stake*" (Jiggins and Collins, 2004 cited in Sun, 2007). Most NRM situations contain a varied web of stakeholders (Grimble and Wellard, 1997 cited in sun, 2007) and their interests vary from individual people to groups or organizations (Sun, 2007). In this research **the term *stakeholder* is used to refer to individuals, groups or organizations with an interest in the NRM in a particular area of social learning**.

The stakeholders are divided into two categories regarding their importance to maintain natural resources: primary and secondary stakeholders (IFAD, ANGOC and IIRR, 2001). The primary stakeholders directly use and/or manage natural resources in the area of social learning. It is assumed that they often have: (1) rights to natural resources; (2) knowledge about how to manage local natural resources, and (3) power to implement and sustain natural resource management practices (Byers, 1996). The secondary stakeholders are directly or indirectly related with NRM in the

area of social learning. They often contribute by providing scientific, technical or broader knowledge about natural resources (Figure 3).

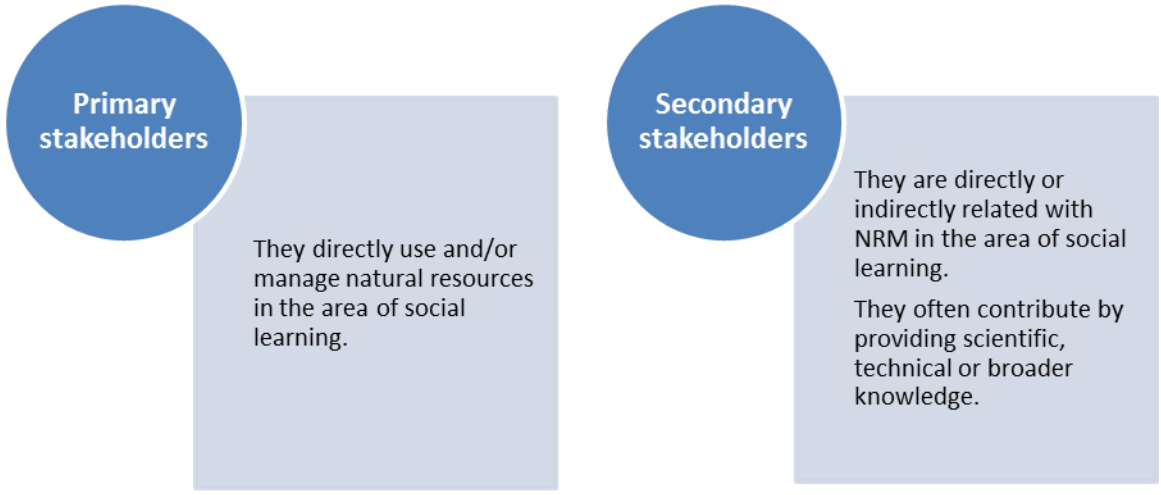

Figure 3. Stakeholders' categories

3.2. Dissonance

Pluralism is taken as the main trigger to enhance the social learning process (Beers and Sol, n.d. Koppen, 2007; Beers et al. 2010; Arnold et al. 2012). Stakeholders learn more in heterogeneous groups than in homogenous ones (Wals et al. 2009). Therefore, social learning needs differences among stakeholders in variety of areas. In particular, different types of knowledge regarding NRM are important because it is the essential material for learning. **All differences among stakeholders' knowledge are defined as dissonance**.

Dissonance gives continuous energy for the social learning process. Dissonance could destroy existing structures and new forms of thinking and acting could emerge (adapted from Wals, 2010). New meaning and perception could be created (Leeuwis, 2004). However, the main obstacle for the realization of the social learning process could be dissonance as well. Multiple differences among stakeholders are potential source for conflict (Arnold et al. 2012; Muro and Jeffrey, 2012) which could block the learning process. It enables to state that dissonance have an ambiguous character in the social learning process. Nevertheless dissonance could trigger social learning to begin; it could be the main obstacle for the learning process realization. As a result, dissonance is a crucial condition of social learning which is especially important in the initiation phase of the process.

The effect of dissonance depends on its **degree** – intensity of differences among stakeholders' knowledge. The dissonance degree is divided into ***high***, ***optimal*** and ***low***. The *high dissonance* degree blocks the social learning process because the differences among stakeholders' knowledge are too

large and create conflict which cannot be successfully solved. The *optimal dissonance* degree activates the social learning process. Different types of stakeholders' knowledge are mobilized for the learning and consequently new ways of seeing the world may emerge (Selby, 2007). The *low dissonance* degree cannot activate the social learning process because stakeholders have no differences to be shared. Absence of dissonance stagnates social learning (Beers and Sol, n.d. Beers et al. 2010). The degree of dissonance and its effect on social learning are visualized in Figure 4.

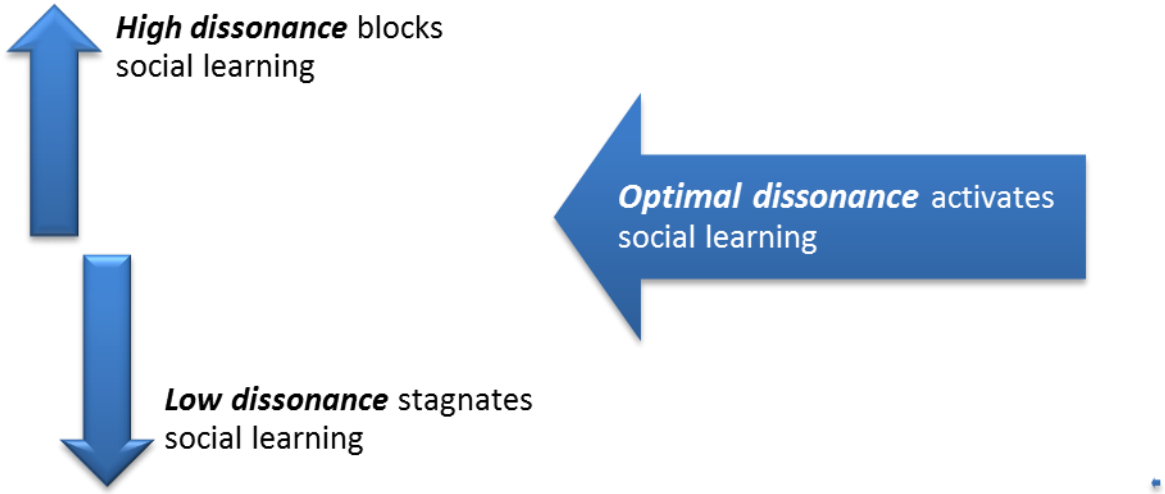

Figure 4. Degree of dissonance and its effect on social learning

A *low dissonance* degree stays mainly in the theoretical level because it is hardly possible to find stakeholders who have the identical knowledge in the context of NRM. As stated previously, most natural resource management situations contain a varied web of stakeholders (Grimble and Wellard, 1997 cited in Sun, 2007). Therefore, dynamics between the *high* and *optimal dissonance* are most likely to be expected in any practical social learning situation.

4. Focus of the Empirical Research

The social learning process, outcomes and conditions were presented in the previous sections of this chapter. This section specifies the theoretical approach and identifies the focus of the empirical research. As a result, three blocks of the research questions are stated at the end.

4.1. Specification of the Theoretical Approach

Figure 5 states the theoretical model of dissonance in the social learning process. This model summarizes the theoretical approach mentioned in the previous sections of this chapter:

- Social learning is embedded in the **context of sustainability** which specification is the maintenance of natural resources (Figure 5).
- The social learning process is structured by three **building blocks**: (I) *common goal,* (II) *mutual trust* and (III) *commitment to maintain natural resources* (Figure 5). A *common goal* creation defines the initiation of the social learning process. The successful creation of a *common goal* leads to *mutual trust* and, finally, *commitment to maintain natural resources* occurs.
- Social learning needs an essential **condition** in order to be initiated and continued. This condition is the ***optimal dissonance*** among stakeholders' knowledge regarding NRM (Figure 5). It means that a *common goal* could be successfully created, *mutual trust* reached, and *commitment to maintain natural resources* occurred in the *optimal dissonance* situation. In general, the *optimal dissonance* determines the successful realization of the social learning process.

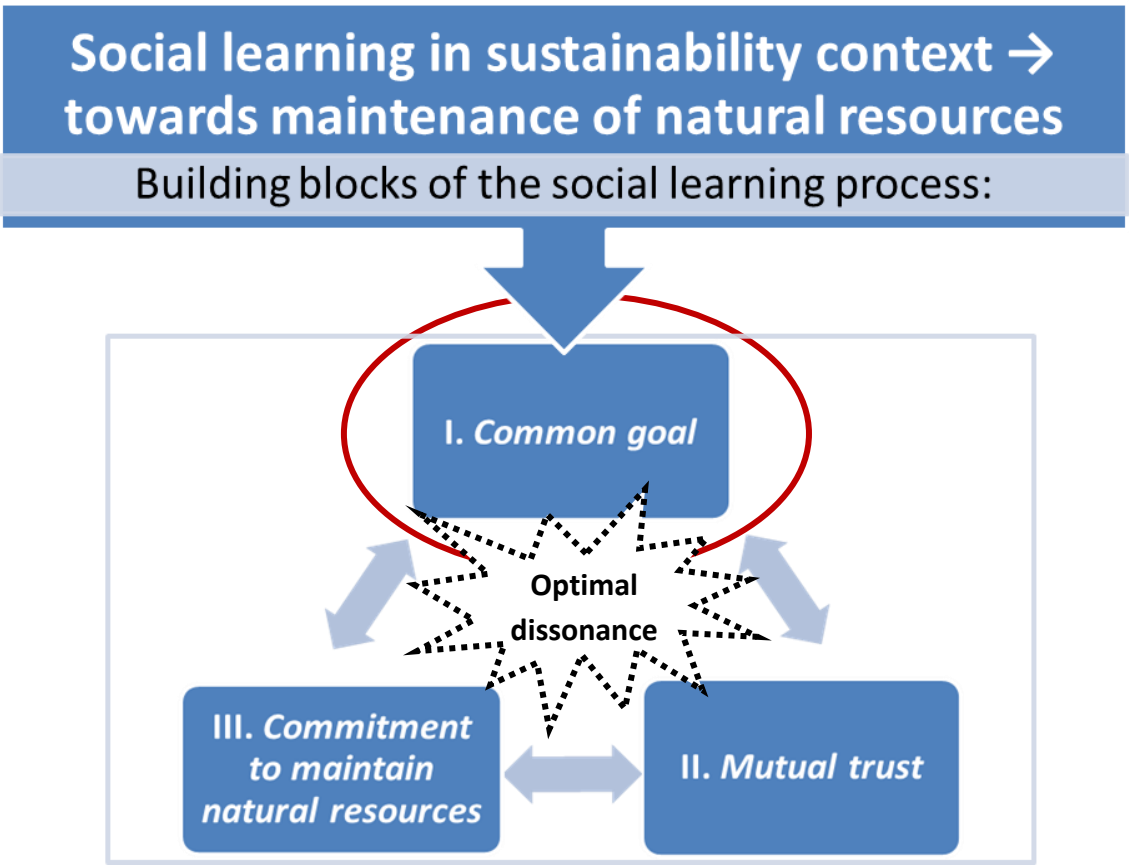

Figure 5. Theoretical model with the focus of the empirical research

However, the *optimal dissonance* is not always present. Dissonance is a dynamic process (Leeuwis, 2000) which could have a positive or a negative effect on the learning process. Effect of dissonance on the initiation of the social learning process depends on its degree (*high*, *optimal* and *low*). Therefore, **the degree of dissonance in the context of a *common goal* creation is the focus of the empirical research.** The evaluation of dissonance degree will enable to state a *common goal* creation possibility which will give the first indication about the whole social learning process realization. The red circle in Figure 5 illustrates the focus of the empirical research.

The *optimal dissonance* degree means that differences among stakeholders' knowledge regarding NRM are present, but that these differences support a *common goal* concerning the maintenance of natural resources. A variety of involved stakeholders has to support a *common goal*. This is the essential element in order to successfully initiate the social learning process. Several case studies illustrate that the important element is not to share the same perspectives or interests, but to understand each other (adapted from Brown et al. 2005a). Any disagreements, oppositions, contradictions have to be "*explicated rather than concealed*" (Wals et al. 2009). By explaining the differences it becomes possible to understand their roots and to begin a collaborative change process (Wals et al. 2009). A *common goal* creation could be described as move from strategic (egocentric) to communicative action (Habermas, 1984 cited in Rist et al. 2006). In this way, the differences will be used for learning. Therefore, the *optimal dissonance* is characterized by the agreement with the maintenance of natural resources. **Stakeholders, who have different types of knowledge regarding NRM, agree with the maintenance of natural resources**.

The *optimal dissonance* is opposed to the *high* and *low* dissonance degrees which have negative impacts on a *common goal* creation. The *high dissonance* degree represents situation when stakeholders disagree with the maintenance of natural resources. Stakeholders' knowledge is too different and they cannot reach a *common goal* concerning the maintenance of natural resources. Therefore, stakeholders' knowledge cannot be used for learning. As the result, the learning process is blocked. While the *low dissonance* degree represents the situation when stakeholders agree with the maintenance of natural resources, but they have identical types of knowledge regarding NRM. This situation stagnates the learning because there are no differences in order to inspire the learning process. The *low dissonance* degree mainly stays in the theoretical level because it is highly impossible to find identical stakeholders' knowledge in NRM context.

Furthermore, sustainability dimensions give a reference to the agreement or disagreement with the maintenance of natural resources. The environmental dimension of sustainability directly refers to the maintenance of natural resources. The social and economic dimensions of sustainability are dependent on the maintenance of natural resources. Therefore, when stakeholder's knowledge regarding NRM supports one or several dimensions of sustainability, this stakeholder agrees with the maintenance of natural resources. When stakeholder's knowledge regarding NRM opposes one or several dimensions of sustainability, this stakeholder disagrees with the maintenance of natural resources. This characterization is illustrated in Figure 6.

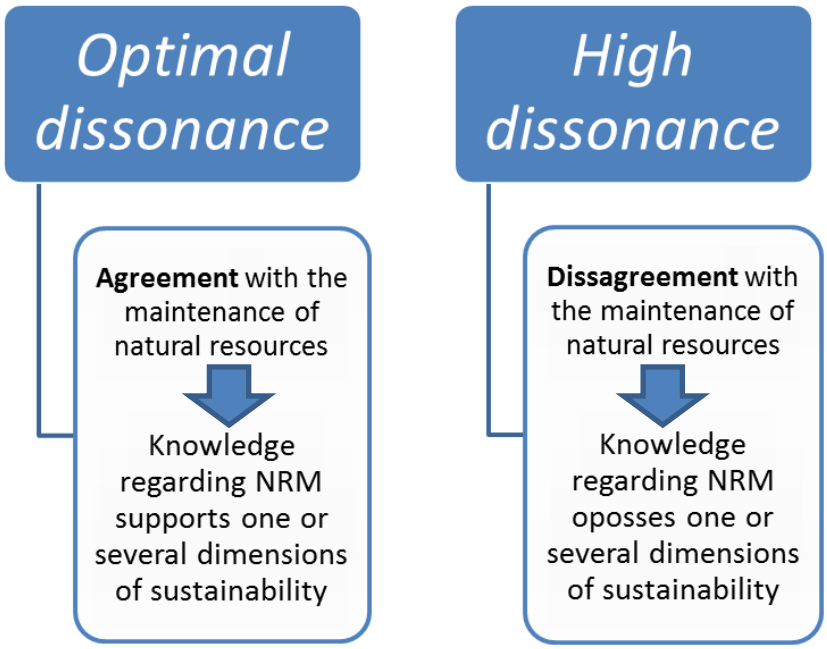

Figure 6. Characterization of the *optimal* and *high dissonance*

Primary stakeholders' knowledge is taken as a first reference point for the dissonance evaluation, because primary stakeholders directly exploit the natural resources. They determine how natural resources are managed and will be managed in the future. They have the main power and influence to maintain natural resources. Therefore, the degree of dissonance in primary stakeholders' knowledge regarding NRM will be identified. It will enable to state a *common goal* creation possibility. Additionally, secondary stakeholders' knowledge often conflicts with other types of knowledge (adapted from Jiggins et al. 2007). Bosch et al. (2003) critically argue that primary and secondary stakeholders who are involved in the same project very often work independently. Therefore, it is important to reveal the degree of dissonance between primary and secondary stakeholders' knowledge regarding NRM as well. Primary stakeholders' reactions to secondary stakeholders' NRM knowledge could give an indication about the possibility to create a *common goal* in the larger scale. Accordingly, it could point out the potential areas of collaboration in order to maintain natural resources. Consequently, **the degree of dissonance will be empirically investigated in two scopes: (1) degree of dissonance within primary stakeholders' knowledge regarding NRM, and (2) degree of dissonance between primary and secondary stakeholders' knowledge regarding NRM.**

Knowledge embodies theoretical and practical understanding of NRM (adapted from Oxford Dictionaries, 2012). It refers to stakeholders' thinking and acting patterns. Knowledge contains both: *what stakeholders **think*** and *what stakeholders **do***. Therefore, a clear distinction among these two spheres is made in the context of knowledge identification. These spheres are defined as **associations** and **practices** respectively. Social learning intends to inspire change in these two spheres of knowledge. Change in associations involves transformations in the conceptual understanding of natural resource management (adapted from Reed et al, 2010; Leys and Vanclay, 2011; Muro and Jeffrey, 2012). This type of change refers to the triple-loop learning where

underlying values, beliefs and worldviews may be changed (Pahl-Wostl, 2009) towards maintenance of natural resources. Change in practices involves improvement in skills and technical competencies (Muro and Jeffrey, 2012). This change could be transformations of current NRM practices into practices that maintain natural resources. Consequently, **associations and practices are addressed from the perspective of natural resource maintenance**. This will illustrate to what extent knowledge regarding NRM agrees or disagrees with the maintenance of natural resources. All statements made above lead to three blocks of the research questions.

4.2. Three Blocks of the Research Questions

The first block of the research questions pinpoints the primary and secondary stakeholders important to the maintenance of natural resources in the area of social learning. It is necessary to identify primary and secondary stakeholders' categories because the following blocks of questions analyze the degree of dissonance within and between these categories. The second block of questions refers to dissonance analysis within primary stakeholders' knowledge regarding NRM. The third block of questions is specific to dissonance analysis between primary and secondary stakeholders' knowledge regarding NRM. Three blocks of the research questions are stated in Table 1.

Table 1. Three blocks of the research questions

RQ.I.	**Who are the main NRM stakeholders in the area of social learning?**
	1. Who are the primary stakeholders? **2. Who are the secondary stakeholders?**
RQ.II.	**What degree of dissonance exists within primary stakeholders' knowledge regarding NRM in the area of social learning?**
	3. What is primary stakeholders' knowledge regarding NRM? 3.1. What associations do primary stakeholders have with the maintenance of natural resources? 3.2. What practices are performed by primary stakeholders in order to maintain natural resources?
RQ.III.	**What degree of dissonance between primary and secondary stakeholders exists in knowledge regarding NRM in the area of social learning?**
	4. What is secondary stakeholders' knowledge regarding NRM? 4.1. What associations do secondary stakeholders have with the maintenance of natural resources?

4.2. What practices could maintain natural resources according to secondary stakeholders?

5. **What are the primary stakeholders' reactions to secondary stakeholders' knowledge regarding NRM?**
   5.1. What are the primary stakeholders' reactions to secondary stakeholders' associations regarding the maintenance of natural resources?
   5.2. What are the primary stakeholders' reactions to secondary stakeholders' practices that maintain natural resources?

