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Environmental Sustainability Through Participatory Approaches: Socio-geographic assessment of the Mathenjwa Tribal Authority Landscape, Northern KwaZulu-Natal.

by

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Submitted in partial fulfilment of the requirements for the degree of Masters of Arts (Geography) in the Faculty of Humanities, University of Pretoria.

Centre of Environmental Studies

Department of Geography, Geoinformatics and Meteorology (GGM)

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Pretoria 0002

Republic of South Africa

2013

DECLARATION

I declare that the dissertation, which I hereby submit for the degree Masters of the Arts (Geography) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

DISCLAIMER

This dissertation consists of chapters, some of which have been prepared for submission in a range of academic journals. As a result, styles may vary between chapters in the dissertation and overlap may occur to secure publishable entities. To ensure readability an overall reference list is added at the end of the dissertation.

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ABSTRACT

Development, environmental sustainability, agriculture and livelihoods are dimensions that are often considered antagonistic. By thinking at the landscape level however, innovative opportunities arise for simultaneity as these entities manifest spatially and require communication across disciplines. Trans-frontier Conservation Areas (TFCAs) embrace this thinking. These are large areas that cut across two or more international boundaries, include within them at least one Protected Area (PA) and other multiple resource use areas, including human dwellings and cultivated areas. Similarly, ecoagriculture is an innovative approach to land use management as it seeks to spatially synergise agriculture, livelihoods and biodiversity conservation across space and requires an awareness of landscape-level issues by land users, a condition which is not necessarily met. Such landscape thinking stems from the fact that if a piece of land is subject to rigorous conservation, it will fail if the surrounding areas are degraded. Additionally, it has been shown that agriculture often benefits from the nearby presence of natural areas for ecosystem services such as pollination, pest management, and erosion control. As such, multifunctional landscape mosaics together with small scale farmers, not large scale monocultures, are the key to global food security, as the former more effectively links agricultural intensification to hunger reduction. In order to ascertain an integrated understanding of the landscape concept, necessary for the formalisation of ecoagriculture, this study assessed the landscape perceptions and understandings held by local people residing within a TFCA. We employed participatory methods within the Mathenjwa Tribal Area (MTA), an area falling within the Lubombo TFCA and identified as holding ecoagriculture potential. Results revealed that local people perceive landscape as a function of subsistence utility. Local people perceive land-use multifunctionality, necessary for the formalisation of ecoagriculture, but at a smaller scale than expected depending on both social and biophysical interpretations. Landscape scale projects should incorporate local landscape understandings.

Key Words: Landscape, simultaneity, multifunctionality, Ecoagriculture, participatory approaches, social groups, agro-ecological zones, South Africa, Transfrontier Conservation Area, transect walk, photo-elicitation.

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Chapter 1

Introduction

Within the context of today's environmental crisis, farming is often no longer analysed independently from its relationships with the surrounding environment but is rather perceived as only one component of larger landscape (Dale and Polasky 2007, Swinton et al. 2007). Agricultural landscapes, including rangelands, cover approximately 40% of the earth's land surface (Gordon, 2010). Studies reveal that the impacts of the interaction between humans and the surrounding landscape are felt beyond the spatial limits of these farms (Sanderson *et al.* 2002). As such, this dissertation holds the concept of "agricultural landscape" as the central focus. The term 'landscape' is a geographical construct that includes many components including biophysical, socioeconomic and cultural aspects simultaneously. Consequently it is a challenge for any landscape to be fully functional across all of these dimensions (Sayer *et al.,* 2007; Wiggering *et al.,* 2003). At the centre of agricultural landscape sustainability is the effective combination of biodiversity conservation, agricultural production and economic development, making such landscapes actual "social-ecological systems" as they cater for a vast array of functions. This is achieved by focussing on complimentary attributes of landscape (Walker *et al.* 2004). Such social-ecological systems would depend heavily on ecosystem services. These are the numerous essential benefits that humans gain from the processes and functions of ecosystems such as the provision of food, water and other natural commodities. They also can be regulating services, aesthetical and spiritual in nature (Millennium Ecosystem Assessment, 2005). According to the Millennium Ecosystem Assessment (2005), ecosystem services are declining in nature and urgent innovation is required to secure their supply.

Landscapes are not complete in themselves as they are inseparable from human beings and their perceptions (Greider and Garkovich, 1994). This has opened up many discussions concerning the interpretation of landscape across human and natural sciences (Tress *et al.*, 2001). Heemskerk *et al.* (2003) suggested that an interdisciplinary approach is required between social and natural scientists when investigating these social-ecological systems and their multifunctionality.

Greider and Garkovich (1994) argued that landscapes are socially constructed as humans confer meaning onto the environment. Therefore landscapes reflect the cultural identities of those who act upon it. Contrasting this viewpoint, Stedman (2003) argues that the physical environment forms the base for social constructions to occur as they are not exclusively social. Thus two broad points of observation emerge; the social constructionists and the realist viewpoints. Tensions between these divergent viewpoints have resulted in a third possible observation point; one that situates humans as agents that can move freely between these two points of observation through freedom of thought (Gross, 2001).

Tress and Tress (2001) interpreted landscape as a multiple system concept within the research context. This system encompasses five elements:

1. Landscape as a spatial entity
2. Landscape as a mental entity
3. Landscape as a temporal dimension
4. Landscape as a nexus of nature and culture
5. Landscape as a complex system.

Tress and Tress (2001) explain that the first two dimensions of landscape (spatial and mental entities) are connected. This is because people use their minds to respond to spatial environments. The human mind, in turn, is situated within cultural contexts leaving a corresponding perception surrounding their spatial environment. This results in a dualistic process between individuals and the landscape. This process unfolds over time (temporal dimension) as landscapes are dynamic. Landscapes are the meeting points between people and their environment both of which have a tangible influence upon the other. This occurs at the nexus of nature and culture. Finally, all of the above landscape dimensions combine to form a complex system.