III. MATERIALS AND METHODS

The research was divided into two stages in order to reveal the role of dissonance in the initiation of the social learning process from theoretical and empirical perspectives. First, existing scientific literature was studied and a theoretical model of dissonance in the social learning process initiation was created (Chapter II). Second, the empirical research was carried out guided by the theoretical model. The empirical research (case study) was conducted in the Kouga Catchment area in the context of a social learning project initiation. Stakeholders' knowledge regarding NRM was investigated and the degree of dissonance was evaluated. This chapter includes a detailed description of materials and methods used in the research. It presents the case study, strategy of respondents' selection, data collection and data analysis methods. Therefore, this chapter starts to cover the second purpose of the research: **to reveal the role of dissonance from an empirical perspective**.

1. Case Study

The case study is an appropriate approach to explore the degree of dissonance in the context of a *common goal* creation. First, evaluation of dissonance degree needs a particular social context (adapted from Loeber et al. 2007; Reed et al. 2010) and a real life situation which is a general feature of the case study (Yin, 1994). Second, the case study is particularly proper in the field where existing knowledge is limited (Eysenck, 1976 cited in Flyvbjerg, 2006; Cavaye, 1996) and theory is at an early, formative stage (Benbasat et al. 1987). In general, it suits the dissonance situation because it needs further theoretical and empirical elaboration.

The case study is a social learning project in the Kouga Catchment, Eastern Cape Province, South Africa. The full title is: *Mobilizing Civil Society to Support Living Landscapes in the Kouga Catchment.* This social learning project in the Kouga Catchment area is a proper setting to study the degree of dissonance in the context of a *common goal* creation, because the conditions to apply the created theoretical model were met (Darke et al. 1998). Firstly, the project is in the initiation phase where a *common goal* creation is the main attention point. Second, the objectives[7] of the project are in

[7] (I) "*The creation of a "collective" awareness and understanding of the socio-ecological and economical needs, challenges, values, norms, and behaviors of individuals, institutions, and organizations on the landscape*"; (II) "*The creation of "collective" intelligence around the socio-ecological and economic opportunities and*

parallel with three building blocks of the social learning process stated in the theoretical model. Therefore, this case enables to use the formulated theory and develop the theory further.

1.1. Project

The empirical research of this thesis is restricted to the Kouga Catchment area where a social learning project is currently unfolding. The project intends to engage stakeholders to create a sustainable future through the social learning process: it "*encompasses a **social learning journey** in order to facilitate the mobilization of civil society to promote, create and restore Living landscapes*[8] *in the Kouga Catchment*" (Van den Broeck, 2011). The main aim of this project is to engage stakeholders to maintain natural resources in the Kouga Catchment area.

The project was initiated by *Living Lands. Living Lands* is a South African foundation which is interested in conservation and restoration activities (Earth Collective, 2011). *Living Lands* is a secretariat of PRESENCE[9] through which the practical work is done. PRESENCE is a multi-stakeholder[10] Learning Network which seeks to enable environmental and socio-economic restoration: to "*work towards creating landscapes in which agriculture, nature conservation and tourism can sustainably coexist*" (Eck et al. 2010). Over the last four years, PRESENCE has been working within the Baviaanskloof Mega Reserve (BMR) which borders the Kouga Catchment area. The social learning approach was used in order to restore the area from environmental and social perspectives. The mobilization and engagement of various stakeholders in the BMR were facilitated by PRESENCE. Consequently, better understanding of the environmental, socio-economic, institutional issues and conservation opportunities across the BMR was achieved. Mind-set changes were observed as well because previously opposing farmers and landowners became open to restoration, conservation and sustainable land-use. As a result, a *common goal* was achieved among farmers, landowners and other stakeholders in the area. This mobilization gave rise to several projects focused on the maintenance of natural resources, for example, *The Working for Lands Program; Restoration of the Baviaanskloof Alluvial Fans; Working for Wetlands; ECPTA Stewardship Agreement* (Van den Broeck, 2011). After this positive experience, it was decided to apply a social learning strategy to other areas in the region. A similar approach and the lessons learned from BMR were extended into the Kouga Catchment area.

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constraints"; (III) "*The creation of "collective" action to create and mainstream the common vision for a living landscape*" (Van den Broeck, 2011).

[8] Living Landscapes – "*variety of healthy eco-systems and land-uses and is home to ecological, agricultural and social systems which are managed so that they function sustainably. This ensures that natural and cultural resources are available for future generations*" (Van den Broeck, 2011).

[9] **P**articipatory **R**estoration of **E**cosystem **SE**rvices & **N**atural **C**apital, **E**astern Cape.

[10] South African Department of Water Affairs and Forestry, Working for Water Programme, Dutch Ministry for Agriculture, Nature & Food Quality (LNV), Government Service for Land and Water Management, South African National Biodiversity Institute, Working for Wetlands Programme, World Wide Fund for Nature – South Africa, Eastern Cape Parks, Gamtoos Irrigation Board, Wageningen University, Rhodes University, Restoration Research Group, Council for Scientific and Industrial Research, 'Spearhead' Ecosystem and Landscape Services.

1.2. Kouga Catchment

A catchment is a geographic area "*where water from rain (or snow) becomes concentrated and drains downhill into a river or lake*" (Vromans et al. 2010). The Kouga River Catchment (Kouga Catchment) belongs to the Gamtoos River System (Catchment L, n.d.) which is located in the western region of the Easter Cape Province, South Africa (Figure 7). The area is surrounded by the Kouga Mountains in the North and the Tsitsikamma Mountains in the South. It borders the BMR in the North, the Formosa Nature Reserve in the South and Gamtoos valley in the East.

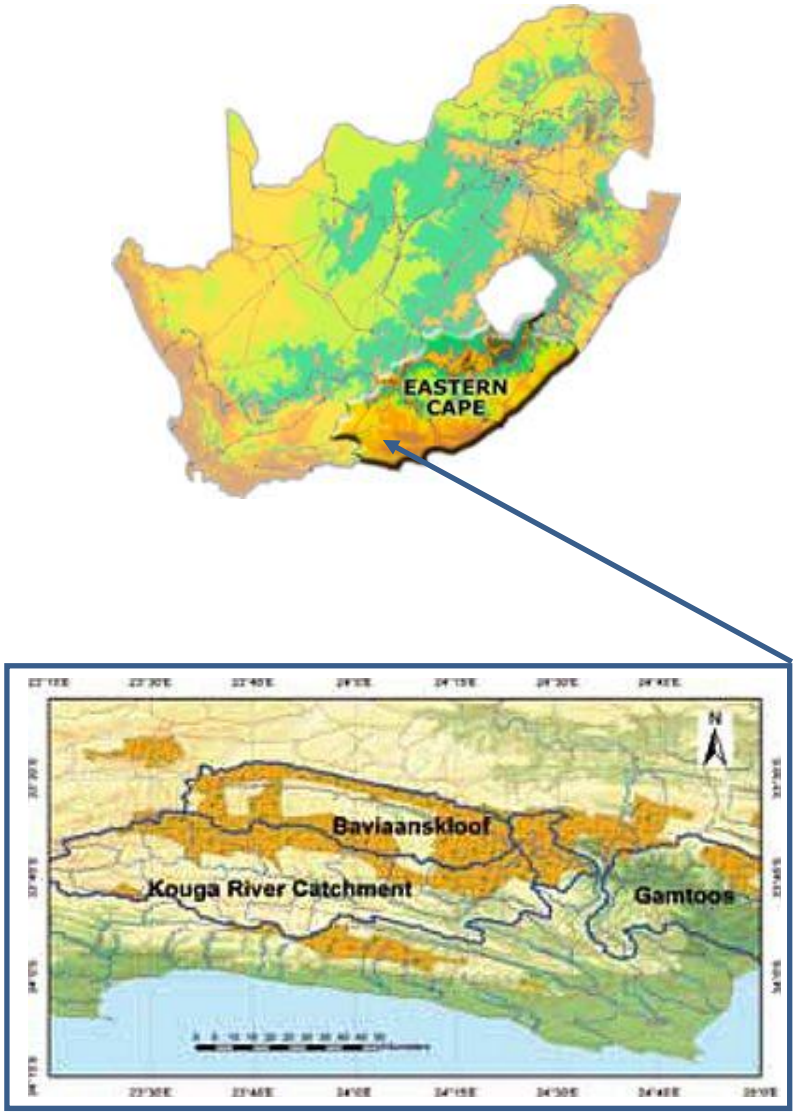

Figure 7. Location of the Kouga Catchment in the Eastern Cape, South Africa (South Africa Online, 2007; Dutch Water Sector, n.d.)

The Kouga Catchment covers an area of 282,040 ha (Mander et al. 2010) and falls within the mountain catchment area of the Langkloof valley - 33°43'S, 24°35'E (Hosking and Preez, 2002). The

Langkloof valley is well known for deciduous fruit farming. It is the second largest fruit producer in South Africa with a high focus on foreign markets. Topographically the Kouga Catchment area is composed of a series of parallel mountain ranges rising step-wise up to an altitude of about 1500 m (Hosking and Preez, 2004). The Kouga Catchment is largely remote and sparsely populated. Some areas are very inaccessible. There are several settlements alongside the main road (Road 62): Haarlem, Misgund, Lauterwater, Krakeel and Joubertina.

2. Selecting Respondents

The degree of dissonance was analyzed (1) within primary stakeholders' knowledge regarding NRM and (2) between primary and secondary stakeholders' knowledge regarding NRM. Therefore, stakeholders for interviewing had to be selected. Stakeholders were divided into primary and secondary categories by their importance to maintain natural resources. The primary stakeholders were farmers who are directly using the biggest part of natural resources in the Kouga Catchment. They have the main influence to maintain natural resources in the area. The secondary stakeholders were representatives from governmental-environmental and governmental-social institutions in the Kouga Catchment who are directly or indirectly related to natural resource management. They contributed by providing scientific, technical or broader knowledge about NRM.

35 stakeholders from the whole study population were chosen for interviewing. The interviewed stakeholders are called respondents. 25 respondents were primary stakeholders and 10 respondents were secondary stakeholders. The higher number of primary stakeholders was interviewed due to the focus on their knowledge. Additionally, natural resource management is mainly a men's activity in the Kouga Catchment. Therefore, the majority of respondents were men.

According Bernard (2011), 10-20 respondents are enough to "*uncover and understand the core categories in any well-defined cultural domain or study of lived experience*". In the other case just 10-13 respondents were needed to understand the contents of a well-defined cultural domain (Bernard, 2011). Subsequently, the number of selected respondents is sufficient to identify the main trends of knowledge regarding NRM in the Kouga Catchment. Furthermore, non-random sampling methods were used in order to increase its identification accuracy. **The choice of respondents was based on the representation of communalities and differences of the whole study population**. The primary stakeholders (farmers) were influential and/or respected, and represented different farming and social groupings. The secondary stakeholders (representatives from governmental-environmental and governmental-social institutions) were well-known and represented different types of expertise.

Farmers were chosen by using snowball and purposive sampling combination. Farmers were not easily identified and accessed in the Kouga Catchment. The information about the area was minimal and farmers were scattered over the large distance. Snowball sampling is suitable for studying such hard-to-find populations (O'Leary, 2004; Bernard, 2011). The initial farmers' contacts were received

from PRESENCE and an extension officer in the Kouga Catchment area. These farmers were contacted for the interviews. The interviewed farmers were asked to point out at least three influential and/or respected farmers in their community. These farmers were in turn interviewed and asked to point out other influential and/or respected farmers. Additionally, purposive sampling was present in order to ensure that farmers came from whole area and represented different farming and social groupings.

The choice of representatives from governmental-environmental and governmental-social institutions was mainly based on purposive sampling. The representatives which were well-known and had a different expertise were chosen for interviewing. Their contacts were received from PRESENCE. Additionally, few respondents were found by using snowball sampling because they were identified during the interviews.

The interviews were held in English since all respondents were able to speak it; nevertheless the dominating first language among farmers was Afrikaans. In some cases they used Afrikaans to express particular and more technical terms. It was not a problem because the semi-structured interviews with farmers were held together with another researcher who was able to understand Afrikaans.

3. Methods of Data Collection

The identification of primary and secondary stakeholders' knowledge required to collect a qualitative data. The data collection was guided by social constructivists worldview: "*to rely as much as possible on the participants' views of the situation being studied*" (Creswell, 2009). The focus was on the open-ended and face-to-face questioning so that respondents could share their point of views about natural resources and their management principles. In this way, the often stressed limitation of the interviews - the information provided by respondents is filtered through their own views (Creswell, 2009) -, becomes strength in this research context. Another limitation in face-to-face interviewing could be the researcher's presence. The researcher's presence could cause biased responses (Creswell, 2009) and provoke *the social desirability effect:* "*when people tell you what they think will make them look good, especially according to prevailing standards of behavior and thought*" (Bernard, 2011). This effect is a consequence of the way questions are asked (Bernard, 2011). Therefore, particular attention was paid to the questions construction. Questions about the maintenance of natural resources were not asked directly. The neutral and applicable concepts to the area's language were chosen in the each type of the interview. Additionally, the researcher tried make it evident that he does not support any specific perspective: "*I came to learn and understand you*". This approach is emphasized in the *Theory-U* (Scharmer, 2009) which stresses the importance to be open-minded and take into account the broader context than the research questions.

Three methods of data collection were used in the following sequence: unstructured interview, semi-structured interview and structured interview. The different data collection methods or combination of them were used in order to answer each block of the research questions (Figure 8). Firstly, unstructured interview intended to identify the main NRM stakeholders in the Kouga Catchment. Secondly, unstructured and semi-structured interviews intended to elicit stakeholders' knowledge regarding NRM (Creswell, 2009), while structured interview aimed to check the link between their knowledge. The data was collected from October 2011 to December 2011.

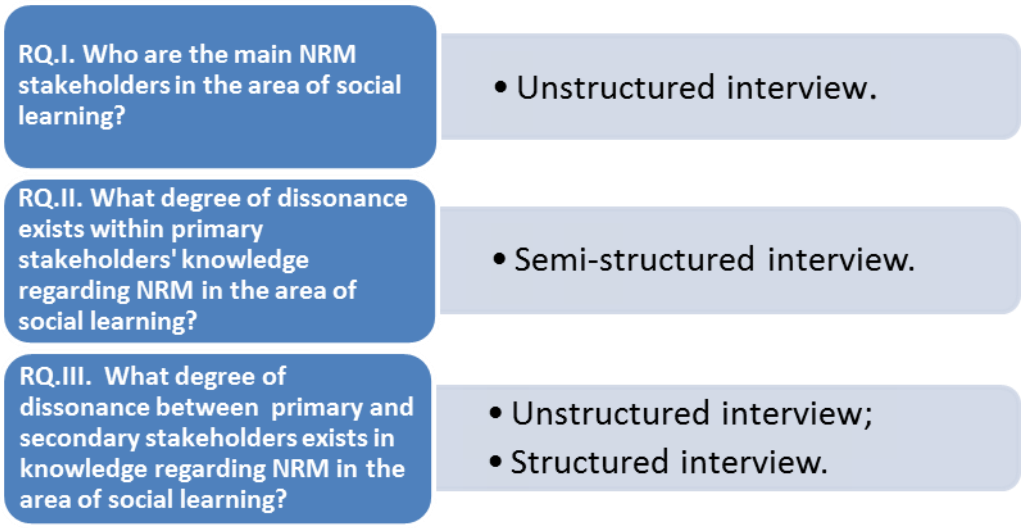

Figure 8. Methods of data collection

3.1. Unstructured Interview

Unstructured interviews were conducted with 10 secondary stakeholders (representatives from governmental-environmental and governmental-social institutions) in the Kouga Catchment area. The unstructured interview "*attempts to draw out information, attitudes, opinions, and beliefs around particular themes* [...] *without the aid of predetermined questions*" (O'Leary, 2004). This interview had two purposes. **The first purpose was to identify the main NRM stakeholders** in the Kouga Catchment in order to group them into primary and secondary stakeholders based on their importance to maintain natural resources. **The second purpose was to identify the secondary stakeholders' knowledge regarding NRM** through (a) associations with the maintenance of natural resources and (b) practices that maintain natural resources.

The strategy was to inspire respondents to talk about the area and to elicit from them the main NRM stakeholders and secondary stakeholders' knowledge regarding NRM. The reasons for the interview were explained: "*I would like to understand the area*"; "*I would like to listen and learn from you*". There was minimal control over responses. The idea was to "*get* [respondents] *to open up and let them express themselves in their own terms, and their own pace*" (Bernard, 2011). Nevertheless, a

checklist was used to be sure that relevant topics were covered during the interview: (1) the main NRM stakeholders in the Kouga Catchment, (2) knowledge regarding NRM: associations with the maintenance of natural resources and practices that maintain natural resources. Each interview took about an hour.

The unstructured interview gave valuable input for the further rounds of interviewing. First, the data collected through unstructured interview prepared the researcher for semi-structured interviews with farmers. The unstructured interviewing was used "*to develop guides for semi-structured interviews*" (Bernard, 2011) including the topics and language applicable to farmers in the area, for instance, the sensitive topics or topics for probing. Second, it prepared the researcher for structured interviews with farmers: the data from unstructured interview was used to construct a structured interview (questionnaire).

3.2. Semi-Structured Interview

25 primary stakeholders (farmers) were approached with semi-structured interview. A more structured interviewing format for farmers was used because their knowledge regarding NRM was the focus of the empirical research. Semi-structured interviewing "*demonstrates that you are fully in control of what you want from an interview but leaves both you and respondent to follow new leads*" (Bernard, 2011). **The purpose of the semi-structured interview was to identify the farmers' knowledge regarding NRM** through (a) associations with the maintenance of natural resources and (b) practices that maintain natural resources.

In this method the questions are open ended and intended to be asked in the same order each time, but the conversation dynamics and any interesting tangents development are pursued (O'Leary, 2004). The reason to interview was explained: "*we would like to understand you*"; "*we would like to learn from you*"[11]. The questions were divided into 6 blocks in order to be sure that the necessary aspects related with NRM were covered: (1) *background information*, (2) *land uses*, (3) *challenges*, (4) *state of the land (health)*, (5) *relationship with the land/involvement in sustainable management of natural resources*, (6) *social networks/relationships*. For each topic a list of questions were prepared. Transitions between blocks of questions were made to keep coherence. Not all questions asked were necessary for knowledge regarding NRM identification. The extra information was necessary for additional research and a project. The questions of semi-structured interview could be found in Appendix 1.

Several probing strategies were used during semi-structured interviewing in order to stimulate the respondents to produce more information. Explanation of a statement was always asked: "*can you explain?*" "*What is about?*" "*What is the reason?*" The probing technique which is called *phased assertion* or *baiting* (Bernard, 2011) was used. This probing technique refers to the acting in a way that you already have knowledge about a particular topic in order to incite the respondents to open

[11] The semi-structured interviews were conducted together with another researcher.

up (Bernard, 2011). Already from the unstructured interviews, the main topics of NRM in the Kouga Catchment were known. Hints for the respondents were mentioned frequently in order to gather more data. Furthermore, an attempt was made to avoid giving farmers the indication about the purpose of the interviews. The *land health* concept was used in order to refer to the maintenance of natural resources in the area. This concept characterized the language that farmers apply to the context of natural resources maintenance. Another attempt was to stimulate farmers to have meetings on their properties and to show the land. In this way, more openness and better identification of knowledge was expected to be achieved.

On average each interview took an hour and a half. In the first half of the semi-structured interviews much new data was produced, but during the second half, data started to reaped. This is considered as a positive sign of knowledge identification accuracy.

3.3. Structured Interview (Questionnaire)

Unstructured and semi-structured interviews identified the primary and secondary stakeholders' knowledge regarding NRM, but structured interviewing was necessary to accurately estimate the link between their knowledge. 23 out 25 primary stakeholders (farmers) interviewed through semi-structured interview also filled out the questionnaire. The questionnaire is a category of the structured interview (Bernard, 2011) characterized by "*a set of printed or written questions with a choice of answers*" (Oxford Dictionaries, 2012). **The main purpose of the questionnaire was to check farmers' reactions to secondary stakeholders' knowledge regarding NRM**. Farmers' reactions to secondary stakeholders' knowledge was structured by farmers' ***reactions to associations*** with the maintenance of natural resources and farmers' ***reactions to practices*** that maintain natural resources.

During unstructured interviews five associations[12] with the maintenance of natural resources and five practices[13] that maintain natural resources were pointed out by secondary stakeholders. These associations and practices were evaluated by farmers with the Likert scale. The measurement was done using the Likert scale because it is suitable to measure "*internal states of people*" (Bernard, 2011). A five point Likert scale was used ranging from *never* (1) to *always* (5); and a three point Likert scale was used ranging from *no* (1) to *yes* (3). The questions which measure *reactions to associations* had a five point Likert scale, and the questions which measure *reactions to practices* had a three point Likert scale as a more elaborate scale will not provide more detailed information.

The way in which respondents interpreted the questions was controlled by their introduction during semi-structured interviewing. The questionnaire began with less sensitive and easy questions and followed with more complex ones. The purpose of each question was introduced and the question sequence followed a logical order. The way of asking was adapted to the language used by farmers as

[12] (1) *alien plants*, (2) *fire*, (3) *water*, (4) *soil*, and (5) *loss of biodiversity.*
[13] (1) *alien plants clearing* and *preservation of alien plants clearing*, (2) *membership in the fire protection association*, (3) *water saving*, (4) *reduction of agrochemicals*, and (5) *conservation.*

well. The questionnaire contained some additional questions which were necessary for additional research. The full questionnaire could be found in Appendix 2.

4. Methods of Data Analysis

Unstructured Interview

If it was approved by the respondent, the unstructured interview was audio taped and transcribed in a summary structure. All interviews together averaged 25 pages of transcription. Coding was used in order to reduce the variety of data into two themes. The first theme was the main stakeholders of NRM in the Kouga Catchment. The main NRM stakeholders were grouped into primary and secondary stakeholders regarding their importance to maintain natural resources in the area.

The second theme was the secondary stakeholders' knowledge regarding NRM. During interviews, secondary stakeholders mentioned a variety of associations with the maintenance of natural resources in the Kouga Catchment. Therefore, interrelated associations were grouped in order to structure this variety. Five groups of associations were distinguished: (1) *alien plants*, (2) *fire*, (3) *water*, (4) *soil*, and (5) *loss of biodiversity.* During interviews, secondary stakeholders mentioned a variety of practices that maintain natural resources as well. Consequently, the same approach as for the associations was done. Interrelated practices were grouped in order to structure the variety. Five groups of practices were identified: (1) *alien plants clearing* and *preservation of alien plants clearing*, (2) *membership in the fire protection association*, (3) *water saving practices*, (4) *reduction of agrochemicals*, and (5) *conservation practices.* These groups of associations and practices were used as the main input to the questionnaire construction.

Semi-Structured Interview

If it was approved by the respondent, the semi-structured interview was audio taped and transcribed in the structure of the 6 question blocks. All interviews together averaged 64 pages of transcription. Coding was used in order to structure the variety of data into associations and practices. During interviews, primary stakeholders (farmers) mentioned a variety of associations with the maintenance of natural resources on their land. Therefore, interrelated associations were grouped in order to structure this variety. Ten groups of associations were distinguished: (1) *performance of production unit*, (2) *wildlife*, (3) *soil biota*, (4) *soil physical characteristics*, (5) *balance in nature*, (6) *leaf and soil analysis*, (7) *alien plants control*, (8) *pest control*, (9) *quality of life,* and (10) *Global Gap standards.* During interviews, farmers mentioned a variety of farming practices done in order to maintain natural resources. For that reason, the same approach as for the associations was done. Interrelated farming practices were grouped in order to structure the variety. Eleven groups of farming practices were crystalized: (1) *no overuse of agrochemicals*, (2) *mulch*, (3) *compost*, (4) *conservation*, (5) *no*

overgrazing, (6) *fire management*, (7) *use of agrochemicals*, (8) *alien plants control*, (9) *diversification of farming*, (10) *no tillage,* and (11) *drip irrigation*.

Frequency analysis of associations and practices was done in order to quantify the data. The frequencies of associations and practices were visualized with graphs in order to distinguish the most important tendencies.

Questionnaire

The data from the questionnaire was quantitative. Associations with the maintenance of natural resources and practices that maintain natural resources were evaluated by farmers with the Likert scale. Associations: (1) *alien plants*, (2) *fire*, (3) *water*, (4) *soil*, and (5) *loss of biodiversity,* were scored from 1 to 5[14]. Practices: (1) *alien plants clearing* and *preservation of alien plants clearing*, (2) *membership in the fire protection association*, (3) *water saving*, (4) *reduction of agrochemicals*, and (5) *conservation,* were scored from 1 to 3[15]. The scores were counted and visualized in spider webs in order to illustrate the dynamics of farmers' reactions.

[14] The neutral positions were taken out in order to clearly illustrate farmers' positive or negative reactions to secondary stakeholders' associations and practices.
[15] *Idem*.

IV. STAKEHOLDERS

This chapter defines the main natural resource management (NRM) stakeholders in the Kouga Catchment. The land uses[16] have had a key impact on the surface of Earth (Foley et al. 2005). Therefore, it is a good indicator of NRM in the Kouga Catchment area. The majority of the land in the Kouga Catchment is privately owned by farmers (190 000 ha); the government controls 83 400 ha which is devoted to nature conservation; the community owns 6 482 ha; *Black Empowerment* project[17] - 4 100 ha; and the municipality - 1 645 ha (Powell and Mander, 2009). Land ownership is illustrated in Appendix 3. Therefore, these landowners are the main stakeholders involved in NRM in the Kouga Catchment. **The main stakeholders involved in NRM are divided into primary and secondary categories relative to their importance in maintaining natural resources**.

1. Primary Stakeholders

Farmers own 67% of the land in the Kouga Catchment which is intended to be used for agricultural purposes. In most cases only parts of the land are employed for intensive agriculture. Agricultural activities are limited to the valleys and mountain top areas due to unsuitable characteristics of the land in the Kouga Catchment. In these areas agriculture has a major impact on natural resources including soil, water, air and biodiversity. These natural resources were transformed and used in order to have adequate agricultural production. As a result, there is a risk of depleting resources through agricultural activities.

Farmers have a power to decide to shift towards maintenance of natural resources on their land or not. Their engagement is a key element because the vast majority of the remaining land in the area is already under conservation activities. Therefore, **farmers are stated as the primary stakeholders** regarding natural resource maintenance in the Kouga Catchment. They should be the main participants of the social learning process. Farmers (approximately 180) vary in several ways: socio-economic backgrounds, farming practices and their impact on natural resources.

[16] Land use – "*the human alteration of the natural environment into the built environment (e.g. agriculture, mining, plantation, and settlements) or the human preservation of the natural environment (e.g. conservation)*" (Vromans et al. 2010).

[17] Several privately owned farms in the Kouga Catchment have been purchased and redistributed as part of land reform program (Mander et al. 2010).

1.1. Socio-Economic Context

The region is dominated by white farmers who have owned properties for several generations. They are mainly descendants of European countries, such as the Netherlands, Germany and France. The term ***boer***[18] is used to define this group. In the last decades the socio-economic status of *boer* farmers changed dramatically. They experienced a difficult transition period due to changes in financial support from the government. Until the end of 80ties (before 1994) farmers received significant subsidies from the government. The profit margins of farming were built on these. After changes in the South African political system those subsidies do not exist anymore. These farmers had to adapt to these changes. Many farmers went bankrupt; others had to intensify their farming in order to keep profit margins (ECPTA representative, 2011).

After the changes in the political system of the country, a new group of farmers is under development. They are defined as ***emerging*** farmers. *Emerging* farmers are descendants of African countries. They had no opportunities to own land or to farm in the previous political system. Nowadays governmental support is focused on them. Several privately owned farms have been purchased by the government and redistributed to *emerging* farmers as part of a land reform program (Mander et al. 2010). Land reform in South Africa was based on political imperatives to address the injustice of "*forced removals and to broaden black ownership of land*" (Hall, n.d.). According to the *White Paper on South African Land Policy*, redistributing the ownership of land to previously, and currently, disadvantaged South Africans could lead to poverty reduction and economic growth (DLA, 1997). At the moment there are 4 100 ha of land redistributed to *emerging* farmers in the Kouga Catchment. These farmers are very dependent on governmental support and need to develop better farming skills.

The majority of interviewed farmers were *boer* (21 out of 25) because they are dominating in the area. A few *emerging* farmers (4 out of 25) were interviewed as well in order to represent the second socio-economic grouping in the Kouga Catchment.

1.2. Farming Practices

The main agricultural activity in the area is deciduous **fruit farming**, such as apples, pears, plums, apricots and peaches, which is concentrated the Langkloof valley. Fruit farming is the main economic driver of the Kouga Catchment (Fruit farmer, 2011a). Fruit farmers are the main contributors to the gross income for the region (ECPTA represenative, 2011) because they provide the majority of the jobs (GIB representative, 2011). There are approximately 150 fruit farmers in the Kouga Catchment, but only 20 of them are big and/or own more than one farm (DAFF representative, 2011). Fruit farming is an intensive type of agriculture which has a high impact on natural resources, in particular:

[18] *Boer* means a farmer in Afrikaans and Dutch languages.

- Natural vegetation was transformed in order to carry out fruit farming. The biggest part of the wetlands in the Langkloof valley have been drained and replaced by orchards (Figure 9). ECPTA representative (2011) states that the transformation of natural vegetation is the main cause for the environmental challenges in the region.
- Most of the water depletion from the Kouga River is due to orchards irrigation. In total 26.5 million m^3 of water per year is abstracted from the Kouga River for orchards irrigation in the Langkloof valley. The main water source is the tributaries which belong to the Kouga River. Harmful effects may include damage to river ecosystems due to decreased flows (Tollefson and Harrington, 2005). Additionally, surface runoff water is stored artificially in dams (Figure 9)[19].
- Farmers use high amounts of agrochemicals[20] in the orchards, especially fertilizers and pesticides. Fruit farmers must fertilize a lot due to the relatively low nutrient concentration in the soil. The dominant fertilizers are mineral (nitrogen, phosphorus and potassium). This use could lead to environmental problems, such as surface and groundwater pollution, deposition of ammonia and acid rain, nitrous oxide emissions, etc. (Koroluk et al. 2005). Pesticides are widely used in order to reduce pests and weed growth. Preventative spraying is usually applied. This use could lead to environmental pollution of soil, water and air (Boivin et al. 2005).

Figure 9. Transformed land and dams in the Langkloof valley

Another agricultural activity in the area is **livestock farming**. The northern part of the Kouga Catchment is not so intensively used for livestock (GIB representative, 2011). This area is not suitable for the fruit farming due to its mountainous origin. The main livestock are sheep and cattle. In this area more natural vegetation exists and the extremely mountainous areas are not farmed at all. The

[19] For more detailed analysis regarding water use in the Kouga Catchment see master thesis of Clara Veerkamp and Marijn Sandbrink.

[20] *Agrochemicals* are used as general term for various chemical substances used in agriculture, such as mineral fertilizers, pesticides, fungicides, herbicides, insecticides, etc.

mountainous areas are largely covered by indigenous vegetation (*fynbos*) (Hosking and Preez, 2004). There are just six livestock farmers who have property in the Kouga Catchment (DAFF, 2011). However, the impact on natural resources is clear:

- An important farming practice is field burning (Livestock farmer, 2011a; b). The indigenous vegetation (*fynbos*) is burned in order to develop a better quality and quantity of grass elements for the animals (Figure 10). Burning is a common traditional practice in the area (Livestock farmer, 2011b). The fields are divided into separate parts and burned at different time intervals in rotation. It is very important to burn correctly and at the right time. Burning too often and uncontrolled burning are big threats to natural resources as they lead to soil erosion (Livestock farmer, 2011d).
- Predators are challenging farmers because they cause loss of livestock. The main predators are caracal, jackal and leopard. The shooting of predators was allowed in the past, however nowadays it is forbidden. Farmers and representatives of conservational organizations are trying to find alternative solutions to predator management, but these are not always efficient (Livestock farmer, 2011b). Sometimes hunting is not excluded which is a threat to biodiversity.
- The tendency to overgraze is noticeable in the area (Veerkamp, in prep). Overgrazing potentially leads to reduced infiltration, accelerated runoff and soil erosion (Czeglédi and Radácsi, 2005).

Figure 10. Burned field

Some farmers **mix** several farming practices on their land. They are doing fruit, livestock farming and other small scale agricultural activities. Farmers usually use tiny areas of their land for the crops (Baselmans, 2011). **Essential oil** farming was started by one farmer. Several farmers are devoted to the tea industry. 10 ha are intensively farmed with **honey bush tea** (*Cyclopia* spp.) which has a growing potential. The expansion of honey bush tea farming is planned for the following years (DAFF, 2012). Unfortunately, overharvesting and illegal harvesting were recognized by a farmer of honey bush tea. It is a worrying threat to the survival of the honey bush plant which is indigenous in the

region (Figure 11). Lastly, it was noticed that few people are buying properties in order to restore them to natural state (ECPTA representative, 2011). These **landowners** are mainly wealthy people who own the land without any agricultural activity.

Figure 11. Harvested honey bush tea

The majority of interviewed farmers were fruit farmers because they are dominating in the area. Few livestock and mixed farmers were interviewed as well in order to represent the second common agricultural activity. A honey bush tea farmer and an essential oil farmer were interviewed in order to represent the small scale agricultural activities. Finally, a landowner was interviewed to have the picture of non-agricultural uses. The interviewed farmers' variation by their farming practices is specified in Appendix 4.

2. Secondary Stakeholders

29% of the land in the Kouga Catchment is controlled by the government. Two main types of government related organizations are active in the Kouga Catchment. The organizations of the first type have the environmental challenges in the Kouga Catchment as their first working priority. They are focused on the maintenance of natural resources and/or expansion of this maintenance to private land. The organizations of the second type are having the social challenges in the Kouga Catchment as the main working priority. The maintenance of natural resources is seen as one of their interests. Both types have valuable knowledge regarding NRM. Therefore, **representatives of**

governmental-environmental and governmental-social institutions are stated as the secondary stakeholders in the Kouga Catchment.

A small part (4%) of the land is owned by three other entities: community, *Black Empowerment* project and municipality (Powell and Mander, 2009). The land which belongs to the *Black Empowerment* project is used for agricultural purposes. The land owned by the community and the municipality is used for housing and/or small scale agricultural purposes as well. Due to the low level of ownership the importance of these stakeholders to sustain natural resources is considered minimal.

2.1. Governmental-Environmental

Two environmental organizations related to government are active in the Kouga Catchment. These organizations are focused to maintain natural resources in the Kouga Catchment. They deal with nature conservation on the governmental land which belong to the Baviaanskloof Mega Reserve (BMR) and the Formosa Nature Reserve, and/or promote conservation practices on the farmers land. These organizations are (1) Gamtoos Irrigation Board, and (2) Eastern Cape Parks and Tourism Agency.

Gamtoos Irrigation Board (GIB) is responsible for practical implementation of the *Working for Water* (WfW) program which was initiated in October 1995 by the South African Government. This is the main program related to the maintenance of natural resources in the Kouga Catchment. It aims to save water resources by clearing invasive plant species. Together it creates jobs and empowers people from historically disadvantaged communities (Marais and Wannenburgh, 2008 cited in Gonzalez, 2009). Therefore, representatives from GIB are important stakeholders in the Kouga Catchment.

Eastern Cape Parks and Tourism Agency (ECPTA) is a biodiversity conservation organization which is also involved in tourism. This agency was established in 2003. ECPTA is active in particular areas of the Kouga Catchment: it is responsible for biodiversity conservation inside the BMR and the Formosa Nature Reserve. ECPTA seeks "*best practice in the conservation management and sustainable utilization of natural resources* […] *in partnership with communities and other stakeholders*" (Eastern Cape Parks, 2009). Therefore, representatives from ECPTA are important stakeholders in the Kouga Catchment as well.

Additionally, ECPTA is trying to expand nature conservation activities on private farmland. ECPTA initiated the *Biodiversity Stewardship Programme* which suggests a wide range of conservation options to private landowners to manage and protect natural resources. In particular, ***Eden to Addo* (E2A)** *Corridor Initiative* seeks to link three mega-reserves (the Garden Route National Park, the BMR and the Addo Elephant National Park) through the private land in the Kouga Catchment. The conservation corridors are intended to be created in order to protect and restore "*the integrity of*

bio-diversity and eco-system functioning" (E2A Corridor Initiative, 2010). The ecological connectivity for species, communities and ecological processes is planned to be created. Consequently, representatives of the E2A *Corridor Initiative* are important secondary stakeholders.

2.2. Governmental-Social

Other organizations related to government are active in the area with their main interest being social welfare of the region. However, they are interested in sustaining natural resources as well. These organizations are (1) Department of Agriculture, Forestry and Fisheries, and (2) Koukamma Local Municipality.

One of the strategic goals of the **Department of Agriculture, Forestry and Fisheries (DAFF)** of South Africa is "*sustained management of natural resources*" (DAFF, 2011). This department is represented by an extension officer in the Kouga Catchment. His primary role is to help farmers to increase agricultural production and manage their land efficiently. He has been directly working with farmers for 35 years and has valuable knowledge about farmers' interest in sustaining natural resources. Therefore, he is an important stakeholder.

The biggest part of the Kouga Catchment belongs to the **Koukamma Local Municipality**. The main focus of the Koukamma municipality is on socio-economic issues of the area. It seeks to "*provide equitable, affordable services and sustainable socio-economic development to improve the quality of life*" (Cacadu District Municipality, 2011). However, it is understood that "*effective management of resources*" (Cacadu District Municipality, 2011) is an integral part of this development. Several representatives of Koukamma Local Municipality are knowledgeable about the maintenance of natural resources, for example, the disaster manager.

Finally, the church is included as environmental-social stakeholder in the Kouga Catchment. Environmental-social projects are carried out by the pastor of the Dutch reform church. He is active in three projects. The first project is focused on coping with waste issues in settlements of the Kouga Catchment. Children are encouraged to collect waste and bring it to the collection point. They receive rewards for this activity. The second project is dedicated to coping with invasive plant species. An invasive plant (*hakea*) has been eradicated by school children. The third project is intended to address alcoholism issues. Alcoholism is the main social problem in the area which needs particular attention. Therefore, this stakeholder provides valuable insight on NRM in the social context. A full list of the interviewed secondary stakeholders and their role specification is summarized in Appendix 5.

V.FARMERS' AGREEMENT AND DISAGREEMENT

This chapter shows primary stakeholders' (farmers') agreement and disagreement with the maintenance of natural resources. Three steps were taken in order to realize this:

- **Farmers' knowledge** regarding natural resource management (NRM) was identified. During the semi-structured interviews, farmers pointed out (a) **associations** with the maintenance of natural resources and (b) **farming practices** that maintain natural resources. Interrelated associations and interrelated farming practices were grouped separately in order to structure the variety of collected data.
- **Frequency analysis** of associations and farming practices was done in order to distinguish the most important tendencies.
- The (in)coherence of these associations and farming practices with **sustainability dimensions** was stated. It enabled to reveal farmers' agreement or disagreement with the maintenance of natural resources.

Consequently, the identification of farmers' agreement or disagreement with the maintenance of natural resources allowed to define the degree of dissonance. The chapter ends with the additional findings of the empirical research.

1. Farmers' Knowledge

1.1. Associations

Associations with the maintenance of natural resources were distinguished after the semi-structured interviews with 25 farmers in the Kouga Catchment. During interviews, farmers mentioned a wide range of associations with the maintenance of natural resources on their land. Interrelated associations were grouped in order to structure this variety. Ten groups of associations were distinguished: (1) *performance of production unit*, (2) *wildlife*, (3) *soil biota*, (4) *soil physical characteristics*, (5) *balance in nature*, (6) *leaf and soil analysis*, (7) *alien plants control*, (8) *pest control*, (9) *quality of life,* and (10) *Global Gap standards*. These groups of associations have different mentioning frequency. Several associations were mentioned just once, while the most frequent was mentioned 14 times. Therefore, the mentioning frequency stresses the main tendencies in farmers'

associations with the maintenance of natural resources. The groups of associations and their mentioning frequency are illustrated in Figure 12.