Due to the multidimensional characteristic of landscape this study incorporated participatory methods with the aim of uncovering unique local understandings of landscape from the bottom-up. This is based on the premise that local people have their own values and norms through which they view the landscape. These unique understandings of landscape provide vital knowledge for the management of the landscape and environmental sustainability. Research into the socio-environmental field has increasingly embraced bottom – up approaches that encourage participation (Chambers, 2006). Public participation has been defined as, "the involvement by a local population and, at times additional stakeholders in the creation, content and conduct of a program or policy designed to change their lives. This is built on a belief that citizens can be trusted to shape their own future through local decision making" (Jennings, 2000, p.1). Participatory research has become increasingly important in the agricultural domain as it has been recognised that farmers in developing countries do not carry sufficient voice in the political decision making agenda due to lack of communication infrastructure, low literacy levels and remote locations. Here participation becomes is vital to ensure agricultural innovation and new technologies are embraced by all (Farrington, 1989).

Agricultural landscapes are inextricably linked to rural livelihoods. Diverse land-based strategies such as arable farming, animal husbandry as well as consumption and trade in natural resources are vital for the majority of rural people even in light of remittances and social grants (Beeton and Lynch, 2012; Shackleton *et al.,* 2001). Moreover livelihoods and conservation were viewed as interconnected entities that exist upon the landscape resulting in unique landscape understandings. Nakashima *et al.* (2000) explain that communities around the world have developed rich sets of interpretations of the natural environment they are surrounded by resulting in local knowledge. Therefore landscape based initiatives within rural areas are strongly linked to livelihood improvement.

According to the Peace Parks Foundation (2011) Transfrontier Conservation Areas (TFCAs) are multiple resource use areas that cross over two or more international boundaries, include large natural systems and two or more Protected Areas (PAs). At this regional scale, objectives such as economic development, biodiversity conservation and regional cooperation become more feasible whilst addressing the sustainability and legitimacy issues created through traditional approaches to biodiversity conservation. As such mutual "nature-society hybrids" have been created (Brandon *et al.,*1998; Neumann, 2004) as TFCAs extend beyond PAs alone and incorporate the developmental needs of the entire region. Now, local communities are incentivized to conserve biophysical resources as they are incorporated into the benefits and payments that are derived from such utilization (Jones, 2005).

The combination of objectives at a landscape scale is also the framework of ecoagriculture. Scherr and McNeely (2008) explain that ecoagriculture occurs when agriculture, biodiversity conservation and rural livelihoods are integrated at landscape level. Under such conditions landscape can be effectively managed to synergise the benefits of agriculture, conservation and rural development in order uplift livelihoods through a landscape milieu of agriculturally productive areas amongst natural areas. This is unique as conventional knowledge suggests that increased agricultural land will inevitably lead to the degradation of the local ecosystem as land gets cleared and utilized. Thinking at a landscape level, however, reveals an opportunity for effective management whereby the landscape structure and function is managed for increased food production without negatively impacting natural flora and fauna (Torquebiau *et al.,* 2012). Furthermore Ecoagriculture Partners (2008) consider local communities as the "stewards of ecosystems." An example is the San Luis Valley, Costa Rica where local coffee, corn and sugar cane production is boosted by the nearby presence of high biodiversity areas. A nearby cloudforest reserve provides important ecosystem services as well as ecotourism facilities. Here livelihoods, ecosystems and agriculture are simultaneously enhanced (Ecoagriculture Partners, 2008).

As local communities are treated as "stewards of ecosystems" with the ecoagriculture framework their perceptions and understanding of landscape is pivotal. We selected the community of the Mathenjwa Tribal Authority (MTA) landscape, Northern KwaZulu-Natal, South Africa and aimed to assess the local understandings of landscape from the bottom-up. The MTA landscape was set aside during the apartheid regime as a rural homeland. Today it falls within the Lubombo Transfrontier Conservation Area (TFCA). The area is a lush and fruitful mix of natural (yet unprotected) ecosystems and rural agriculture thus creating a high potential for elements of ecoagriculture. Nineteen per cent of this landscape is covered by the Usuthu Gorge Community Conservancy Area (UGCCA), a PA under community supervision. The MTA lies adjacent to the Ndumu Game Reserve, an area formally protected by the provincial government. Here, a rural community resides who depend on a combination of subsistence living, social grants and farm sales. Nearly all of the people own vegetable gardens as well as maize fields to supplement their diets. Many people own livestock that graze upon the hilly terrain. For these reasons the area has been identified as an informal ecoagriculture landscape with a high potential for ecoagriculture to uplift livelihoods (Chitakira and Torquebiau, 2010, Torquebiau *et al.,* 2012).

Accordingly the overall aims of this dissertation are to:

- To employ participatory methods in order to unveil, from the bottom up, how local people understand their landscape.
- To reveal which components of the landscape are perceived as most vital for livelihoods at a local level.
- Assess these landscape understandings against the notion of landscape held by ecoagriculture as defined by Scherr and McNeely (2008) and Ecoagriculture Partners (2008) as to understand the local feasibility of ecoagriculture from the bottom up.
- Unveil the differences in local landscape understandings within the MTA across special, gender and age groups.

In line with these overall aims chapter 2 employs a transect walk methodology aimed at discovering local landscape perceptions. These specific units were then employed in a statistical comparative analysis unveiling further insights into the local perceptions of landscape. Chapter 3 is a study of a photo-elicitation exercise together with a photograph ranking statistical comparative analysis. Both chapters employ qualitative and quantitative methods in order to unveil bottom-up information concerning this landscape.