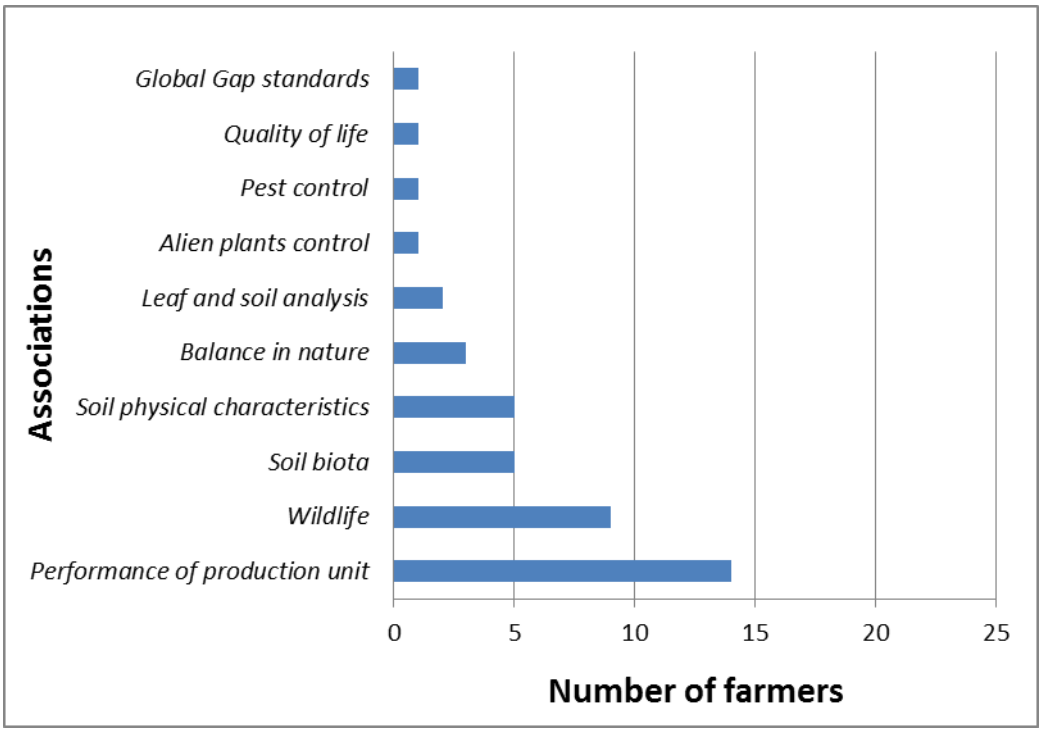

Figure 12. Groups of associations and their mentioning frequency

In this section, all groups of associations are described and their (in)coherence with sustainability dimensions is stated. Description of associations is based on farmers' statements, while their relation with sustainability dimensions is based on the theoretical approach presented in Chapter II[21].

(1) The most frequently mentioned group of associations is ***performance of production unit***. 14 out of 25 farmers pointed out associations related with performance of production unit. The majority of farmers perceive the good condition of fruit trees, plants or livestock as an inevitable sign of maintenance of natural resources. This condition is defined mainly by the appearance of fruit trees: "*trees look good*" (Fruit farmer, 2011j), "*trees are happy*" (Fruit farmer, 2011o), "*trees are healthy*" (Fruit farmer, 2011l); or continuous reproduction of livestock: "*animal cycle in nature which regenerates itself*" (Mixed farmer, 2011c). However, from the interviews it was seen that good *performance of production unit* is important for the farmers because it ensures a substantial agricultural production. Therefore, this group of associations refers to the economic dimension of sustainability. **(2)** ***Wildlife*** was mentioned by 9 farmers. The presence of biodiversity, such as

[21] The environmental dimension of sustainability directly signifies the agreement to maintain natural resources. The social and economic dimensions indirectly signify the agreement. Therefore, farmer agrees with the maintenance of natural resources, when his associations support one or several dimensions of sustainability; farmer disagrees with the maintenance of natural resources, when his associations oppose one or several dimensions of sustainability.

mammals, birds, insects and plants on the farmland, is a substantial indication of natural resource maintenance for farmers. The increasing diversity of the current species is important as well. Therefore, this association directly refers to the environmental dimension of sustainability.

(3) The associations related with ***soil biota*** were pointed out 5 times. Farmers define *soil biota* as the living organisms in the soil, for instance, earthworms, fungi and other microorganisms. This group of associations stands for the environmental dimension of sustainability because soil biota ensures "*essential soil processes and play a key role in maintaining the soil quality*" (Fox, 2005) which supports the maintenance of natural resources. **(4)** ***Soil physical characteristics*** were specified 5 times as well. Farmers define *soil physical characteristics* as smell, texture and water retention capacities of the soil. A fruit farmer (2011o) described a good state of the soil as the ability "*to take the soil*". This expression describes a good soil structure where air and water can circulate easily. Therefore, *soil physical characteristics* cover the environmental dimension of sustainability. **(5)** The associations with ***balance in nature*** were pointed out by 3 farmers. These farmers perceive the maintenance of natural resources as minimal farming intervention to processes occurring in nature: "*less we disturb the balance in the nature, better we do*" (Mixed farmer, 2011b). Farmers experienced this tendency in their daily farming practices. Therefore, this attitude is in line with the environmental dimension of sustainability.

The second half of associations had a minimal mentioning frequency. **(6)** ***Leaf and soil analysis*** was mentioned twice. Leaf and soil analysis is done regularly in order to efficiently monitor the state of fruit trees and soil. This analysis is mainly done by big farms or companies in the area in order to make successful management decisions. Therefore, it could be defined as a form of addressing the economic dimension of sustainability because the main goal is to ensure adequate agricultural production. **(7)** ***Alien plants***[22] ***control*** was mentioned once. A livestock farmer stressed the importance of controlling alien plants on the farmland due to water resource protection. This association directly refers to the environmental dimension of sustainability. The Kouga Catchment is heavily invaded by invasive plant species, such as *Acacia* spp. (black wattle), *Pinus* spp., *Hakea* spp. (Hosking and Preez, 2002; Hosking and Preez, 2004), and willow (GIB representative, 2011). Alien plants use higher amounts of water as compared to indigenous vegetation and consequently pose a threat to biodiversity. Therefore, *alien plants control* is very important for the protection of water and biodiversity in the area.

(8) ***Pest control*** was mentioned once. A fruit farmer pointed out the controlled pest population as an inevitable sign of maintenance of natural resources. Pests damage fruit trees and consequently threaten agricultural production. Thus, this association stands for the economic dimension of sustainability due the direct focus on substantial agricultural production. **(9)** ***Quality of life*** was pointed out once as well. A livestock farmer (2011b) associated maintenance of natural resources to general welfare in daily life: "*being here and enjoying nature*". The presence of natural resources creates a good feeling for him. Therefore, this association mainly belongs to the social dimension of

[22] *Alien plants* refer to invasive plant species. This term is widely used in the Kouga Catchment.

sustainability. **(10)** Finally, ***Global Gap standards*** were mentioned. Global Gap standards ensure the maintenance of natural resources for one fruit farmer. This farmer has to meet strict standards in variety of areas in order to be allowed to export to foreign countries. In particular, he pays attention to restrictions on high use of pesticides and fertilizers. Therefore, this association refers to the environmental dimension of sustainability because the reduction in agrochemical use has a positive effect on the maintenance of natural resources.

All groups of associations refer to the environmental, social or economic dimensions of sustainability. The environmental dimension of sustainability dominates over social and economic ones. Associations addressing the environmental dimension of sustainability were mentioned 1,5 times more frequently than associations referring to social and economic dimensions together. It shows that the **interviewed farmers strongly agree with the maintenance of natural resources in the context of associations**. They perceive human and nature interdependence. A commonly repeated phrase by farmers illustrates this trend: "*if you look for environment, environment will look for you*". Nevertheless, the most frequently mentioned group of associations (*performance of production unit*) stands for the economic dimension. This group of associations represents the biggest communality among farmers. It proves that the economic profit is important for the farmers in the context of natural resource maintenance. This perception could be explained by the high commercial aspect that dominates in fruit farming. Fruit farmers have to meet high competiveness in foreign markets and must be in touch with new technologies in order to stay in business.

> *"I am not farming to get as much as I can now, because somebody else will have problems with that in a later stage, probably my son. I do not want him to say: my old man was terrible, everything is dead now"* (Fruit farmer, 2011f)

To summarize, **the tendency to place associations into several dimensions of sustainability is noticeable**. In particular, the trend to combine the environmental and economic dimensions is present: "*to create jobs and include man in the whole circle of nature*" (Mixed farmer, 2011b). The interviewed farmers pay attention to maintenance of natural resources, but economic profitability is stressed as well. The church representative (2011) very accurately summarized this tendency: "*farmers know and love nature, but they have to act in order to make ends meet*". The maintenance of natural resources is taken into account, but natural resources are intended to be managed in a way which ensures economic profitability.

1.2. Farming Practices

Farming practices that maintain natural resources were distinguished after the semi-structured interviews with 25 farmers in the Kouga Catchment. During interviews, farmers mentioned a variety of farming practices done in order to maintain natural resources on their land. Interrelated farming

practices were grouped to structure this variety. Eleven groups of farming practices were distinguished: (1) *no overuse of agrochemicals*, (2) *mulch*, (3) *compost*, (4) *conservation*, (5) *no overgrazing*, (6) *fire management*, (7) *use of agrochemicals*, (8) *alien plants control*, (9) *diversification of farming*, (10) *no tillage,* and (11) *drip irrigation*. These groups of farming practices have different frequency of mentioning. Several farming practices were mentioned just once, while the most frequent was mentioned 13 times. Therefore, the mentioning frequency stresses the main farming practices done in order to maintain natural resources. The groups of farming practices and their mentioning frequency are illustrated in Figure 13.

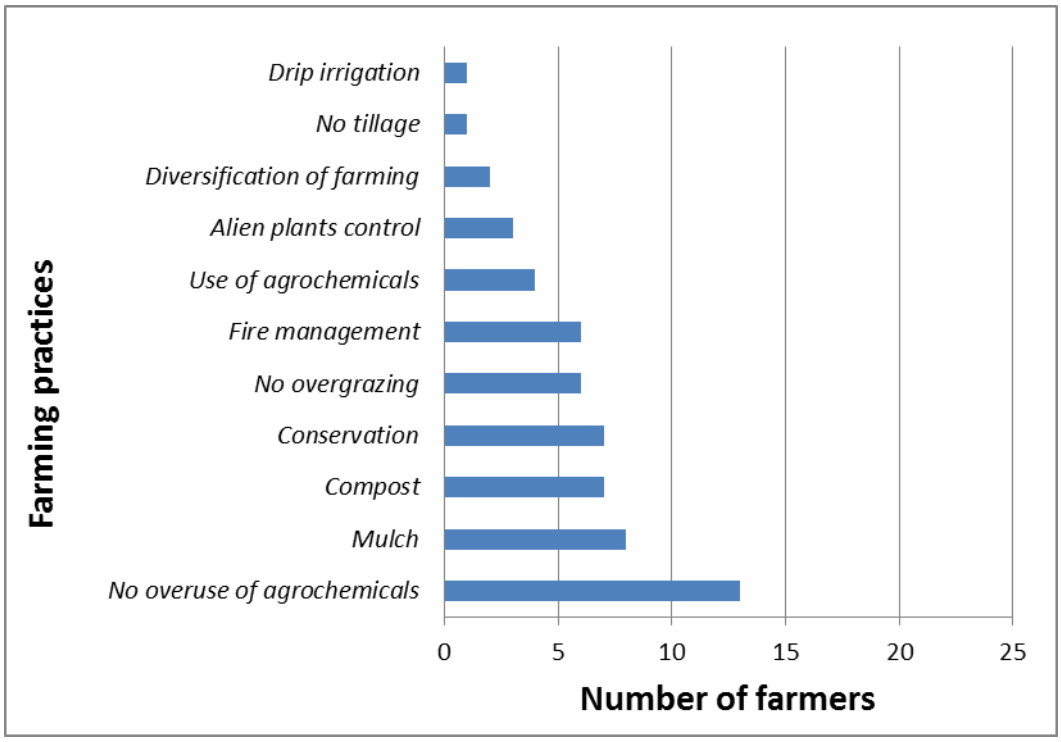

Figure 13. Groups of farming practices and their mentioning frequency

In this section, all groups of farming practices are described and their (in)coherence with sustainability dimensions is stated. The description of farming practices is based on farmers' statements, while their relation with sustainability dimensions is based on the theoretical approach elaborated in Chapter II[23].

(1) The most frequently mentioned group of farming practices is ***no overuse of agrochemicals***. The majority of farmers (13 out of 25) stressed the reduction of agrochemical use in their farming practices as the main activity to maintain natural resources on their land. They point out the

[23] The environmental dimension of sustainability directly signifies the agreement to maintain natural resources. The social and economic dimensions indirectly signify the agreement. Therefore, farmer agrees with the maintenance of natural resources, when his farming practices support one or several dimensions of sustainability; farmer disagrees with the maintenance of natural resources, when his farming practices oppose one or several dimensions of sustainability.

necessity to manage agrochemicals in a responsible way: "*cannot spray each day, because you taking out something from ecosystem*" (Fruit farmer, 2011e); "*no unnecessary fertilization*, [...] *no waste of chemicals on the environment*" (Fruit farmer, 2011f). The negative impact of agrochemical use on natural resources is greatly perceived the farmers: "*in the past we sprayed and the soil became hard, we lost vegetation of the soil, a lot of micro elements*" (Fruit farmer, 2011h). These farmers pay particular attention to the use of alternatives to current pesticides, for instance, pheromones[24] and new generation spraying materials which have fewer negative impacts on natural resources.

(2) ***Mulch*** as a farming practice which maintains natural resources was mentioned by 8 farmers. Farmers define *mulch* as a cover put on the soil surface which has a number of benefits. They use mulch in order to naturally fertilize the soil, prevent pests and save water. The positive effect on soil properties is stressed: "*it is possible to take soil, it is possible to put piece of wood easily into the soil*" (Fruit farmer, 2011o). This expression defines the good soil structure. **(3)** ***Compost*** was pointed out 7 times. These farmers use compost as a natural fertilizer which adds organic material and micro-organisms to the soil. Furthermore, mulch and compost are farming practices which rehabilitate the soil properties. They are especially used in sustainable agriculture, such as biological (organic)[25] and biodynamic[26]. **(4)** ***Conservation*** was stressed by 7 farmers. These farmers are focused on protection and monitoring of animal and plant species on their land. Big farms have conservation plants, for example, *Dutoit* company, which owns 11 farms in the area, follows a conservation plan with particular attention to use of agrochemicals, soil properties, farming's effect on wildlife, etc. One landowner in the Kouga Catchment keeps the property mainly for conservation purposes: "*to improve the health of the land is my passion*" (Landowner, 2011).

(5) ***No overgrazing*** was mentioned 6 times as a farming practice which maintains natural resources. A few farmers perceive the negative impact on the plants and soil properties when too many animals are kept in one area. They state the importance to control the livestock grazing in order to prevent biodiversity loss and soil erosion. **(6)** ***Fire management*** was pointed out 6 times as well. Fire is a common incident in the Kouga Catchment. It happens naturally or is used as a farming practice to improve the grass elements for the livestock. Massive fire events occurred in the area: 150.000 ha burned in 2005; 170.000 ha burned in 2009. Thus, several farmers stress *fire management* as an important practice in order to protect natural resources.

All these above mentioned farming practices directly refer to the environmental dimension of sustainability. These practices are focused on reducing negative impacts, conserving and/or sustaining natural resources. They represent farmers' attention to maintaining natural resources on

[24] Pheromone – "*a chemical substance produced and released into the environment by an insect*" (Oxford Dictionaries, 2012). Pheromones *"specifically disrupt the reproductive cycle of harmful insects. This substance, unlike conventional pesticides, does not damage other animals* [and does] *not pose health risks to people*"(Patlak, 2003).

[25] Biological (organic) agriculture – an alternative farming method which "*prohibits the use of chemical plant protectants, chemical fertilizers, genetic engineering, radiation or antibiotics. It applies crop rotation and avoids monocultures*" (Co-Extra Glossary, 2006).

[26] Biodynamic agriculture – "*a method of organic farming that incorporates certain astrological and spiritual principles and practices*" (Oxford Dictionaries, 2012).

their land. **(7)** However, ***use of agrochemicals*** was mentioned 4 times as an inevitable farming practice. Four farmers were stressing the importance of using various agrochemicals in order to obtain an abundant agricultural production. It was seen from the interviews that the priority of these farmers is production without attention to the maintenance of natural resources. Natural resources are tools to ensure productivity. Damage done to the natural resources by the use of various agrochemicals is not understood. Therefore, this practice cannot be a part of any sustainability dimension.

The last four farming practices are in line with the environmental dimension of sustainability. **(8)** ***Alien plants control*** was specified 3 times. Farmers stress that they are removing invasive plant species from their land in order to protect water resources. This practice was mentioned in the form of an association as well. Thus, it shows that farmers recognize the significance of alien plants eradication for the maintenance of water resources in the Kouga Catchment. **(9)** ***Diversification of farming*** practices was mentioned twice. Two farmers distinguished the importance of combining various farming practices on their land in order to not overuse natural resources. They combine sheep farming with fish, essential oils, herbs, etc. In this way, the pressure on the land by any one type of farming is reduced. **(10)** ***No tillage*** was pointed out once. A livestock farmer (2011a) is tilling the land "*as minimal as possible*". This farming practice is very common in sustainable types of agriculture. It leaves more crop residue on the soil surface and increases soil cover, which has a number of benefits in an agro-ecosystem[27] (Huffman et al. 2005). While intensive tillage is mainly used in conventional agriculture[28], and has a number of negative effects on soil properties, such as soil erosion, loss of nutrients, loss of water storage capabilities, loss of soil organic matter, etc. **(11)** Finally, ***drip irrigation*** was mentioned once as a practice which maintains natural resources. Drip irrigation is applied directly at the roots of plants in order to protect water resources.

The environmental dimension of sustainability greatly dominates among farming practices. Farming practices which directly refer to the environmental dimension were mentioned 54 out of 59 times. It represents an absolute majority. These farming practices are often common in biological and biodynamic agriculture which are completely focused on maintaining natural resources. The ability to help nature to recover itself is seen as the biggest benefit of biological agriculture by several farmers. These farmers stress that the environment created by biological agriculture is vastly different from

> *"With biological farming you are coming back to nature as nature was created"* (Fruit farmer, 2011g).

[27] No tillage is "*offering protection against wind and water erosion; adding organic matter to the soil, which helps to maintain soil health; promoting carbon sequestration in soil, which helps to reduce levels of atmospheric carbon dioxide; and providing better wildlife habitat, which supports biodiversity*" (Huffman et al. 2005).

[28] Conventional agriculture – any farming which contrasts to alternative farming methods such as biological and biodynamic agriculture. *"Chemical plant protectants, chemical fertilizers and intensive mass animal farming are common*" in conventional agriculture (Co-Extra Glossary, 2006).

that created by conventional farming. According to a fruit farmer (2011g), in biological farming "*you are getting back to the nature, everything is in balance*"; but in conventional farming everything "*looks as cement*". The most frequently mentioned farming practice (*no overuse of agrochemicals*) stands for the environmental dimension of sustainability and support biological farming principles. Agrochemical use is reduced by the majority of farmers in order to sustain natural resources. Farmers especially noticed the effect on soil properties: "*fewer fertilizers are used and the ground health becomes better*" (Fruit farmer, 2011o). This practice represents the biggest communality among farmers in the context of natural resource maintenance.