The study forms a part of the encompassing Lubombo Project. This project was founded by CIRAD and the Centre for Environmental Studies (CFES) at the University of Pretoria with the primary aim of "biodiversity enhancement through sustainable livelihoods" within the Lubombo TFCA. Within this framework the project seeks to find innovative solutions to combine agriculture, biodiversity conservation and sustainable livelihoods in order to ensure an effective social-ecological system (Cholet, 2010). The Lubombo Project is the umbrella project that has incorporated various other participatory studies at Masters and PhD levels that assess the landscape and potential of ecoagriculture within the MTA. A few of these studies include a participatory landscape performance assessment (Chitakira *et al.*, 2010), the assessment of community future visions regarding their landscape (Chitakira *et al.,* 2012), and the feasibility study of ecoagriculture landscape labelling (Cholet, 2010).

Chapter2

The importance of local perceptions of landscape for the implementation of ecoagriculture in a Southern African Transfrontier Conservation Area

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Abstract

Ecoagriculture represents an innovative solution for synergy among agricultural production, livelihoods and nature conservation, achievable at landscape scale whilst requiring an awareness of local landscape-level issues. We uncovered the landscape perceptions of subsistence farmers in a Transfrontier Conservation Area in Southern Africa. Comparative analyses provided an integrated landscape understanding, revealing differences in perceptions among geographical areas rather than among social groups. Farmers are deeply aware of the importance of landscape-level characteristics for their livelihoods but perceive land-use multi-functionality at a much smaller scale than expected, shaped by both social and biophysical criteria. Ecoagriculture is likely to enhance livelihoods because of the pre-existing perception of landscape multi-functionality. Landscape scale projects such as ecoagriculture should only be pursued with prior analyses of local understandings of landscape and relevant scales.

Keywords: simultaneity, bottom-up, ecoagriculture, social groups, agro-ecological zone.

1. Introduction

Innovative solutions are necessary to address the challenges of population growth, food security and environmental sustainability (World Health Organisation, 2005). This requires simultaneity and synergy between both the social and biophysical dimensions (Heemskerk *et al.* 2003). Although formal Protected Areas (PAs) remain crucial for the conservation of global biodiversity (Persha *et al.,* 2010); conservation objectives cannot be reached within the spatial limits of PAs only (Lindenmayer *et al*. 2008).

This has become one of the many reasons why conservation management has changed from centralised decision making towards inclusive decision making, engaging communities and stakeholders as resource users (Lele *et al.* 2010, Bϋscher and Dressler, 2010). This requires the simultaneous integration of social and biophysical viewpoints to discover new solutions. Such simultaneity of objectives can be realized at the landscape scale, i.e. at spatial configurations beyond the size of a field or a farm. The term “landscape,” is a geographical construct with components that meet biophysical, socioeconomic and cultural needs. It is a challenge for any landscape to be fully functional across all these dimensions (Sayer*et al.* 2007; Wiggering *et al.* 2003) as it requires interaction among various disciplines. A recent development embracing this thinking is Transfrontier Conservation Areas (TFCAs), defined as large areas crossing two or more international boundaries, including at least one PA and other multiple resource use areas (Peace Parks, 2011). These areas aim to initiate landscape simultaneity through objectives such as sustainable utilization of biodiversity and cultural resources whilst fostering regional socio-economic development (Sandwith*et al.* 2001, Smith *et al.* 2008).

The simultaneity between nature conservation and agricultural production at a landscape scale can materialize in the form of multipurpose landscape mosaics. McNeely and Scherr (2003) coined such landscapes as "ecoagriculture" landscapes. This is an approach integrates agriculture (including forestry, agroforestry, grazing lands, etc.), biodiversity conservation and rural livelihoods through a mosaic landscape structure (McNeely and Scherr, 2003; Scherr and McNeely, 2008) and requires the collaboration of many stakeholders (Ecoagriculture Partners, 2008).

Scherr and McNeely (2008) further functionalise an ecoagriculture landscape through the inclusion of the following dimensions:

- Natural areas that provide essential ecosystem synergies with agriculture and rural livelihoods.
- Agricultural production areas that meet livelihood, food security and market needs whilst having a positive relationship with surrounding ecosystem services.
- Institutional mechanisms that support the synergies of agricultural production and conservation at a landscape scale.

The benefits of biodiversity conservation and agricultural production can reciprocate at landscape scale for ecosystem services such as pollination, pest control and other ecosystem services resulting in improved livelihoods (Perfecto *et al.* 2009; Scherr and McNeely, 2008). This is especially pertinent since small scale farmers and not large scale monocultures can enhance local food security as the former more effectively links agricultural intensification to hunger reduction (Tscharntke*et al.* 2012, Horlings and

Marsdin, 2011; Chappell and Lavalle, 2011). TFCAs and ecoagriculture thus share a common objective: the aim of achieving landscape scale multi-functionality.

Natori and Chenoweth (2008) assessed rural landscape perceptions of farmers and naturalists in rural areas of Japan in the light of improving conservation strategies due to changing socio-economic circumstances. They found that conservation strategies need to consider these perceptions, especially concerning the intensification of rice paddies.

Ecoagriculture views local resource users as “stewards of ecosystems” (Ecoagriculture Partners, 2008; Scherr and Mcneely, 2008) making their conception of the term “landscape” a starting point. In South Africa, biodiversity conservation initiatives are hampered by top-down beliefs such as the “tragedy of the commons” paradigm (Hardin, 1968). In reality, however, local collective norms exist that ensure the sustainability of natural resources (Allsopp *et al.* 2007; Ostrom, 1990). Collaborative efforts are required to reconcile local conceptions of landscape in order to achieve integrated understandings of landscape multi-functionality as no single solution exists for socio-environmental problems (Ostrom, 1990) especially within the rural African context of poverty, climate change and population growth.

In order to assess whether ecoagriculture can be deliberately fostered within a TFCA, we analysed the way people who live in a TFCA perceive their landscape. We selected a specific area in Northern KwaZulu-Natal, South Africa, known as the Mathenjwa Tribal Authority (MTA) as an example of an area holding ecoagriculture potential (Torquebiau *et al.* 2012) and being part of the Lubombo TFCA, a transfrontier initiative connecting South Africa with equivalent areas in Swaziland and Mozambique.

Typically, this rural area is a blend of farmed and untransformed areas, either protected or not. We aimed to assess local communities' discernment of the landscape concept by employing participatory transect walks with the farmers themselves. A transect walk is a method that shows the spatial arrangement of land features and relevant issues along a given route (Alagad, 2009). Here the farmers planned their own route through the landscape in order to unveil subjectively significant understandings of the concept of landscape. Results of the transect walks were used in comparative analyses across social groups and agro-ecological zones in order evaluate its consistency with notions of ecoagriculture. This was achieved by comparing the results of this study with the framework of ecoagriculture (following Ecoagriculture Partners, 2008) and Scherr and Mcneely's (2008) definition of ecoagriculture landscapes.

In order to make this comparison we asked the following questions:

- How do people's perception of the landscape compare with equivalent ecoagriculture definitions as defined by Scherr and McNeely (2008) and Ecoagriculture Partners (2008)?
- What is local people's perception of the concept of landscape?
- What causes these perceptions?
- What components of the landscape are considered important within local perceptions?
- How do these perceptions differ among social groups and agro-ecological zones of the study site?

2. Materials and methods

2.1. Study site

The MTA Landscape falls in the northernmost reaches of the KwaZulu-Natal Province of South Africa (26°48'S to 26°54'S; and 32°00'E to 32°09'E). The area has been characterized climatically as having "hot rainy summers" and "warm dry winters" (Earle, 1979). Mean annual rainfall ranges from 500mm in the eastern lower areas (100 m ASL) to 800m in the higher western areas (600 m ASL) (Torquebiau *et al.,* 2012). The area has been identified as having a low potential for agriculture, especially in the lower, eastern areas due to low rainfall and high annual evaporation potential (Mucina and Rutherford, 2006; Jozini Local Municipality, 2011). The total area of the MTA landscape is 547 km^2. Nineteen per cent of this area is covered by the Usuthu Gorge Community Conservancy Area (UGCCA, Figure 1), a protected area under local community management. The area borders the Ndumu Game Reserve, a provincial protected area.

The vegetation of the area is mixed savanna, woodland and grassland biome (Earle, 1979; Mucina and Rutherford, 2006). The lower, eastern reaches of the landscape has mixed deciduous woodland vegetation with the higher areas being more forested, especially in the deep valleys. The area falls within the Maputaland Pondoland Albany biodiversity hotspot (Conservation International, 2012) and hosts many endemic and vulnerable flora species (Mucina and Rutherford, 2006). In 2000, the governments of South Africa, Swaziland and Mozambique signed a tri-lateral agreement for the creation of the Lubombo TFCA, including the MTA (Peace Parks, 2011).

For this study, the landscape was divided into three agro-ecological zones, following earlier studies (Chitakira *et al.*2012) (Figure 1) and based on altitude, climatic, social and biophysical features of the area, with each of these displaying unique features for comparative analysis. The lower zone (below approximately 150 m ASL) is a low lying plain, the middle zone (approximately 350 m ASL) is a rugged mountainous area and the upper zone (above 550 m ASL) is a plateau.

[Figure 1 near here]

The area has experienced socioeconomic transformations linked to its political history and spatial isolation (Kloppers, 2004) resulting in a population of sedentary famers, some of whom still own cattle (Torquebiau *et al*. 2012). The local municipality (Jozini) Integrated Development Plan (2011 -2012) recognises that the area lacks access to basic institutional support such as roads and electricity needed for development. Ninety per cent of the population is economically inactive resulting in household food insecurity. These communities have a high dependence on cultivation and natural resource collection whilst being subsidised by government social grants. The area has been isolated from conventional agriculture. Consequently, most people practice small scale farming amongst natural areas, resulting in a spatial milieu of land-use (Torquebiau *et al*. 2012). This suggests that landscape scale projects that simultaneously combine agricultural strategies with the surrounding biodiversity at a landscape scale have the potential to improve living standards.

2.2. Methods

Due to the bottom-up nature of this study participatory methods were used. Such an approach has become increasingly important within the agriculture and the sustainability agendas (Chambers, 2006).

2.2.1. Transect walks

A transect walk is a method that shows the spatial arrangement of land features and relevant issues along a given route (DFID *et al.* 2008). Prior to this process the researcher and translator explained to a participant that the aim of this methodology was to understand the concept of landscape according to local conceptions without the influence of any hegemonic views of landscape. The participant was then asked to determine the route of the transect walk in order to identify subjective significant areas or components of the landscape and to discuss them accordingly. During a transect walk a participant was free to consider any element that he/she considered as "landscape", thus allowing the local conceptions of landscape to emerge. Thus landscape components were unveiled by the participant without hindrance or influence from the researcher's notion of landscape. Across the study site eleven participants embarked upon these transect walks (Lower agro-ecological zone n = 4; Middle agro-ecological zone n = 4; Upper agro-ecological zone n = 3). Participants selected were local land users who had grown up in the study site. This is judgemental sampling based on the prior knowledge that the area holds ecoagriculture potential and is inhabited by small-scale farmers who share a relationship with the surrounding landscape (Torquebiau *et al.* 2012). Participants were not exposed to the results of other transect walks ensuring individual landscape perceptions to emerge.