However, *use of agrochemicals* was perceived as a crucial farming practice by a few farmers. These farmers are using agrochemicals in order to get an abundant agricultural production, but the negative impact on the environment is not taken into consideration. Agrochemicals directly refer to various chemical substances used in agriculture. It includes mineral fertilizers (nitrogen, phosphorus and potassium), pesticides, fungicides, herbicides, insecticides, etc. The use and overuse of them causes great environmental concern in several areas: (1) contamination of the surface and groundwater, (2) contamination of soil and (3) decrease in biodiversity. This negative impact is elaborated below.

The use of agrochemicals may lead to contamination of surface water and groundwater (Cerejeira et al. 2003; Koroluk et al. 2005; Hildebrandt et al. 2008; Mózner et al. 2012). Groundwater can spread pollutants and load lakes and rivers over very large distances, accordingly, increasing health risks for animal species, livestock and human beings (Mózner et al. 2012). For instance, nitrate[29] loading in lakes and rivers encourages over enrichment and eutrophication which is a threat to fresh-water ecosystems (Mózner et al. 2012). Additionally, a high amount of agrochemicals affects the soil properties. Chemicals leaching into the soil leads to soil degradation (Mózner et al. 2012), for example, the use of pesticides changes the pH and texture of the soil. The upper layers of the soil have substantial pesticide accumulation (Arias et al. 2006) which can stay for decades (Aubertot, 2007). Lastly, the use of agrochemical substances disturbs natural environments of various organisms. In particular, there may be a negative impact on "*non-target species and interference with normal predator-prey relationships*" (Koroluk et al. 2005). The use of pesticides in order to decrease the population of a certain pest leads not only to a reduction of this certain pest, it reduces other, non-target organisms as well (Thomson and Hoffmann, 2007; Stavrinides and Mills, 2009; Nash et al. 2010). Accordingly, the normal predator-prey environment is disturbed. Consequently, the decrease in biodiversity is directly dependent on agrochemical use. Overall, the agrochemical use causes the depletion of natural resources. This illustrates that the *use of agrochemicals* contradicts entirely with the environmental and any other dimension of sustainability.

To summarize, the environmental dimension of sustainability dominates among farming practices. **The vast majority of interviewed farmers agree with the maintenance of natural resources in the context of farming practices**. However, **a few farmers disagree with the maintenance of natural resources in the context of agrochemicals use**. Consequently, it identifies the variations in farmers'

[29] Nitrate - inorganic form of nitrogen.

agreement and disagreement with the maintenance of natural resources. These variations will be discussed in the following section.

2. Variations of Agreement and Disagreement

In this section farmers' agreement and disagreement to maintain natural resources in the Kouga Catchment are discussed. During semi-structured interviews, farmers pointed out (a) associations with the maintenance of natural resources on their land and (b) farming practices that maintain natural resources on their land. Therefore, the focus of the interviews being on these aspects, the expectation was to be able to identify the associations and farming practices referring to the maintenance of natural resources. The (in)coherence with sustainability dimensions enabled to check this tendency.

Associations with the maintenance of natural resources meet the expectation. All associations refer to the environmental, social or economic dimensions of sustainability. As a result, it can be stated that **interviewed farmers unanimously agree with the maintenance of natural resources in the context of associations**. The majority of associations belong to the environmental dimension of sustainability, while the most frequently mentioned association belongs to the economic one. This shows the trend to divide associations into several dimensions of sustainability.

Almost all farming practices belong to the environmental dimension of sustainability. These practices are directly focused on reducing negative impacts, conserving and/or sustaining natural resources. Therefore, **the majority of interviewed farmers agree with the maintenance of natural resources in the context of farming practices**. The most frequently mentioned farming practice that maintains natural resources was *no overuse of agrochemicals.* The majority of the interviewed farmers emphasized that a reduction in agrochemicals use is needed in order to sustain natural resources on their land. The harmful effect of agrochemicals was widely stressed: "*you are spraying poison, you kill everything*" (Mixed farmer, 2011b). However, one farming practice is the opposite to the main tendency. During interviews, a few farmers stressed **the importance to use various agrochemicals** in order to achieve an abundant agricultural production. These farmers do not grasp the damage done to natural resources by using these agrochemicals. Additionally, this understanding is in direct conflict with the largest communality among farmers in the context of farming practices (*no overuse of*

> *"One of the worst things was spraying a lot of herbicides in the past; we did not realize that it is killing everything"* (Fruit farmer, 2011g)

agrochemicals). Therefore, it demonstrates that **a few interviewed farmers strongly disagree with the maintenance of natural resources in the context of agrochemical use**.

To summarize, farmers' agreement concerning the maintenance of natural resources is unanimous in the context of associations. All interviewed farmers stand for the maintenance of natural resources in a direct or indirect way. However, disagreement is noticeable in the context of farming practices. The disagreement exists regarding agrochemicals use. The majority of interviewed farmers point out the need to reduce agrochemical use in order to maintain natural resources, while a few farmers perceive the use of agrochemicals as an indispensable farming practice. These results enable to answer the second block of the research questions elaborated in Table 2.

Table 2. Answer to the second block of the research questions

RQ.II.	What degree of dissonance exists within primary stakeholders' knowledge regarding NRM in the area of social learning?
	The combination of the *optimal* and *high dissonance* is present in farmers' knowledge regarding NRM in the Kouga Catchment. The *optimal dissonance* dominates in interviewed farmers' knowledge because farmers unanimously agree with the maintenance of natural resources in the context of associations and a majority agrees in the context of farming practices. However, the *high dissonance* exists in one area of farming practices. The majority of interviewed farmers stress the reduction of agrochemical use in order to sustain natural resources, while a few *emerging* farmers point out the necessity to use agrochemicals without any concern to deplete natural resources.

The farmers without concern of natural resource depletion belong to the same socio-economic group. They are all *emerging* farmers who face a lot of productivity challenges, and are highly financially insecure. As a consequence, the interviewed *emerging* farmers see the use of high amounts of agrochemicals as a main way to increase their agricultural production. The priority of *emerging* farmers is to survive through farming and become financially independent: "*we want to sustain our lives*" (Fruit farmer, 2011c). Their primary concern is to cover their basic needs. This demonstrates a parallel with Maslow's hierarchy of needs. Firstly, basic human needs have to be covered: physiological needs of the human body and safety, which includes financial security. When these needs are achieved, an understanding of the next level of needs can occur. These needs are related with love, self-esteem, and self-actualization (Maslow, 1943). The maintenance of natural resources is not a basic human need. Therefore, it is comprehensible that humans facing a high financial insecurity will not have needs related with the maintenance of natural resources. Firstly, they have to cover their basic need - *to sustain the life* –, and then the understanding, that it is important to maintain natural resources in this life, can occur.

Moreover, this trend is supported by the view of other farmers regarding natural resources. Farmers who are financially more secure pay greater attention to the maintenance of natural resources. They have the understanding that it is crucial to maintain natural resources, but the focus on financial security remains. It is represented by the interviewed farmers' inclination to divide sustainability into environmental and economic dimensions. The importance of maintaining natural resources is understood, but the economic state is important as well: "*I will never be sustainable*, *if I am bankrupt*" (Fruit farmer, 2011l). This tendency reveals socio-economic dependency. **The socio-economic state of the farmers heavily influences the understanding of natural resource maintenance**. Farmers who are financially insecure do not understand the necessity to maintain natural resources. Farmers who are more financially stable already have the understanding that the maintenance of resources is important, and they are trying to integrate this in their farming practices.

Consequently, it is not possible to make general conclusions about farmers' knowledge regarding NRM; the interviewed farmers could be divided into groups concerning the types of knowledge. This division has socio-economic implications because, as explained above, the understanding of the necessity to maintain natural resources is influenced by socio-economic state of the farmers. Firstly, the interviewed farmers are divided into ***boer*** and ***emerging*** farmers. *Boer* farmers have a tendency to pay attention to maintenance of natural resources. It is represented by their inclination to divide sustainability into the environmental and economic dimensions. However, *boer* farmers differ by the priority to the environmental or the economic dimension. The majority of interviewed *boer* focus on the economic dimension. They are ***commercial*** farmers intending to manage natural resources in a way which ensures economic profitability; but the maintenance of resources is taken into account as well. Nevertheless, there are several farmers among *boer* who give an absolute priority to the environmental dimension of sustainability. They hold ***alternative*** perspectives in which the maintenance of natural resources is a central aspect of their farming activities. Furthermore, few of *alternative* farmers try to separate themselves from *commercial* farmers: "*commercial farmers do not care about natural stuff;* [...] *ecosystem was destroyed to plant apples*" (Essential oil farmer, 2011).

The other group of interviewed farmers is *emerging*. Only a small number of *emerging* farmers was interviewed, but their knowledge differs greatly from the rest. With their current socio-economic state, they do not understand the necessity to maintain natural resources. They did not express any need to sustain natural resources. Summarizing, **three groups of interviewed farmers concerning the types of knowledge could be distinguished: *emerging*, *commercial* and *alternative***. *Emerging* farmers are still far away from the maintenance of natural resources: they prioritize economic profit. *Commercial* farmers take the intermediate position: they are combining attention to economic profit and natural resources. *Alternative* farmers are principally devoted to the maintenance of natural resources. These groups of interviewed farmers are illustrated in Figure 14.

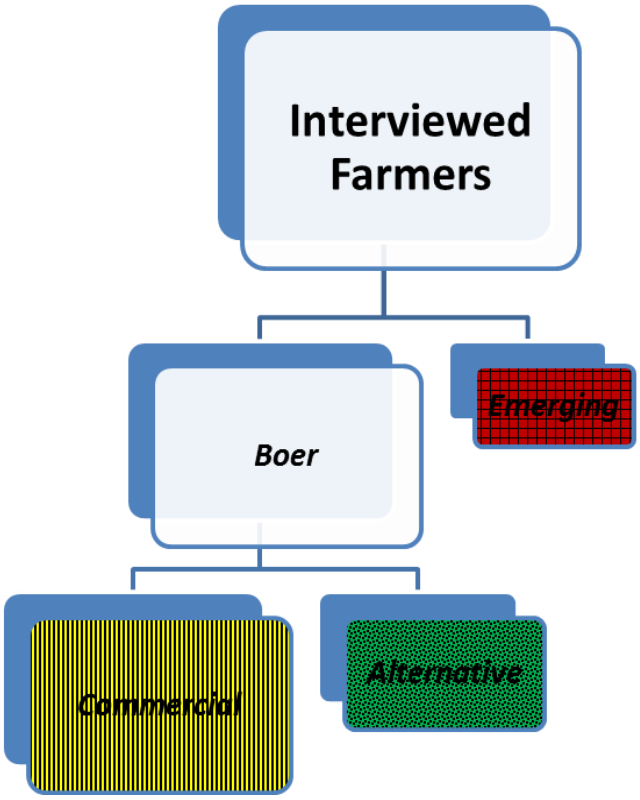

Figure 14. Groups of interviewed farmers concerning the types of knowledge

The graphic and background color of the boxes represent the differences in knowledge types. Quadrates in red background demonstrate the knowledge type of *emerging* farmers. They still do not have understanding of necessity to maintain natural resources. As a result, their farming practices contradict the principles of natural resource maintenance. Stripes in yellow background illustrate the middle position of *commercial* farmers. The understanding and practical commitment to maintain natural resources are present. Dots in green background stand for *alternative* farmers who have a deep understanding and are entirely committed to maintain natural resources. Therefore, **farmers' knowledge regarding NRM is consistent**. The line between understanding and practical commitment is present. Farmers who understand the importance to maintain natural resources are more or less practically engaged in it. It means that the understanding of human beings is constructing the way how natural recourses are and will be used.

Finally, the size of the boxes approximately represents the number of each group of farmers present in the Kouga Catchment. The region is dominated by *boer* farmers in respect to *emerging* farmers. *Commercial* farmers are more dominant than *alternative* ones among the group of *boer* farmers (Figure 14). Furthermore, the number of interviewed farmers[30] represents these tendencies because the choice of respondents was based on the representation of communalities and differences of the whole study population.

[30] 21 farmers of *boer* origin (14 out of 21 were *commercial* farmers, 7 out of 21 were *alternative* farmers) and 4 *emerging* farmers were interviewed.

VI. AGREEMENT AND DISAGREEMENT BETWEEN FARMERS AND SECONDARY STAKEHOLDERS

This chapter is devoted to the agreement and disagreement between primary stakeholders (farmers) and secondary stakeholders[31] concerning the maintenance of natural resources. It is a different type of analysis compared with the previous chapter. The focus of Chapter V was on farmers' agreement and disagreement with the maintenance of natural resources. But the agreement and disagreement has to be evaluated between farmers and secondary stakeholders as well, because secondary stakeholders are involved and have valuable knowledge regarding natural resource management (NRM) in the Kouga Catchment. Therefore, this chapter concentrates on farmers' agreement and disagreement with secondary stakeholders. Two steps were taken in order to achieve this:

- Secondary stakeholders' knowledge regarding NRM was identified. During the unstructured interviews, secondary stakeholders pointed out (a) **associations** with the maintenance of natural resources and (b) **practices** that maintain natural resources. Interrelated associations and interrelated practices were grouped separately in order to organize the variety of collected data.
- Associations and practices were **evaluated by farmers**. The evaluation was structured by farmers' ***reactions to associations*** and farmers' ***reactions to practices***. The most important tendencies of evaluation were visualized in spider web plots. It enabled to show farmers' agreement or disagreement with secondary stakeholders' knowledge regarding NRM.

Consequently, the identification of farmers' agreement or disagreement with secondary stakeholders' knowledge allowed to define the degree of dissonance. The chapter ends with the main findings of the empirical research.

1. Secondary Stakeholders' Knowledge

Associations with the maintenance of natural resources were distinguished after the unstructured interviews with 10 secondary stakeholders. During interviews, secondary stakeholders mentioned a

[31] Secondary stakeholders refer to governmental-environmental and governmental-social institutions representatives in the Kouga Catchment. The secondary stakeholders are presented in Chapter IV.

wide range of associations with the maintenance of natural resources in the Kouga Catchment. Interrelated associations were grouped in order to structure this variety. Five groups of associations were distinguished: (1) *alien plants*, (2) *fire*, (3) *water*, (4) *soil*, and (5) *loss of biodiversity.* These groups of associations have different mentioning frequency because usually each secondary stakeholder mentioned several associations. Associations are listed by their mentioning frequency starting with the most important one in Table 3. **Each group of associations refers to the environmental challenges in the Kouga Catchment**. Therefore, both terms *association* and *challenge* will be used as synonyms in this chapter.

Additionally, secondary stakeholders pointed out practices that maintain natural resources. These practices represent the ways how to face environmental challenges in the Kouga Catchment. Mentioned practices not necessarily cover the wide spectrum of solutions, but rather give several examples how to address these challenges. Interrelated practices were grouped in order to have a clear structure: (1) *alien plants clearing* and *preservation of alien plants clearing*, (2) *membership in the fire protection association*, (3) *water saving*, (4) *reduction of agrochemicals*, and (5) *conservation.* These practices are listed in Table 3.

Table 3. Associations and practices

	Associations:	Practices:
(1)	***Alien plants***	*Alien plants clearing,* *Preservation of alien plants clearing*
(2)	***Fire***	*Membership in the fire protection association*
(3)	***Water***: shortages, floods	*Water saving*
(4)	***Soil***: erosion	*Reduction of agrochemicals*
(5)	***Loss of biodiversity***	*Conservation*

In this section, all groups of associations and practices are described and their (in)coherence with sustainability dimensions is stated. Description of associations and practices is based on secondary stakeholders' statements and is supported by additional information sources, while their relation with sustainability dimensions is based on the theoretical approach presented in Chapter II[32].

[32] The environmental dimension of sustainability directly signifies the agreement to maintain natural resources. The social and economic dimensions indirectly signify the agreement. Therefore, secondary stakeholder agrees with the maintenance of natural resources, when his associations and practices support one or several dimensions of sustainability; secondary stakeholder disagrees with the maintenance of natural resources, when his associations and practices oppose one or several dimensions of sustainability.

(1) The most frequently mentioned group of associations is ***alien plants***. The majority of interviewed secondary stakeholders stated that alien plants are threatening natural resources in the Kouga Catchment. These plants cause water shortages and decrease in biodiversity. Therefore, secondary stakeholders stressed ***alien plants clearing*** as a crucial practice to face this challenge. Alien plants are cleaned by secondary stakeholders in the whole Kouga Catchment territory – by the *Working for Water* (WfW) program. The main concern of secondary stakeholders is that there is no on-going commitment from farmers regarding cleaning activities: when WfW cleans the alien plants on farmers' land, this cleaning is not maintained by farmers in most cases (GIB representative, 2011). Consequently, alien plants regenerate very quickly. Thus, secondary stakeholders pointed out that ***preservation of alien plants clearing*** is an inevitable practice as well.

(2) The second group of associations with the maintenance of natural resources is ***fire.*** This group is interrelated with *alien plants*. Alien plants have a big impact on fires occurring in the Kouga Catchment area. They make fires "*hotter, more frequent and longer*" (ECPTA representative, 2011). Secondary stakeholders stated that fire itself is of high importance in the Kouga Catchment environment: "*fire drives a lot, it is huge*" (ECPTA representative, 2011). Fires occur naturally and are caused by farmers burning in wrong weather conditions. Therefore, planned fire management is necessary in order to face natural fire regimes and manage human made fires. Secondary stakeholders mentioned farmers' ***membership in the fire protection association*** as an important sign of natural resources protection. Members of the fire protection association share information about fire management, receives training, shares costs, etc. Consequently, it leads to more efficient fire management practices.

(3) Third group of associations is related to ***water****.* Two different trends in this group of associations were distinguished. First trend are ***water shortages***. The interviewed secondary stakeholders perceive water shortages as a big challenge in the Kouga Catchment. Several points illustrate this view. First, water from the catchment is greatly used for farming; in particular fruit farming requires high amounts of water. Second, competition for water resources from the cities outside of the Kouga Catchment territory is increasing (ECPTA representative, 2011). Third, the Kouga Catchment is a water scare area due to a dry climate. Rainfall patterns are changing drastically: "*no good rains;* [nowadays] *it is becoming dryer*" (Fruit farmer, 2011o). All these points lead to constant water availability issues which have a tendency to grow in the future.

Second trend in associations related to *water* is ***floods***. Secondary stakeholders stated that floods are often occurring in the Kouga Catchment. They cause a lot of damage in the whole territory. The biggest flood in the area's history happened in 2007. Orchards were totally destroyed: "*flashed away*" (Fruit farmer, 2011g). The interviewed secondary stakeholders pointed out that water related challenges need particular attention. One of the ways to face them is ***water saving*** practices. There is a variety of specific practices applied in the area. Some of them are heavily interrelated with other problematic areas. For instance, *alien plants clearing* and *preservation of alien plants clearing* are very important to save water resources because alien plants use much more water than indigenous vegetation.

(4) Fourth group of associations is linked to ***soil***. Secondary stakeholders mentioned trends of ***soil erosion***[33] in the area. Soil erosion "*removes top soil, reduces soil organic matter and contributes to the breakdown of soil structure*" (Van Vliet et al. 2005). Soil erosion occurs naturally due to floods which occur often in the Kouga Catchment. It is also accelerated by agrochemicals use and overgrazing. Therefore, reduction of agrochemicals use and controlled grazing may prevent the gradual destruction of the soil. A few interviewed secondary stakeholders especially stressed the ***reduction of agrochemicals*** use as one of the ways to reduce soil erosion, as a high amount of agrochemicals is used for the fruit farming in the area. However, soil erosion is a complex challenge with multiple causes which needs a variety of solutions. Some of them are mentioned in the context of the fifth group of associations.