Within each transect walk discussions about each subjectively identified landscape component included the strengths, weaknesses, opportunities and threats to the landscape component (SWOT analysis). These discussions occurred at the very landscape component identified by the participant in order to ensure the richness of the subjective data. Numerous notes were taken by the researcher along the walk as the participant discussed various aspects of the landscape within and additional to the SWOT analysis framework. Many landscape components and additional observations would not have been discovered if the researcher and the participant did not embark on these walks. Within this study outputs of transect walks can easily be transcribed in the form of drawn profile diagrams (Narayanasamy, 2009).

2.2.2. Individual ranking exercise

This method was quantitative and designed to enrich the transect walks. Prominent landscape components that emerged from the transect walks were arranged on an interview sheet. Participants ranked the importance of each landscape component on a 0 to 5 scale, where 0 represented non-importance and 5 a maximum importance. Individual respondents (*n*=116) were categorised according to both social group and agro-ecological zone for comparative purposes. This resulted in sample sizes of 28 - 30 participants across social groups and 37 – 40 across agro-ecological zones. Mean scores were calculated for each group. Social groups identified for this study are younger men (<30 y of age), older men (>=30 y of age), younger women and older women. This classification was used, considering the low life expectancy in South Africa (49.33 years at the time of the study) (IndexMundi, 2011). Such intergroup categorisation was chosen in order to be sensitive to alternative landscape views across these groups keeping in mind the possible differing cultural norms that exist across both gender and age roles. Agro-ecological zones were chosen based upon previous studies (Chitakira *et al.,* 2012). These areas display unique biophysical and social characteristics for comparative purposes. Individual respondents remained oblivious to the results of other individual ranking exercises.

A Kruskall-Wallis test was applied to scores of landscape components across social groups and agro-ecological zones in order to determine statistically significant differences. Landscape components that revealed significant differences were subject to a further Kruskal-Wallis multiple comparison test to identify particular agro-ecological zones or social groups that differ statistically from others.

Respondents further quantified the reasons that underlie the importance or non-importance attributed to landscape components. These are termed "causative mechanisms." Participants were asked to choose, from a list, the first 3 causative mechanisms related to why they considered an area important or not important. This list was derived from qualitative remarks suggested by transect walk participants as they raised their thoughts over landscape components. For example, a participant would suggest that vegetable production relates to the causative mechanism "health" whilst selling resources collected from natural areas related to the causative mechanism "income." The causative mechanisms selected by participants in this exercise were given a score (3 - 2 or 1) depending on the order they were chosen. These scores were turned into a percentage for comparative purposes across social groups and agro-ecological zones. Within this method participants were free to include additional landscape components or causative mechanisms according to their understanding.

3. Results

3.1 Landscape component identification and purpose

Figure 2 illustrates a typical transect walk whereby the transect walk participant would subjectively identify with areas as the representation of their perception of a significant landscape.

[Figure 2 near here]

In this example landscape components identified are:

1. Fields

2. Garden

3. River (drinking water)

4. Grazing area

5. Woodlands

6. Community Garden

7. Irrigating water

8. River reed (*Ikhwane*) area

9. Playing ground

10. Woodlands

11. Grasslands

12. Irrigating Water.

In order to highlight the perceived importance of this landscape at a local level the identified landscape units are classified into 3 main categories (following Shackleton *et al.* 2001) who shed light on the importance of landscape based strategies in rural areas above social grants and remittances:

- Arable production
- Animal husbandry
- Natural resource consumption and trade.

Table 1 categorises the landscape components identified during transect walks according to these dimensions as well as components classified as "other." Participants (n=11) identified 78 individual components across all transect walks. Different participants would identify with similar landscape components that also reveal similar land-use purposes. For example many participants identified with their personal home gardens, all suggesting a homogenous purpose (i.e. vegetable production). For this reason Table 1 represents a collective summary of the landscape components.

[Table 1 near here]

A tendency for participants to identity with proximate individual resource areas existed when considering the landscape (Table 1 and Figure 2). Out of 78 identified landscape components, 63 (81%) were individual resource areas consistent with subsistence living and Shackleton's *et al.* (2001) multiple land based strategies in rural areas. Resources from these areas ranged from food and water to building materials and livestock requirements. The remainder of the landscape components represented areas of infrastructure (e.g. water tap and sports field) and are categorised as "other" in Table 1.

3.2 Perceived Strengths and Weaknesses of Landscape Components

Table 2 summarises perceived strengths and weaknesses related to landscape components obtained through the SWOT analysis concerning each landscape component. The perceived strengths held by local people add validity to the fact that these areas are in fact indispensable for land users, even though they are not valued formally (Shackleton *et al.,* 2001). Perceived landscape weaknesses reveal shortcomings of identified landscape components from a livelihood perspective. These landscape perceptions are pertinent for consideration within landscape management initiatives. Depending on their relative perception of the area, participants did not attribute perceived strengths or weaknesses to all 78 landscape components identified in the transect walks. Across all transect walk participants, a tendency existed to identify more extensively with the weaknesses than the strengths they attribute to the landscape components.

[Table 2 near here]

3.3. Landscape component assessment

3.3.1. Assessment across age/gender groups

Table 3 shows a quantitative assessment, across social groups, of the landscape components as they attributed an importance score through the individual ranking exercise. Areas of drinking water are perceived as the most important across all social groups.

[Table 3 near here]

Except for reed areas (*Ikhwane*) there were no statistically significant differences across social groups (Table 3). Figure 3 indicates the scores across social groups for this landscape component.