(5) Fifth group of associations with maintenance of natural resources is ***loss of biodiversity***. The Kouga Catchment is an important area for biodiversity conservation. It is connected with three biodiversity hotspots[34] in South Africa (DEAT, 2005). However, several secondary stakeholders emphasized that ecosystems in the area are heavily fragmented due to direct human activities, such as natural vegetation transformation for orchards or grazing: "*people changing a landscape for agricultural use, plowing natural vegetation for orchards, sowing grass species for grazing*" (ECPTA representative, 2011). Ecosystems are fragmented due to indirect human activities as well, in particular due to alien plants and soil erosion (ECPTA representative, 2011). Additionally, secondary stakeholders pointed out that the Kouga Catchment is very volatile to weather patterns: "*you get all the extremes*" (GIB representative, 2011). The Kouga Catchment is very prone to fires, droughts and floods. All these aspects are directly causing biodiversity loss in the Kouga Catchment territory. Subsequently, secondary stakeholders identified ***conservation*** practices to be crucial in order to sustain natural resources in the area. In particular, these conservation practices should focus on the creation of resilience to weather extremes.

All groups of associations and practices unanimously stand for the environmental dimension of sustainability. Associations and practices directly address the maintenance of natural resources in the Kouga Catchment. It shows that the **interviewed secondary stakeholders totally agree with the maintenance of natural resources**. This tendency was expected because the biggest part of secondary stakeholders are representing environmental organizations which are dedicated to the maintenance of natural resources, such as biodiversity conservation and water resources protection. The rest of the secondary stakeholders have sustainable management of natural resources as one of their interests. Furthermore, during the interviews, associations and practices were addressed from the perspective of natural resource maintenance.

> The conservation of natural resources is *"a way to improve ecosystems functioning"* (ECPTA representative, 2011).

[33] Soil erosion – "*the movement of soil from one area to another which occurs naturally or can be augmented by some farming activities*" (Van Vliet et al. 2005).
[34] Biodiversity hotspots – "*areas of high species diversity, which are also under serious threat*" (Vromans et al. 2010).

Each association and activity mentioned by secondary stakeholders requires collaboration with farmers and their long term engagement. It shows that secondary stakeholders see collaboration with farmers as an inevitable necessity for the maintenance of natural resources in the Kouga Catchment. Therefore, it is important to reveal farmers' reactions. It leads that secondary stakeholders' associations and practices have to be evaluated by farmers in order to define their agreement or disagreement. This evaluation could give an indication about the potential areas of collaboration between farmers and secondary stakeholders in the context of natural resource maintenance.

2. Farmers' Reactions

Structured interviews (questionnaires) were used to accurately evaluate farmers' agreement or disagreement with secondary stakeholders' associations and practices. 23 out 25 farmers interviewed through semi-structured method also filled out the questionnaire in order to evaluate associations and practices pointed out by secondary stakeholders. The evaluation was structured by farmers' ***reactions to associations*** and farmers' ***reactions to practices***. These associations and practices were evaluated with the Likert scale. *Reactions to associations* had a five point Likert scale, and *reactions to practices* had a three point Likert scale as a more elaborate scale will not provide more detailed information. The Likert scale had positive, neutral and negative positions. The focus of analysis was positive and negative evaluations in order to identify farmers' agreement or disagreement. In some cases, few farmers expressed neutral position showing the absence of agreement or disagreement. Therefore, the neutral positions were taken out. Finally, the scores of positive and negative evaluations were counted and visualized in spider webs.

2.1. Reactions to Associations

Five groups of associations with the maintenance of natural resources were mentioned by secondary stakeholders. These groups were assessed by 23 farmers in order to define their agreement or disagreement. The groups of associations are listed from 1 to 5 regarding their importance to secondary stakeholders: (1) *alien plants*, (2) *fire*, (3) *water shortages* and *floods*, (4) *soil erosion*, and (5) *loss of biodiversity*. Farmers' reactions had positive and negative tendencies. Positive tendencies represent agreement with associations; negative tendencies represent disagreement with associations. Variations of agreement and disagreement are visualized in the form of spider web plots below (Figure 15 and Figure 16). The lines in the plots illustrate the number of farmers that agreed or disagreed with each association.

The positive farmers' reactions to associations mentioned by secondary stakeholders are varying from *often* to *always*. The dashed green line represents the number of farmers who responded *often* to each association. It means that associations pointed out by secondary stakeholders are often important to farmers. The green line represents the number of farmers who responded as *always* to each association. It shows that associations pointed out by secondary stakeholders are always important to farmers. These both reactions characterize the farmers' agreement with associations of natural resource maintenance stated by secondary stakeholders.

The negative farmers' reactions to associations mentioned by secondary stakeholders are varying from *not often* to *never*. The dashed red line represents the number of farmers responding *not often* to each association. It means that associations pointed out by secondary stakeholders are not often important to farmers. The red line represents the number of farmers reacting *never* to each association. It signifies that associations pointed out by secondary stakeholders are never important to farmers. These both reactions characterize the farmers' disagreement with associations of natural resource maintenance stated by secondary stakeholders.

In this section, farmers' agreement and disagreement to each group of associations are described. Each group of associations refers to the environmental challenge in the Kouga Catchment. Therefore, the term *challenge* is mainly used instead of *association* in the following part.

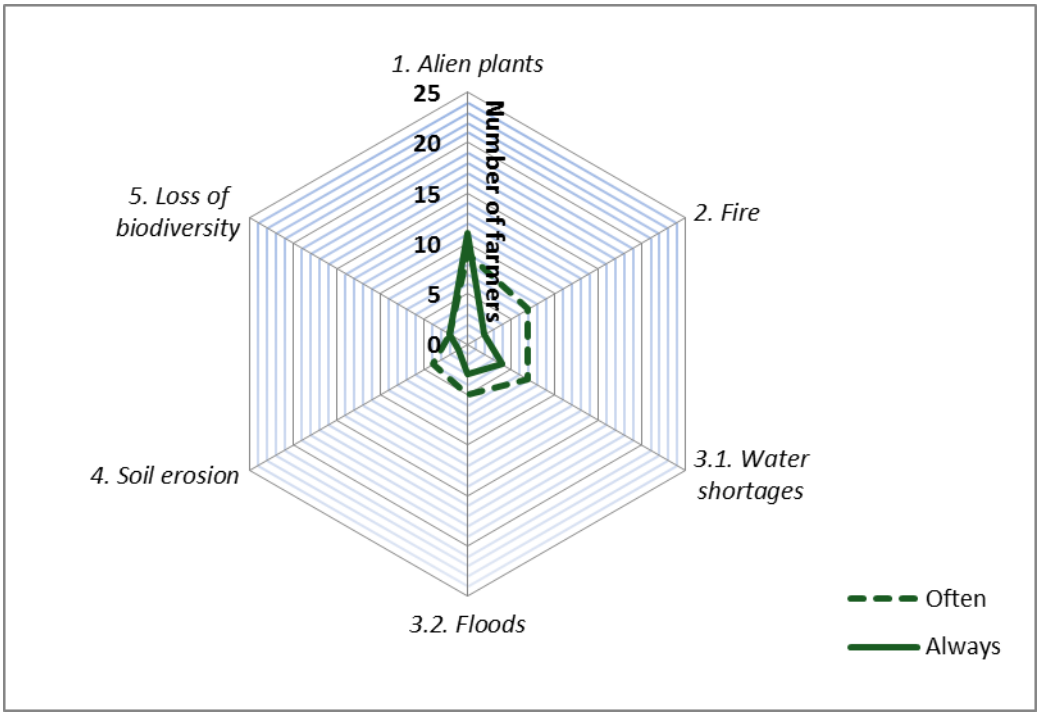

Figure 15. Farmers' agreement with associations

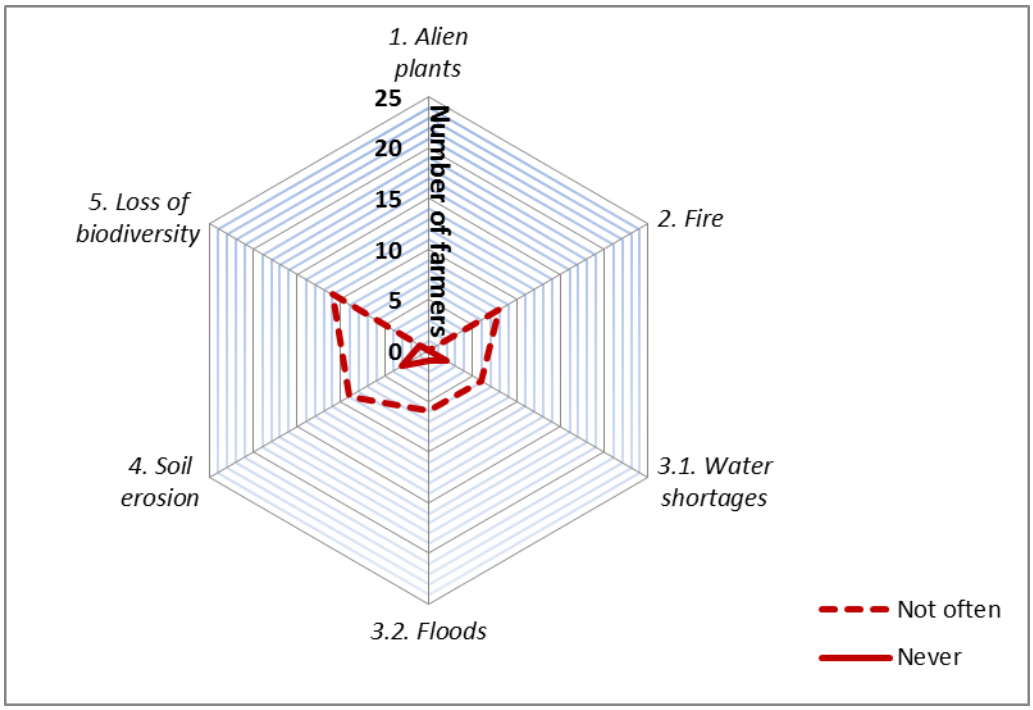

Figure 16. Farmers' disagreement with associations

(1) The strongest farmers' agreement is present with challenge of ***alien plants***. This challenge received the highest positive reaction: 11 farmers ranked *alien plants* as an *always* important challenge and 9 ranked *alien plants* as often an important one. To sum up, 20 out of 23 farmers had a positive reaction. No negative reaction was expressed. It means that the interviewed farmers perceive *alien plans* as a big challenge. Moreover, the interviewed secondary stakeholders stated *alien plants* as the most important environmental challenge in the Kouga Catchment. Therefore, *alien plants* characterize a significant communality between farmers and secondary stakeholders in order to collaborate towards maintenance of natural resources.

(2) ***Fire*** was evaluated positively by 9 out of 23 farmers; negatively by 8 out of 23 farmers. The amount of positive and negative reactions of farmers is almost equal. On the one hand, fire is treated as an important challenge; on the other hand, fire is treated as an unimportant one. Therefore, neither a strong farmers' agreement nor a strong disagreement could be stated. **(3)** ***Water*** related challenges had two different trends: *water shortages* and *floods*. *Water shortages* were evaluated positively by 11 out of 23 farmers; negatively by 8 out of 23 farmers. *Flood events*: positively by 8 out of 23 farmers; negatively by 7 out of 23 farmers. It shows similar tendencies as the previous challenge. The positive and negative reaction is almost of the same degree. It means that the similar amount of interviewed farmers agree and disagree with water challenges in the Kouga Catchment area.

(4) ***Soil erosion*** was evaluated positively by 5 out of 23 farmers; negatively by 12 out of 23 farmers. The negative evaluation was quite higher. It means that more than a half of interviewed farmers see

soil erosion as an unimportant challenge in the Kouga Catchment, while secondary stakeholders have the opposite point of view. Consequently, it can be stated that bigger farmers' disagreement than agreement is present in the context of soil erosion. **(5)** ***Loss of biodiversity*** was evaluated positively by 4 out of 23 farmers; negatively by 13 out of 23 farmers. The negative reaction is even higher compared to *soil erosion*. The majority of interviewed farmers perceive loss of biodiversity as an unimportant challenge in the Kouga Catchment, while secondary stakeholders take the opposite position. As a result, it can be stated that farmers' disagreement is higher than agreement in the context of loss of biodiversity.

To summarize, the strongest agreement is present in the context of *alien plants*. Challenges related with alien plants receive the biggest support (positive reaction) from interviewed farmers; a negative reaction is absent. Additionally, secondary stakeholders treat a*lien plants* as the most important environmental challenge. Therefore**, *alien plants* is a significant communality between farmers and secondary stakeholders in order to collaborate towards maintenance of natural resources in the Kouga Catchment**. Other challenges do not show any solid tendencies for collaboration. *Fire* and *water* challenges demonstrate neither strong agreement nor strong disagreement. *Soil erosion* and *loss of biodiversity* challenges represent higher farmers' disagreement than agreement.

2.2. Reactions to Practices

Five groups of practices representing the possible ways to face the environmental challenges were mentioned by secondary stakeholders. These groups of practices were assessed by 23 farmers in order to define their agreement or disagreement. The practices are listed from 1 to 5 regarding their importance to secondary stakeholders: (1) *alien plants clearing* and *preservation of alien plants clearing*, (2) *membership in the fire protection association*, (3) *water saving*, (4) *reduction of agrochemicals*, and (5) *conservation*. Farmers' reactions to each practice were described as positive (*yes*) and negative (*no*). Positive reactions stand for farmers' agreement with practices stated by secondary stakeholders; negative reactions stand for farmers' disagreement with practices stated by secondary stakeholders. Variations of agreement and disagreement are visualized in the form of spider web plot below (Figure 17). The lines in the plot illustrate the number of farmers who agreed or disagreed with each practice. The hollow red line in the plot illustrates the number of farmers who disagree with practices mentioned by secondary stakeholders; the full green line in the plot illustrates the number of farmers who agree with practices mentioned by secondary stakeholders.

In this section, farmers' agreement and disagreement to each practice are described. Farmers' agreement and disagreement are defined in the form of involvement in these practices. Each practice refers to the ways how to face environmental challenges in the Kouga Catchment area.

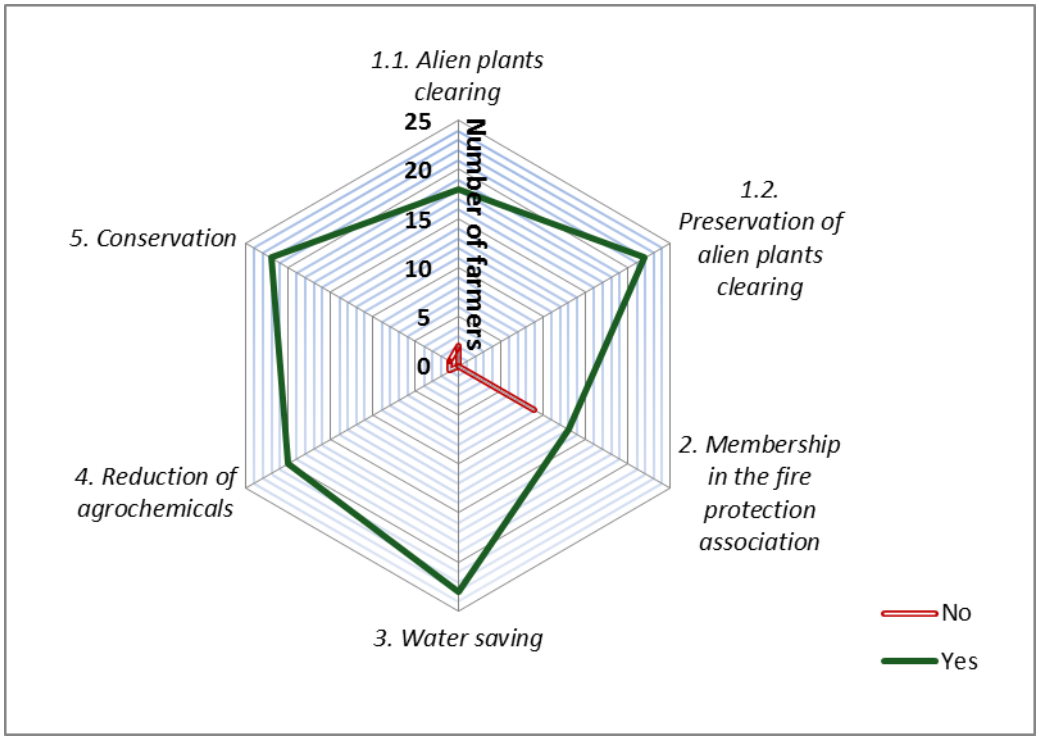

Figure 17. Farmers' agreement and disagreement with practices

The high farmers' involvement in each activity mentioned by secondary stakeholders is clearly noticeable. **(1)** ***Alien plants clearing*** and ***preservation of alien plants clearing*** are performed by 18 out of 23 farmers and 22 out of 23 farmers, respectively. Non-involvement was stated just for *alien plants clearing*. Two *emerging* farmers are not taking part in this activity. The lack of engagement could be explained by the financial vulnerability of *emerging* farmers. The alien plants clearing require extra investments. Consequently, it is hardly possible that *emerging* farmers who face financial insecurity will be active in such a kind of activity. Therefore, the majority of interviewed farmers agree with secondary stakeholders. They both (farmers and secondary stakeholders) support and are actively involved in *alien plants clearing* and *preservation of alien plants clearing*.

(2) ***Membership in the fire protection association*** has a lower involvement score. 13 out of 23 farmers are members of the fire protection association in the Kouga Catchment. The others are not members. However, the lower membership in the fire protection association has a substantial explanation. A fire protection association in the biggest part of Kouga Catchment does not exist yet; it is still in a developing process. During the interviews, farmers expressed the willingness to join this association. Therefore, a higher farmers' membership in the fire protection association could be expected in the future.

(3) Farmers distinguished an essential importance of involvement in maintenance of water resources in the Kouga Catchment. All interviewed farmers (23 out of 23) pointed out that they are doing ***water saving*** practices. It shows farmers' unanimous agreement with secondary stakeholders in the context of water saving. Both farmers and secondary stakeholders give crucial attention to

water saving practices. Consequently, water saving practices could be stated as a unanimous communality between farmers and secondary stakeholders in order to collaborate towards the maintenance of natural resources.

(4) The majority of interviewed farmers see ***reduction of agrochemicals*** as an important practice to maintain natural resources. 20 out of 23 farmers are reducing agrochemical input in their farming. Just one livestock farmer is not involved in agrochemicals reduction. However, this livestock farmer is not using a lot of agrochemicals compared with other farmers. Therefore, the majority of interviewed farmers agree with secondary stakeholders in the context of agrochemicals reduction. Both farmers and secondary stakeholders perceive the reduction of agrochemicals as a way to maintain natural resources. **(5)** ***Conservation*** practices received a strong positive farmers' reaction as well. Almost all farmers (22 out of 23) stated that they are conserving biodiversity on their land. Just one fruit farmer is not performing any conservation on the farmland. He is a young farmer who started his business one year ago. Therefore, it could be expected that changes will occur in his behavior in the following years. Consequently, the majority of interviewed farmers agree with secondary stakeholders regarding conservation practices.

Overall, the interviewed farmers highly agree with secondary stakeholders regarding practices that maintain natural resources. **A great majority of farmers are involved in each practice** which is maintaining natural resources in the Kouga Catchment according to secondary stakeholders. The strongest farmers' agreement is regarding *water saving* practices. All interviewed farmers pointed out that they are involved in this activity. Therefore, ***water saving*** **is a unanimous communality between farmers and secondary stakeholders in order to collaborate towards maintenance of natural resources**. The strong agreement between farmers and secondary stakeholders can be found in other practices as well. The majority (22 out of 23 farmers) is involved in *preservation of alien plants clearing* and *conservation* practices. The involvement in *alien plants clearing* and *reduction of agrochemicals* is just a little bit less. The disagreement is very low or cannot be stated due to substantial reasons explained above.

Farmers' agreement and disagreement with secondary stakeholders' associations and practices were presented separately. However, associations and practices are indispensably interrelated: each association stands for the environmental challenge in the Kouga Catchment and each practice states the possible ways how to deal with this challenge. Therefore, variations of agreement and disagreement per each association and its practice have to be discussed at once. It could reveal deeper insights to farmers' agreement and disagreement with secondary stakeholders, and give a better indication to the possible areas of collaboration. These variations of agreement and disagreement are elaborated in the next section.

3. Variations of Agreement and Disagreement

In this section, farmers' agreement and disagreement with secondary stakeholders regarding maintenance of natural resources are discussed. During the unstructured interviews, secondary stakeholders pointed out (a) **associations** with the maintenance of natural resources and (b) **practices** that maintain natural resources. These associations and practices were **evaluated by farmers** in order to identify their agreement or disagreement. Variations of farmers' agreement and disagreement for each association and its practice are discussed together. Each association and its practice represent the environmental challenge in the Kouga Catchment and its potential solution, respectively. This discussion could give a better indication about the potential areas of collaboration between farmers and secondary stakeholders towards maintenance of natural resources.

The interviewed farmers and secondary stakeholders treat ***alien plants*** as a very important challenge in the Kouga Catchment. Farmers recognize *alien plans* as an enormous challenge: *alien plants* receive the highest farmers' agreement score compared with other challenges; disagreement is absent. Furthermore, the majority of farmers are involved in ***alien plants clearing*** and ***preservation of alien plants clearing***. Next to this, secondary stakeholders rank a*lien plants* as the most important environmental challenge and regard *alien plants clearing* and *preservation of alien plants clearing* as important as well. Therefore, it could be stressed that ***alien plants*** **is a significant area for farmers and secondary stakeholders** to collaborate towards maintenance of natural resources.

Fire does not show any solid tendencies among interviewed stakeholders: secondary stakeholders pointed out fire as a challenge, while farmers do not express any concrete position. They neither strongly agree nor strongly disagree. The low ***membership in the fire protection association*** is explained by its absence in the biggest part of the Kouga Catchment. However, farmers express the willingness to join this association which enables to state that a higher farmers' involvement could be expected in the future.

Farmers are not treating ***water*** as a great current challenge; nevertheless they unanimously agree with secondary stakeholders that it is necessary to save water resources. All interviewed farmers pointed out that they are incorporating ***water saving*** in their farming practices. It means that farmers clearly understand that water has a potential to become a huge problem in the future. Consequently, ***water saving*** **practices is the most important area for farmers and secondary stakeholders** to collaborate towards maintenance of natural resources.

The interviewed farmers and secondary stakeholders do not agree that ***soil erosion*** is a challenge in the Kouga Catchment. Secondary stakeholders perceive **soil erosion** as a challenge, but the bigger part of interviewed farmers sees it as an unimportant one. However, farmers' involvement in ***reduction of agrochemicals,*** which is an indirect way to face soil erosion, is high. The majority of farmers are reducing the agrochemical input on their land. Consequently, the majority of interviewed farmers agree with secondary stakeholders regarding the reduction of agrochemicals. Furthermore,

there is a probability that interviewed farmers do not link *reduction of agrochemicals* with *soil erosion*. Farmers recognize the *reduction of agrochemicals* itself to be important for the protection of natural resources.

Finally, there is no agreement between farmers and secondary stakeholders that ***loss of biodiversity*** is a challenge in the Kouga Catchment. The biggest part of interviewed farmers perceives *loss of biodiversity* as unimportant challenge, while the interviewed secondary stakeholders recognize it as an important one. However, the interviewed farmers strongly agree with the necessity to conserve biodiversity. The high majority of farmers are involved in ***conservation*** practices on their land. Therefore, the majority of interviewed farmers agree with secondary stakeholders regarding the conservation activities. Besides, it is again noticeable that farmers not necessarily link the challenge with the potential practice to face it. This tendency is highly plausible because challenges and its potential solutions were pointed out by secondary stakeholders.

To summarize, several findings are stated. First, two areas of collaboration between the interviewed farmers and secondary stakeholders were found. These areas are ***alien plants*** and ***water saving*** practices. **Farmers agree with secondary stakeholders in the context of *alien plants* and *water saving* practices**. The interviewed farmers and secondary stakeholders treat *alien plants* as a big challenge in the Kouga Catchment, and they both perceive *water saving* to be a crucial activity in the area. Furthermore, *alien plants* are related with *water saving* practices. The main threat that alien plants cause is that they are using more water resources compared with indigenous vegetation. Alien plants are spreading very fast and in the following years even more areas of the Kouga Catchment will be invaded. Consequently, even more water resources will be used. That's why *alien plants* is a big challenge for farmers and secondary stakeholders. Therefore, it enables to merge *alien plants* into *water saving* practices. In this way ***water saving*** **becomes a core area of collaboration between farmers and secondary stakeholders regarding the maintenance of natural resources**. Interviewed farmers and secondary stakeholders understand that water is a key resource in the Kouga Catchment which is under great pressure[35]. Several aspects prove this point of view. First, the fruit farming dominates the area which requires high amounts of water. Several fruit farmers mentioned water as the main limiting factor to expand the farming area: "*expansion is very limited due to water limits*" (Fruit farmer, 2011b). Second, water resources are used for the cities outside of the Kouga Catchment. Third, the Kouga Catchment itself is in a dry climate zone where climate patterns are becoming more extreme. As a result, the high majority of interviewed farmers and secondary stakeholders realize that they cannot waste water: "*water is not here*" (Fruit farmer, 2011f) and perceive that on the long term water will

> *"The* [...] *war will be for the water"* (ECPTA representative, 2011)
>
> "*Water is the main challenge*" (Fruit farmer, 2011h)

[35] This tendency was also found in the environmental-biophysical assessment of the Kouga Catchment area. See master thesis of Clara Veerkamp.

become a threat. Therefore, water saving is a central point for farmers and secondary stakeholders collaboration in the context of natural resource maintenance.

This finding is supported by Chapter V as well. Farmers themselves mentioned associations and farming practices related with the maintenance of water resources, for instance, *alien plants control*, *mulch* and *drip irrigation* are used by farmers in order to save water resources. These results enable to answer the third block of the research questions elaborated in Table 4.

Table 4. Answer to the third block of the research questions

RQ.III.	What degree of dissonance between primary and secondary stakeholders exists in knowledge regarding NRM in the area of social learning?
	The combination of the *high* and *optimal dissonance* is present between farmers and secondary stakeholders' knowledge regarding NRM in the Kouga Catchment. The *high dissonance* dominates between interviewed farmers and secondary stakeholders' knowledge, because few farmers disagree with associations and practices pointed out by secondary stakeholders in most cases. The *optimal dissonance* exists in the area of water saving practices. This is an essential area for collaboration between farmers and secondary stakeholders in order to maintain natural resources in the Kouga Catchment.

Furthermore, **socio-economic dependency** was noticed again. The disagreement with the maintenance of natural resources was pointed out mainly by *emerging* farmers. Two out of four farmers who expressed disagreement with practices that maintain natural resources are *emerging* farmers. This tendency supports the finding of Chapter V. The *emerging* farmers do not have the understanding of the necessity to maintain natural resources at their current state. Their priority is to survive through farming and become financially independent.

VII. CLOSURE

This chapter finishes the research. The first section combines the results of the previous chapters and formulates conclusions. A reflection of the whole research is made in the second section. The chapter ends with practical conclusions and recommendations for the Kouga Catchment study area.

1. Conclusions

This research intended to reveal the role of dissonance[36] in the initiation of the social learning process from both theoretical and empirical sides. Social learning treats the sharing of different knowledge regarding natural resource management (NRM) as the learning process which could inspire the changes towards maintenance of natural resources. The results of the research indicate three characteristics of dissonance in the initiation phase of the social learning process.

The first characteristic is that dissonance has **two opposite effects** on the initiation of the social learning process: dissonance has a potential (1) to activate and (2) to block the learning process. The activation or blocking depends on the dissonance degree[37]. The *optimal dissonance* degree activates the learning process; while *high* and *low dissonance* degrees block and stagnate the learning process, respectively. As a result, the presence of the *optimal dissonance* is a crucial condition for a successful initiation of the social learning process. The *optimal dissonance* means that differences among stakeholders' knowledge regarding NRM are present, but that these differences support a *common goal* concerning the maintenance of natural resources. In this way, stakeholders' knowledge can be used for learning. The *optimal dissonance* illustrates that diversity among stakeholders is not enough; stakeholders have to have the same vision concerning the maintenance of natural resources in order to construct a successful learning process.

The empirical research highlighted some other characteristics of the dissonance in the initiation of the social learning process. The empirical research illustrated that **the degree of dissonance is higher when more categories of stakeholders are involved**. The *optimal dissonance* dominates in primary stakeholders' knowledge, but *the high* dissonance degree dominates between primary and secondary stakeholders' knowledge. Therefore, higher diversity of stakeholders' categories potentially leads to a higher degree of dissonance. Furthermore, empirical research proved the

[36] Dissonance - all differences among stakeholders' knowledge regarding NRM.
[37] Dissonance degree - intensity of differences among stakeholders' knowledge regarding NRM.

assumption stated in the theoretical approach that **the combination of the *high* and *optimal dissonance* is most likely to be present in the initiation of the social learning process**. The *low dissonance* was not found in a real life situation. Management of natural resources is a complex activity which includes a large variety of stakeholders with different knowledge, interests and values. Therefore, stakeholders who have an identical knowledge regarding NRM were not identified during the empirical research.

Consequently, these three characteristics result in the domination of the *high dissonance* in the initiation phase of the social learning process. The high differences among stakeholders' knowledge regarding NRM will always be present. Therefore, it underlines that **the *optimal dissonance* has to be seen as a continuous focus point in practice** in order to successfully initiate the social learning process. This reality opens questions concerning dissonance management: *how to ensure acknowledging diversity, but preventing the conflict creation? How could multiple differences be used for learning? How to empower the move from individual to common preferences?* These questions show that active external assistance is needed in order to stimulate the situation of the *optimal dissonance*.

Learning in NRM context requires bringing together multiple stakeholders and creating their interdependency by finding common goals. The stakeholders who are willing to maintain natural resources have to be assembled and the ones which do not have this attitude have to be guided to understand their needs in a broader perspective. The capability to facilitate their interaction, the intensity among their differences, defines the successful initiation and continuation of the social learning process. Subsequently, the importance of **facilitation** in the initiation of the social learning process is highlighted. It is crucial to focus on aspects which influence the degree of dissonance and try to facilitate them in order to create the *optimal dissonance* situation.

This research revealed one aspect which influences the degree of dissonance. The empirical research showed that **the degree of dissonance is influenced by the socio-economic state of involved stakeholders**. Stakeholders who created the *high dissonance* situation were from the same socio-economic context. This was particularly apparent with primary stakeholders (farmers). Farmers' knowledge regarding NRM is heavily influenced by their socio-economic state. Farmers who are financially vulnerable do not understand the necessity to maintain natural resources. Their priority is to survive from these resources. Farmers who are more financially secured have the understanding concerning the importance to maintain natural resources. Consequently, it has to be taken into consideration that the maintenance of natural resources will never be a priority for financially vulnerable stakeholders.

To conclude, the empirical research enabled to use the formulated theory and develop the theory further. Two opposite effects of dissonance on the social learning process were noticed - the dissonance could be an inspiration for the social learning to begin, but at the same time could be an obstruction. The tendency of the *high dissonance* domination against the *optimal* one was noticed as well. Therefore, the *optimal dissonance* situation should be created in order to initiate the social

learning process successfully. It implies the necessity of facilitation with special attention to the socio-economic state of involved stakeholders. These conclusions are summed up in Figure 18.

Figure 18. Highlights of conclusions

2. Discussion

This section provides a critical reflection of the whole performed research and points out which shortcomings have affected the conclusions the most. The discussion is done in the following sequence: theory, methods, results and various conditions of the research.

Theory

The theoretical model created in this research provided a useful starting point for dissonance characterization in the initiation phase of the social learning process. This theoretical model was very suitable for the analysis of the case study, since a parallel setting could be found in the latter. Firstly, the social learning project was in the initiation phase (creation of a *common goal*). Secondly, the objectives of the project were in parallel with three building blocks of the social learning process stated in the theoretical model. A better setting could hardly be expected. However, this model could be questioned in the context of **other case studies**, as other cases could give new insights into the model. Especially, it is interesting to look into cases which encompass other building blocks of the social learning process, such as *mutual trust* or *commitment to maintain natural resources*.

Furthermore, an empirical inquiry revealed issues for **the applicability of the term *dissonance***. *Dissonance* was the central term in this research. In particular, this term was convenient to illustrate the necessity of pluralism and differences for the social learning process in the theoretical model; nevertheless its use in the empirical part was problematic. A lot of difficulties arose in the presentation of the results, because the term *dissonance* brings more negative connotations than positive ones. In the dictionary the term *dissonance* is defined as "*lack of agreement or harmony between people or things*" (Oxford Dictionaries, 2012). The term *dissonance* is a synonym with the terms, such as *discord*, *disagreement*, *conflict*, etc. This is in conflict with the *dissonance* characterization in the theoretical model of this research. The theoretical model of this research stresses positive and negative connotations of the *dissonance* with a particular focus on the positive ones. The *optimal dissonance* has a positive effect: *activates social learning.* The *high* and *low dissonances* have negative effects: *blocks and stagnates social learning*. Consequently, the term *dissonance* always had a negative tendency and could not successfully represent positive connotations of pluralism and differences in the case of the *optimal dissonance*. This ambiguous connotation became very noticeable in the results presentation because it was very difficult to clearly present the collected data regarding the *optimal dissonance* definition.

The problematic presentation of the results was caused not just due to the ambiguous connotation of the term, but also due to its complexity. The *optimal dissonance* was stated as a major condition for the realization of the social learning process which refers to a very complex situation. It encompasses a lot of features at once, such as pluralism, diversity, *common goal*, stakeholders, etc. this could result in a sometimes complex explanation of the results. Therefore, a different conceptualization approach is suggested to be used. The features of *optimal dissonance* could be listed as the separate conditions of the social learning process. In this way, the *optimal dissonance* does not have to be applied and more clarity could be brought to further theoretical and empirical elaborations.

Methods

Three methods of data collection were used in the research: unstructured interview, semi-structured interview and structured interview (questionnaire). Unstructured and semi-structured interviews intended to elicit respondents' knowledge regarding NRM, while questionnaire was aimed to check

the link between their knowledge. The unstructured and semi-structured interviews had the disadvantage that it gave a lot of space for **researcher's interpretation of collected data**. Especially, the questions about the maintenance of natural resources were not asked directly. The concept of *land heath* was used in order to refer to maintenance of natural resources providing extensive space for the respondents to describe their understandings. As a result, the researcher used a lot of personal judgment to group the answers into a clear structure. However, the researcher has spent a great amount of time in the case study area trying to listen and understand respondents. This fact gives indication that the ability to build representative results was present.

Results

The results were based on the identification of stakeholders' knowledge regarding NRM. It was not easy to classify this kind of knowledge. Therefore, several aspects have to be pointed out. First, it is important to stress that **this research intended to cover just the trends of the current knowledge** in the Kouga Catchment area. Only a small portion of the whole study population was interviewed. Therefore, it is necessary to interview more stakeholders in the Kouga Catchment in order to have more accurate identification of the knowledge.

Second, general knowledge regarding NRM showed quite positive trends towards maintenance of natural resources. However, this **knowledge needs specification**. Knowledge was identified through (a) associations with the maintenance of natural resources and (b) practices that maintain natural resources. Some of these associations and practices are still very broad and could contain various aspects and meanings, for instance, farmers associate the maintenance of natural resources with *balance in nature* and *quality of life;* secondary stakeholders stressed *water saving* and *conservation* as practices that maintain natural resources. Furthermore, *water saving* was stressed as the main focus for collaboration between primary and secondary stakeholders. However, this is a very extensive area, and it is highly possible, that when stakeholders will come together and will start to discuss the details, some disagreements might raise. Therefore, these vague associations and practices need further specification.

Third, the primary stakeholders' (farmers') knowledge was the main reference point in dissonance analysis. However, a **paradox in farmers' statements** concerning the maintenance of natural resources was noticed. The majority of interviewed farmers (76%) stated that they are maintaining natural resources. The minority (24%) pointed out: "*no*; *it could be improved; we are getting there*", interestingly, these are the farmers who are mainly devoted to the maintenance of natural resources. They are focused to sustain natural resources on their land, for example, they are reducing agrochemical input, doing conservation, etc. On the contrary, farmers who are not entirely focused on the maintenance stated that they are doing quite a lot. This paradox shows that farmers, who have a deeper insight and practice in the maintenance of natural resources, evaluate themselves more severe. They stress that still a lot of things have to be done to reach a real state of maintenance. Therefore, the more accurate knowledge regarding the maintenance leads to the higher self-evaluation standards.

Fourth, it is found that knowledge regarding NRM is based on the **socio-economic dependency**. The importance of the socio-economic state could be influenced by two characteristics of the research area: (1) a high financial insecurity by one group of farmers, (2) a commercial farming domination. Therefore, it could be interesting to check the socio-economic dependency in other cases where more financial security is present and commercial farming is not dominating. It could reveal a better understanding about the importance of the socio-economic state.

Finally, the conclusions emphasize the high need for **facilitation** in order to successfully initiate the social learning process. Facilitation was not the focus of this research, but it was always present in this research context. Hints towards the facilitation were present already in the theoretical framework, for instance, the use of passive forms meant the necessity of somebody's assistance. Furthermore, the researcher in the Kouga Catchment study area acted mainly as facilitator. He was collecting the data in the initiation phase of the social learning project helping the learning process to start with his efforts. Therefore, the facilitation is potentially the main point of attention in the initiation of the social learning process. Consequently, future research could look to the social learning process from a facilitation point of view.

Conditions

Several circumstances influenced the data collection process and the data itself of the empirical research. The first condition was **the initial phase** of the project. The research was done in the context of the social learning project in the Kouga Catchment area. It was just the starting phase of this project. As a result, the territory was unknown; just a few contacts with the stakeholders in the area were present. Therefore, a lot of time was taken to build the initial contacts and identify the main characteristics of the area. On the one hand, it gave a very valuable experience for the researcher and gave the opportunity to understand the area better; but on the other hand, the collected data could be more artificial, because a lot of things had to be done before accessing the respondents.

Second, the **scope of the research was too large** in the beginning. The research proposal was broad and not enough information was gathered about the case study before arrival. Furthermore, the data was collected not just for this research; data for another research and social learning project were collected together. Consequently, a lot of changes with regard to the initial research plan were made and more data than necessary were collected. On the one hand, it gave an opportunity to understand the area and stakeholders better; on the other hand, it resulted in a more difficult selection of the data relevant to this research.

Additionally, several practical constrains were apparent in this research context. More **time** than planned was needed to conduct the research in the case study area. Located in South Africa, the case study area was quite different from Europe geographically and culturally. Different cultural setting and working principles were found. Accordingly, it took more time to adapt and start the research. However, it gave opportunities for the researcher to be creative in order to deal with the time pressure.

Another constraint is the **research area's accessibility**: the research area (The Kouga Catchment) is not easily accessible. This area was far away from the researcher's living place in South Africa making it necessary to rely on transportation to reach the area (the main devise of transportation was a car). However, a limited amount of cars was available which also had to be shared with other people. Consequently, it was not always possible to reach the research area. As a result, it trained the researcher to do a precise and flexible planning in advance with several options.