[Figure 3 near here]

River reed (*Ikhwane*) areas are marshy areas containing reeds (*Cyperus latifolius*) known locally by the Zulu people as "*Ikhwane*." Even though Old ladies attributed the most importance to this landscape component, a Kruskal-Wallis multiple comparison of the scores of river reed (*Ikhwane*) areas revealed that statistically significant differences in perceived importance of this resource are age rather than gender based. No other landscape components reflected statistically significant differences across social groups suggesting a homogenous sense of land use across social groups.

3.3.2. Assessment across agro-ecological zones

Table 4 represents landscape components analysed across agro-ecological zones through the individual ranking exercise. Scores related to areas of drinking water were consistently high across agro-ecological zones (Table 4) reflecting the high perceived importance of this landscape component as was the case across social groups (Table 3).

Six landscape components revealed statistically significant differences across agro-ecological zones (Kruskal-Wallis test; Figure 4).

[Table 4 near here]

[Figure 4 near here]

Figure 4.a and 4.b show that the landscape components “playing ground” and “irrigating water” were perceived as most important in the upper agro-ecological zone. People from the lower agro-ecological zone ranked the highest importance to grazing lands, UGCCA and termite mounds (Figures 4.c; 4.d; 4.f respectively) suggesting that proximity to these resources has an impact on perceived importance. The lower zone was most endowed with these landscape components and closer to the UGCCA.

Comparisons across the lower agro-ecological zone with the middle and upper agro-ecological zones regarding the perceived importance of the landscape components “termite mound” and “building sand” represented a trade off in resource use based on proximate availability (see Figure 4.e & 4.f). These landscape component rankings relate to differences in housing construction techniques and ecosystem services in the respective zones.

Figure 4.e represents the landscape component “building sand” where it is clear the people from the lower agro-ecological zone show little or no perceived importance whilst people the from the middle and upper agro-ecological zones show a similar

moderate perceived importance resulting in the lower agro-ecological zone as an outlier in this sense. This is because people from the lower agro-ecological zone either purchase building sand from the nearby town, Ndumo or they harvest termite mounds (Figure 4.f); whilst the people from the middle and upper agro-ecological zones use building sand (clay) in order to erect houses.

3.4. Causative mechanisms attributed to landscape components.

[Figure 5 near here]

3.4.1 Reasons motivating perceived importance of landscape components

The most frequent causative mechanisms for landscape component ranking were:

- Health
- Income
- Shelter / Safety
- Social Purposes
- Cultural Purposes
- Education
- Future

This is illustrated across social groups and agro-ecological zones in Figure 5 a & b respectively. The primary perceived causative mechanism was health. Secondarily participants perceived a linkage between income and the landscape. These linkages were consistent across social groups and agro-ecological zones (Figures 5 a & b). The fact that health and income are strongly linked to the landscape reinforces the perception that the landscape components are a function of livelihood. Other causative mechanism did not show clear trends across social groups and agro-ecological zones.

3.4.2. Reasons motivating perceived non-importance of landscape components

Causative mechanisms that were linked to the perceived non-importance of all landscape components across social groups and agro-ecological zones are outlined in Figure 5 c & d respectively. These are the landscape components that participants attributed with an importance score of 0 during the individual ranking exercise.

The most frequent reasons for non-importance were:

- I do not use that area
- I have alternative strategies

- There is not enough space
- Area is too far
- Buy at the closest town

The participants perceived landscape components within their local proximity. For this reason the most prevalent causative mechanisms for landscape component non-importance across social groups was: “I have alternative strategies” (Figure 5.c.). This was due to the fact that some types of landscape components were too far away, resulting in alternative strategies within a more local proximity.

Participants hesitated to attribute non-importance toward landscape components. Consequently the percentage of these causative mechanisms is significantly lower than those associated with the importance of landscape components. Nevertheless some differences in landscape component non-importance across agro-ecological zones emerged, notably the trade-off between building sand and termite mounds between the lower agro-ecological zone against the middle and upper agro-ecological zones; both of which are used for construction purposes. This is because in 33 out of 39 participants of the individual ranking exercises from the lower agro-ecological zone attributed non-importance to building sand as a landscape component alternatively using termite mounds or purchased building sand for construction. As a result respondents from the lower agro-ecological zone are the only group to have the self-derived causative mechanism “Buy at the closest town” (Figure 5.d.). Similarly, the causative mechanism “I have alternative strategies,” most apparent in the lower agro-ecological zone, is related to termite mounds as an alternative to building sand for construction (Figure 5.d.) as this resource occurs abundantly only within this area.

4. Discussion

4.1. Understanding the landscape from the bottom-up

Alternative landscape views: The landscape components selected by the participants of the transect walks do not represent conventional (western) understandings of landscapes but rather individual resource areas on a smaller scale (Figure 2 & Table 1) that effect livelihood strategies as they are linked to the concept of health (Figure 5 a & b). Hence landscape components were identified through a sense of survival. Local dependency on these functional landscape units has therefore created this alternative conception of landscape that is not consistent with western world views of landscape (i.e. combinations of biophysical and sociocultural elements) but rather a conception of individual resource units on a reduced scale. Place dependence is the type of attachment experienced by a person with a place when the place serves a potential utility compatible with the needs of the person (Stokols and Shumaker, 1981). Therefore, local conceptions of landscape are a function of utility; the ability to provide resources to the local people with the goal of maintaining health. This utility shows that a direct use value needs to be attributed to these components of the landscape (Twine *et al.* 2003).

Adding to these alternative conceptions of landscape is the fact that there exists no word in isiZulu (the local language) for landscape. The closest word is "*umhlabathi*," meaning land, or soil. This alternative conception of landscape based on dependence unveils the marginalised state of the Mathenjwa community revealing that, as rural people, they do not rely exclusively on government support as suggested by Shackleton *et al*. (2001) but also depend on a functional landscape. Therefore landscape improvement strategies can have a direct linkage to livelihood improvement.

Nature – culture interactions: Further investigations into the landscape perceptions show that local people interpret the landscape through both social and natural viewpoints. By comparing Table 1 (perceived land-use purposes) with Table 2 (perceived strengths and weaknesses) it is clear that perceived strengths and weaknesses are a mental reaction to the corresponding physical resources associated with the purposes of landscape components. For example, agriculturally productive areas such as fields and gardens have food production and nutritional purposes derived from the physical amenity of the landscape component (Table 1). At the same time a mental reaction occurs such as the perception of rich soils, availability of irrigation water and the ability to survive (Table 2). Tress and Tress (2001 p. 147) suggest that people respond to the physical reality of landscapes with their culturally influenced minds. Stedman (2003) argues that an emphasis needs to be given to the role of the physical environment as it underpins mental constructions. Consequently, in a biologically diverse region such as the MTA it can be seen that the physical environment (landscape and resource endowment) has indeed contributed to the mental constructions.

Two poles of observation emerge in the literature. One situates meanings and interpretations (perceptions) whilst the other puts the reality of the material environment as a starting point of interpretation. The former represents the social constructionist whilst the later represents the realist point of view. These viewpoints have interactions (Gross, 2001) as nature and culture have reciprocal effects. Therefore people both shape and are shaped by the landscape (Tress and Tress, 2001 p.147).

Illustrating these reciprocal effects is the community rules regarding landscape components identified through qualitative discussion at landscape components during transect walks. For example, one rule views flowing water as strictly drinkable (upstream) or non – drinkable (downstream). Efforts are made to maintain the integrity of the drinkable water. This community collaboration represents reciprocal effects amongst people whilst the interaction with the river (washing and drinking) represents reciprocal effects between people and landscape. The simultaneous interactions of interpretations are a result of people dwelling in a resource rich landscape as well as within a strong community context; both influencing the perception of the landscape. Community rules apply to grazing lands, woodlands, grasslands and other areas in order to maintain the sustainability of these resource areas. This reveals that landscape components identified in transect walks are indeed the "nexus of nature and culture" (Tress and Tress, 2001 p.149).

These community rules support the notion of ecoagriculture that communities are "stewards of ecosystems" (Ecoagriculture Partners, 2008). Marginalized communities are often thought to degrade the sustainability of the environment, especially through communal resources (Cavendish, 2000; Hardin, 1968). However, in situations such as this, humans interact on multiple levels with ecosystems and arrange multiple institutional structures maintaining the long term sustainable utility of communal resources (Ostrom 1990). This self-regulation of natural resources is an optimistic indication that landscape scale projects can be managed at local levels and will have a direct link to livelihoods.

4.2. Local perceptions of the MTA landscape that are consistent with ecoagriculture

Landscape components, as identified across transect walk participants; correspond to the three pillars of ecoagriculture (Ecoagriculture Partners, 2008):

Enhancing Rural Livelihoods: The perceived purposes portrayed by the majority of landscape components relate to subsistence functions (Table 1) thus illustrating the overall local perceived value of the landscape as a multifunctional "safety net" for rural Southern African people suggested by Shackleton *et al.*(2001) This is validated through the perceived linkage to health (Figure 5. a & b). Scherr and McNeely (2008 p.480) suggest that, in order to uplift rural livelihoods, institutional mechanisms which support landscape synergies between conservation and agriculture need to exist. The existence of community rules (discussed in section 4.1.) whereby this community has self-mobilised in order to promote sustainability of landscape resources suggests that such mechanisms could already be in place.

Ecosystem Services: Scherr and McNeely (2008 p.480) suggest that, within ecoagriculture landscapes, "natural" areas are managed to provide support to agricultural areas and other livelihood benefits. The vast majority of landscape components (drinking water, river bed, woodlands etc.) selected by participants yield vital ecosystem services such as health derived from palatable natural water and organic vegetables from gardens and wild areas. Comments from the transect walks such as "nature supplies" and "the soil is rich in minerals" confirmed this linkage. Even without formal environmental protection the participants exposed the perceived supportive quality of biodiversity and the environment, although they do not phrase it as such and are not familiar with the concept of biodiversity; it is an important consideration for projects such as ecoagriculture; especially at scales consistent with local land practices.

Agriculture: Finally, the landscape components such as fields and gardens are perceived as consistent with agricultural systems as they provide livelihood support and food security (Scherr and McNeely, 2008 p.480). This was confirmed through comments such as "we survive with this garden" during transect walks. Participants also suggested that the grasslands surrounding these areas were a good fertiliser as cut grass could be spread above soils as a nutrient. This revealed the local perceived spatial structure of agriculturally productive areas (gardens) sharing a positive relationship with areas of high biodiversity (grasslands). This is consistent with the ecoagriculture concept of synergy between agriculturally productive and environmentally protected areas within a mosaic structure (McNeely and Scherr, 2003; Scherr and McNeely, 2008).

This perceived compatibility local landscape perceptions to ecoagriculture exists even without the knowledge of the benefits of this landscape structure such as environmentally sustainable agricultural yield (Ecoagriculture Partners, 2008; Matson *et al.* 1997; Perfecto *et al.* 2009). Therefore, together with the three "pillars" of ecoagriculture (Ecoagriculture Partners, 2008) the participants of the transect walks have shown that their landscape perception is consistent with:

- Shackleton's *et al* (2001) sectors of multiple land-use.
- Scherr and McNeely (2008) concepts of ecoagriculture (agricultural production, sustainable livelihoods and environmental protection).