3. Practical Conclusions and Recommendations

This section of the chapter provides practical conclusions and recommendations for the Kouga Catchment study area. The focus of the empirical research was the degree of dissonance in the context of a *common goal* creation. The evaluation of the dissonance degree in this setting gave valuable insights for the social learning project initiation in the Kouga Catchment area. Farmers were identified as the main participants of the learning process. They were stated as the primary stakeholders due to their major importance to maintain natural resources in the area. The secondary stakeholders were representatives from governmental-environmental and governmental-social institutions in the area because they had a valuable knowledge regarding NRM which could be shared. Firstly, the dissonance degree was identified within farmers' knowledge regarding NRM. Secondly, the degree of dissonance was identified between farmers and secondary stakeholders' knowledge. This evaluation enabled to state a *common goal* creation possibility within and between categories of stakeholders.

The combination of the *optimal* and *high* dissonance is present in primary stakeholders' (farmers') knowledge regarding NRM. The *optimal dissonance* dominates in interviewed farmers' knowledge because farmers unanimously agree with the maintenance of natural resources in the context of associations and a majority agrees in the context of farming practices. However, the *high dissonance* exists in one area of farming practices. The majority of interviewed farmers stress the reduction of agrochemical use in order to sustain natural resources, while a few *emerging* farmers point out the necessity to use agrochemicals without any concern to deplete natural resources.

Therefore, it enables to state that a *common goal* exists among the majority of interviewed farmers in the Kouga Catchment. Farmers have a varied knowledge regarding NRM, but the majority of them support the maintenance of natural resources. Consequently, the variation in knowledge could inspire the learning process because farmers can get valuable insights from each other regarding the ways to maintain natural resources. In this way, the differences will be used for learning. Thus, positive tendencies are already present for the initiation of the social learning process. However, **a *common goal* has to be created in the context of agrochemicals use in order to start a successful learning process**. It is necessary to take into account the opposition expressed by a few *emerging* farmers, which is mainly influenced by their socio-economic state.

The combination of *the high* and *optimal* dissonance is present between farmers and secondary stakeholders' knowledge regarding NRM. The *high dissonance* dominates between interviewed farmers and secondary stakeholders' knowledge, because few farmers disagree with associations and practices pointed out by secondary stakeholders in most cases. The *optimal dissonance* exists in the area of *water saving* practices. This is an essential area for collaboration between farmers and secondary stakeholders in order to maintain natural resources in the Kouga Catchment. They have a *common goal* regarding water saving and understand each other's interdependence. Therefore, the learning process regarding water resource maintenance has a potential to start. However, a *common goal* in other areas related with natural resource maintenance is not present yet. **The differences are still too high in order to successfully activate the learning process on the large scale**.

Based on these findings, several **recommendations** regarding the social learning project initiation in the Kouga Catchment can be made. Two strategies are suggested to be used in order to initiate the social learning process. First, collaboration **is recommended to be started in the context of water saving**. Stakeholders could be motivated to collaborate regarding this topic because it is a *common goal* between interviewed stakeholders. The water saving could be a potential starting point for the social learning process as it will bring stakeholders together.

Second, collaboration could be based not on the topic, but on **the groups of stakeholders concerning the types of knowledge regarding NRM**. The stakeholders whose knowledge supports the maintenance of natural resources could be placed at the centre of collaboration. Three groups of farmers based on their knowledge regarding NRM were distinguished: *emerging*, *commercial* and *alternative*. *Emerging* farmers are still far away from the understanding to maintain natural resources: they prioritize economic profit. *Commercial* farmers take the intermediate position: they are combining attention to natural resources and economic profit. *Alternative* farmers are principally devoted to the maintenance of natural resources. Secondary stakeholders form one group concerning knowledge: they are devoted to the maintenance of natural resources. Therefore, *alternative* farmers and secondary stakeholders can be placed at the centre of collaboration. *Commercial* farmers can be included as well, because the majority of them understand the importance and are trying to incorporate the maintenance of natural resources to their farming practices.

In both strategies, it could be expected to expand the collaboration into other areas and/or groups in the future. The opposing knowledge could be reduced through facilitation processes. Several secondary stakeholders expressed the certitude that a lot of farmers would adjust their behavior in case they had a deeper knowledge concerning the necessity to maintain natural resources. Therefore, the importance of facilitation in the initiation of the social learning process is stressed again.

> *"Farmers have to be forced to go to study"* (ECPTA representative, 2011)

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Appendix 1: Semi-Structured Interview

I. BACKGROUND INFORMATION

1. Could you identify your property on the map?
   - ➔ Name of the farm[38]
   - ➔ Identify land cover/features (farming area, main vegetation type, ecosystem)
   - ➔ Approx. Places is enough
   - ➔ Take GPS coordinates
2. What is the size of your farm?
3. Since how many years you are living and/or farming on this land?
4. How many generations of your family lived/farmed on this land?
   - ➔ How many years?
5. Is there someone in your family who can take over the ownership of your land after you retire?
6. How many workers do you employ?
   - ➔ Understand his role of importance in the area

II. LAND USES

7. What do you farm (land uses)?
   - 7.1. How many ha each type of land use covers?
   - 7.2. How many years this type of land uses is on practice?
   - 7.3. Please rank the most economic important land uses.
8. Are there any reasons why you have to apply **fertilizers/pesticides**?
   - 8.1. If yes, how much/ how frequently are you using this fertilizers/pesticides?
   - 8.2. What kind of fertilizers/pesticides are you using?
   - 8.3. Please explain why are you using them? What is the impact on the land?
9. If there is anything else you could tell us about how you manage your farm (**alternative practices** = environmentally friendly)?
   - ➔ Please explain your motivation to use "alternative practices" and their impact on the farming
10. Have you always been farming like this or were there any changes in your farming practices? And why farming like this or why you had to change?
11. When are you harvesting? Is it always in the same time? Is the area which is more productive? For what reason this area is more productive? (What is important for the production of your products? And why?)
    - ➔ specific insects, soil structure, water availability, quantity etc.
12. Do you have a constant yield over the years? What causes the changes?

[38] Text after arrows mainly served as indication for researcher where the talk has to be guided and/or what it is necessary to know.

III. CHALLENGES

13. What are the main challenges/issues regarding your farming practices?
    - ➔ Could be anything but focus on the environmental issues, but socio-economic aspects are taken into account for later analyses
    - ➔ Rank at least 3 the main important ones

    13.1.What is, according to you, the biggest issue in the Kouga Catchment area?
14. Do you know the **causes** of these issues?
    - ➔ Explain the system, he might talk about ecological processes, linkages etc
15. Can you explain the **impact** of these issues on your land? (farming management, land cover, ecosystem)
16. Is this a new issue, or was it always a problem? Changes over time?
    - ➔ Maybe ask about climate change? (Scientist talk about climate change in terms of more extreme events like flood and drought, did you experience this events in your area?)
17. How do you **deal with it**? What are you doing to address these challenges?

    17.1. What kind of help/support do you need to solve these issues? (Future aspect included)

    → F.e. alien clearing (WfW), more pesticides, different species for production, collaboration with other stakeholders, organizations, subsidies, restoration and conservation.
18. Who are the **key individuals or organizations** with whom you have collaborated on (environmental) issues that you are facing during the last three years?

    18.1. What are the key individuals or organizations with whom you need to collaborate in order to solve these issues?

IV. STATE OF THE LAND (HEALTH)

19. Do you consider that your farmland is **healthy** at the moment?
    - ➔ Degradation on the land?
    - ➔ Water, soil, vegetation, animals
    - ➔ Ask about water quality, where he get his water from, how they store the water
20. How do you measure/test/see whether your land is healthy? (degradated?)
    - ➔ Note down what **indicators** he used
    - ➔ Ask to describe the area (biodiversity in the area, or hotspot, or other special attributes)
    - ➔ Identify on the map
21. What are you **doing in order to keep your land healthy**?
    - ➔ I mean his experience with environmentally friendly farming practices/reduced impact to the environment in the farming practices. → Reduced pesticides, Reduced chemical fertilizers, Water saving practices, Fire control practices, Conservation practices, Alien clearing practices (black wattle)

    21.1 In case (s)he is interested, ask from where information/knowledge came from?
22. Who are the **key individuals or organizations** with whom you have collaborated/collaborating on keeping your land healthy during the last three years?

    → In case he is doing this

22.1.Who are the key individuals or organizations with whom you wish to collaborate in order to keep your land healthy?

23. Scientist call this area part of the cape floral region with his high variety of different plant and animals (**biodiversity**) but what does actually mean for the area and for your farming? Any benefits out of it?

    23.1.Or specific plants or pest control important for you? If yes, why are these things important or why not important?

    23.2.Are there any important species that have disappeared or appeared in the area? Do you know what´s the reason for that? (If he knows something about migratory birds and crop pollination?)

V. RELATIONSHIP WITH THE LAND, POTENTIAL & INVOLVEMENT TO SUSTAINABLE NRM

24. What is your **motivation** to manage the land in the way that you do? What responsibilities do you feel you have with your land? (in order to keep it healthy)
25. What are your personal **objectives** regarding land management?

    25.1. What do you want to achieve on or with your land? Do you have some personal plans regarding your farm?
26. Do you see any other **potential** in your land /the Kouga Catchment?
    - ➔ Tourism, honeybush tea production... (Why should tourist visit the area?)
27. What should be done to improve this potential?
    - ➔ Communication, collaboration, subsidies, information, restoration, conservation...
28. In my thesis research I am interested in **sustainable** natural resource management. It is a general concept, but what does actually mean for you? (in your farming context)
    - ➔ What do you consider sustainable?
    - ➔ Some might say something that relates to just their farm, others might think about the whole area.
29. What is your experience in **maintaining the health of your land and keeping the economic profit**?
30. Do you need to meet particular **standards** regarding your farming (production) inside and/or outside South Africa?
    - ➔ Legislation, environmental standards

    30.1 In case you are exporting to foreign markets, what king of standards do you have to meet (attention to environmental standards)? What kind of standards?
    - ➔ Subscription to any certification requirement, (e.g. fair-trade)?

VI. SOCIAL NETWORKS/RELATIONSHIPS

- ➔ Main questions already covered in previous part [18 & 22]. Possibility to summarize.

31. How often and where do you meet your neighbors or the other farmers?
32. What are your relationships with the neighbors?
33. Are you a member of any local farming/business/local organizations?

    33.1. If yes, how often are you involved in activities within these organizations?

Appendix 2: Questionnaire

Interview date: _____

Interview location: _____

Please mark the suitable boxes

1. Some questions about the area, your land and your farming practices:

	No	Sometimes	Yes
1.1. Are you aware of any alien plants occurring on your land and/or the Kouga Catchment area?			
1.2. Are you concerned about the fires occurring on your land and/or the Kouga Catchment area?			
1.3. Are you concerned about water issues on your land and/or the Kouga Catchment area?			
1.4. Are you aware about soil erosion on your land and/or the Kouga Catchment area?			
1.5. Are you aware of impact of climate change?			
1.6. Are you aware what kind of plant and/or animal species exists on your land and/or the Kouga Catchment area?			
1.7. Are you aware about conservation and/or restoration activities on your land and/or the Kouga Catchment area?			
1.8. Are you watching programs, reading newspapers related with environmental issues?			

2. We have heard that farmers and land owners are currently experiencing several challenges. Do any of these challenges have an impact to you, and to what extent?

Challenges:	Impact				
	Never	**Not often**	**Neutral**	**Often**	**Always**
2.1. Alien plants					
2.2. Fires					
2.3. Water shortages					
2.4. Flood events					
2.5. Soil erosion					
2.6. Climate change					
2.7. Loss of plant and animal					

diversity					
2.8. Other: _____					

3. How do you deal with these challenges?

	No	Sometimes	Yes
3.1. I am involved in alien plants clearing or I was involved in the last 3 years			
3.2. In case alien plants were removed from my property, my aim is to maintain this situation			
3.3. I am a member of fire protection association or similar initiative			
3.4. I apply water saving practices			
3.5. I reduce the amount of chemical pesticides and fertilizers			
3.6. I undertake nature conservation and/or restoration activities on my land			
3.7. I protect wildlife, indigenous birds, endemic plant species			
3.8. I do not kill caracal, jackal and leopard if they venture on my land			
3.9. I talk with others about the environmental problems on my land and/or in the Kouga Catchment area			
3.10. I recycle waste (for example, paper, plastic)			
3.11. I buy organic, fair trade or local products			

4. Next up are some questions on if you would like to be part of a number of initiatives?

	Degree				
	Never	**Not often**	**Neutral**	**Often**	**Always**
4.1. I would be interested to find out how to improve the health of my land[39]					
4.2. I would like to share my knowledge about it					
4.3. I would like to remove alien plants from my land					
4.4. I would like to join fire protection association					
4.5. I would like to introduce water saving practices					

[39] The health of the land could be improved by these practices: (1) reduction of chemical pesticides and fertilisers use, (2) water saving, (3) fire control, (4) plants and animals protection, (5) conservation and/or restoration.

4.6. I would like to reduce my chemical input on the land					
4.7. I would like to participate in nature conservation and/or restoration activities					
4.8. I would be interested to find out non-lethal approaches to managing caracal, jackal and leopard					
4.9. I would like to meet other farmers and/or organization to discuss environmental issues					

5. What are your views on the following choices/dilemmas?

	Degree				
	Never	**Not often**	**Neutral**	**Often**	**Always**
5.1. I would consider to change a certain farming practice, if there is an alternative which improves the health of the land[40]					
5.2. I would change a certain farming practice to a practice which improves the health of the land, if my livelihood could be assured					
5.3. I would consider adopting practices which improves the health of the land, even if they reduced my production, without receiving any compensation					
5.4. I would like to take a practice which improves the health of the land, if offered appropriate incentives[41]					

6. Please indicate people who you feel are respected and influential in your community:

Name and surname (Rank 1 for the highest influence)	**Why is (s)he influential?**	**Contact details**
6.1.		
6.2.		
6.3.		

[40] Practices which improve the health of the land could be: (1) reduction of chemical pesticides and fertilisers use, (2) water saving, (3) fire control, (4) plants and animals protection, (5) conservation and/or restoration.

[41] Subsidies; tax rebate; access to a support network of like-minded farmers, land owners and/or organizations; extension officer support; access to scientific information and support; assuredness that your land stays healthy in the long term perspective.

6.4.		
6.5.		

Personal information

7. Name(s) and surname: _____
8. Property name(s) and location: _____
9. E-mail: _____
10. Tel/Cell:_____
11. What language do you primarily use at home?

English	Afrikaans	Xhosa	Zulu	Other

12. What language is primarily used with farm staff?

English	Afrikaans	Xhosa	Zulu	Other

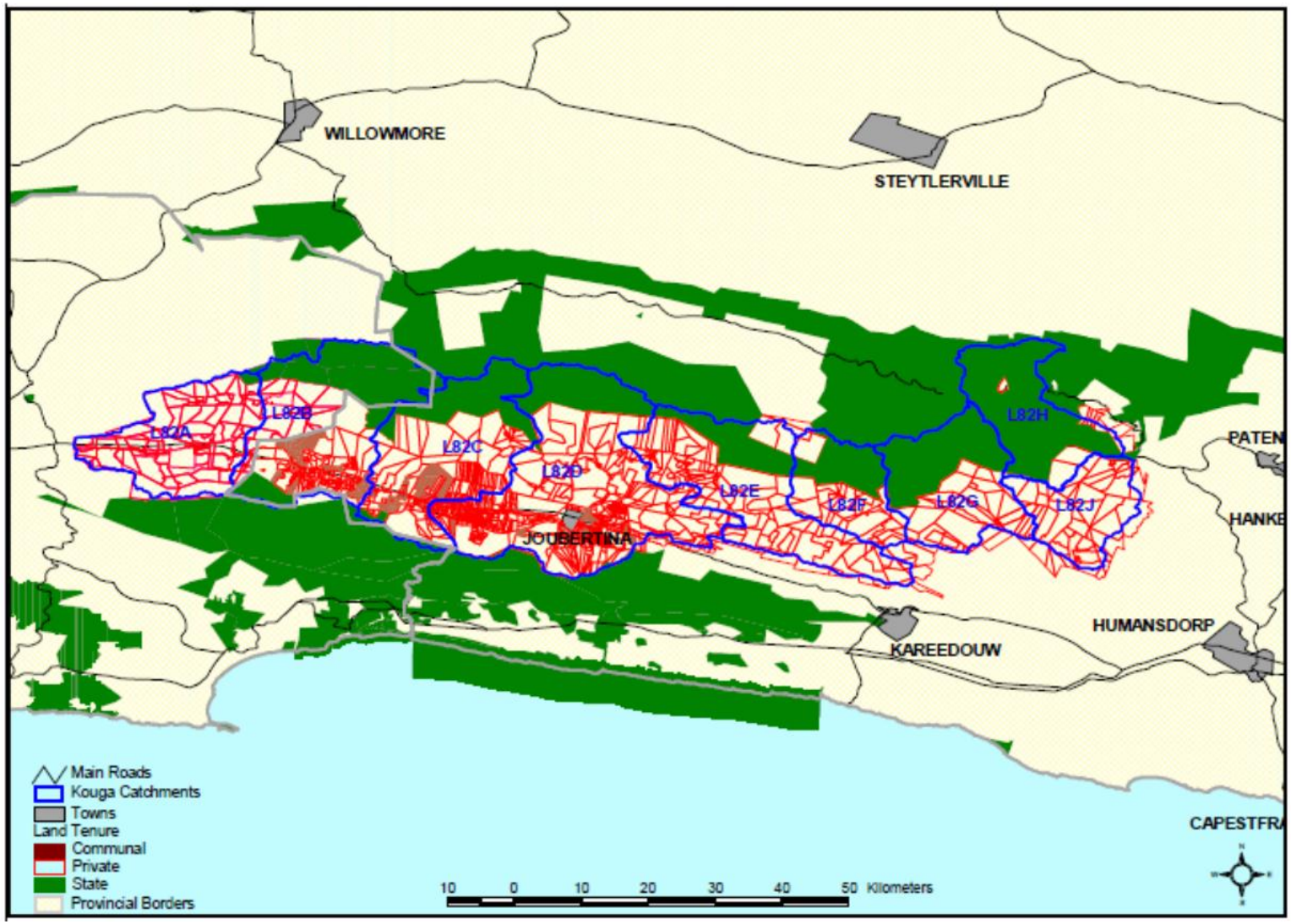
13. Marital status:

Single	Married	Separated or divorced	Widowed	Other (please specify)

14. Level of education completed:

High school	Diploma	Full degree	Post-graduate diploma	MSc degree	PhD degree	Other: _____

Appendix 3: Land Tenure in the Kouga Catchment (Powell and Mander, 2009)



Appendix 4: Interviewed Farmers Division by Farming Practices

Farming practice	Number of interviewed farmers	Letter referring to a particular interview
Fruit	15	a, b, c, d, e ,f, g, h, i, j, k, l, m, n, o
Livestock	4	a, b c, d
Mixed	3	a, b, c
Honey bush	1	-
Essential oil	1	-
Landowner	1	-

Interviews were held from November to December 2011.

Appendix 5: Interviewed Secondary Stakeholders and their Role Specification

Secondary stakeholder	Organization	Role	Interview Date
1. Governmental-Environmental	GIB	C.E.O.	30/09/2011
2. Governmental-Environmental	GIB	Area Manager: WfW projects	04/10/2011
3. Governmental-Environmental	GIB	WfW manager in the Kouga Catchment area	05/12/2011
4. Governmental-Environmental	ECPTA	Manager: Biodiversity Stewardship Programme	06/10/2011
5. Governmental-Environmental	ECPTA	Regional manager: West	07/10/2011
6. Governmental-Environmental	ECPTA	Ecologist: Baviaanskloof	07/10/2011
7. Governmental-Environmental	E2A Corridor Initiative	Langkloof Project Coordinator E2A Corridor Initiative	29/09/2011, 29/11/2011
8. Governmental-Social	DAFF	Extension officer	29/09/2011, 26/10/2011
9. Governmental-Social	Koukamma municipality	Disaster manager	26/10/2011
10. Environmental-Social	Church	Pastor of the Dutch reform church	24/11/2011