The above perceived consistencies with landscape based initiatives together with the spatial arrangement of these areas (as depicted in figure 2) suggests that local people would readily grasp these landscape management concepts such as the synergy of agriculture and biodiversity across space in a landscape mosaic structure (Following Scherr and McNeely, 2008).

4.3. Implications and considerations for ecoagriculture

Perceived landscape weaknesses: Many of these weaknesses are solvable within the context of landscape management. For example, the perceived threat of free roaming livestock to agriculturally productive areas as well as clean water areas creates the need for formal, instead of traditional, fencing of fields, gardens and water holes. Alien plant species further disrupt the integrity of the woodlands and the grazing lands (Table 2). Accordingly landscape management strategies could provide solutions such as adequate fencing and biodiversity management.

Even though ecoagriculture promotes biodiversity within rural setting, it is not without externalities such as the perceived threat of snakes associated with landscape components such as grasslands and woodlands (Table 2). High biodiversity areas inevitably accommodate such fauna. These issues therefore should be addressed on different levels such as education and access to medical resources.

Differences in perceived importance across social groups: The statistical analysis of River reed (*Ikhwane)* area revealed that old people attribute the most significance to these areas of the landscape (Table 3 and Figure 3.). These reeds are used to make traditional mats known locally as "*icansi*". *Ikhwane* is a product that has been identified as a potential marketing resource with the use of existing skills and materials (Kotze *et al.,* 2000) thus creating cultural and economic benefits within communities (Nel, 2010). Zulu women are the harvesters and crafters of this resource for cultural artefacts. In contrast, younger people show a tendency to diminish cultural values tied into these areas. Nel (2010) suggests that *Ikhwane* crafting is important for the maintenance of traditional skills and practices through community based management of wetlands whereby local people derive a value form the resource hence inspiring sustainable utilisation. Therefore ecoagriculture should embrace the evidence that old women are "stewards of ecosystems" (Ecoagriculture Partners, 2008) concerning this resource.

Differences in perceived importance across agro-ecological zones: Six landscape components revealed statistical differences in perceived importance across agro-ecological zones compared to one landscape component across social groups (Tables 3 & 4). Differences of perceived importance of landscape components are therefore more spatially than socially based suggesting a heterogeneous array of land-based strategies exist across agro-ecological zones as people react to local resource endowment, as suggested by the results of the transect walks (Figure 2). For example, the landscape component "Termite mound" exists only in the lower agro-ecological zone resulting in its utilization only within this area (Figure 4.f). Significant statistical differences relating the landscape component

UGCCA showed that people from the lower agro-ecological zone attributed the most perceived importance to this area (Figure 5.d and Table 4). The main entrance to the UGCCA is located on its south boundary with the lower agro-ecological zone thus explaining the associated highest perceived importance by people of this area. This further confirms that people have a tendency to consider landscape components at a local scale.

Perceptions concerning the UGCCA reveal community attitudes toward conservation and PAs. Table 2 shows that conservation strategies have been coupled with benefits such as income and resources. Attitudes toward conservation and the UGCCA, however, are not always positive with lack of access to natural resources as the main issue (Table 2). These issues are consistent with TFCA concerns over the long run sustainability of conservation within local communities (Sandwith et al. 2001, Smith et al. 2008) and reinforces the logic that conservation and PAs need to provide tangible benefits to local communities (Jones and Murphree, 2001; Berkes, 2004; Ferraro, 2002).

Statistically significant differences relating the landscape component "grazing land" showed that people from the lower agro-ecological zone attribute the most importance to this area (Figure 4.c). Concerns over the grazing lands were voiced in the middle and upper agro-ecological zones regarding the invasive species *Sandanezwe (Chromolaena odorata)* and higher human populations respectively; thus affecting the quality of grazing lands and leading to an associated dissatisfaction. This shows that, whilst people may perceive grazing lands as important, they may be simultaneously dissatisfied by their quality. Here the difference between place attachment and place satisfaction emerges; both impacting an individual's sense of place (Stedman, 2003, 676) leading to diminished importance scores within these areas.

The above perceived differences in landscape importance, among people from the different agro-ecological zones, are an illustration of the spatial arrangement of livelihood strategies that exist at proximate scales. Accordingly the enhancement of agricultural and environmental amenities should account for such livelihood strategies at these local landscape scales.

5. Conclusion

The people of the MTA maintain perceptions of a multifunctional mosaic landscape consistent with ecoagriculture. Hence landscape-based projects may have a positive impact on local livelihoods as people have revealed perceptions of the landscape as a buffer against poverty. The conceptions of landscape held by our participants are however, unique. At an individual level people perceive the existence of landscape mosaics on a considerably reduced spatial scale than that of ecoagriculture and other hegemonic world views. At these scales participants revealed that landscapes provide multiple functions such as agricultural production and natural resource provision. Further assessment of the perceived strengths, weaknesses and threats to these landscape components provided insight into management implications for the formalisation of ecoagriculture. Both nature and culture influence the perceptions of landscape as local people reside within a resource rich landscape and social context endowed with traditions and community practices to manage that landscape. This indicates that eco-agricultural development in this area would need to use different implementation approaches compared to that in Western countries. These rules need to incorporate local knowledge, community practices as well as the physical amenities that influence local landscape perceptions as revealed in this paper.

Different land-use strategies exist across agro-ecological zones based on available resources, uncovered with the insight of the local people. These resource-dependent localized strategies should be further analysed at a sub-landscape scale consistent with scales as perceived by local people. Within the MTA, landscape mosaics exist at this reduced scale, each with their own unique issues that were exposed through the assessment of local people's perceptions leading to a fuller understanding of this multifunctional landscape.

Chapter 2: Tables

Table 1: Summary of identified landscape components and corresponding purpose across the study site.

Shackleton *et al.* (2001) Landscape Categories	**Landscape Component**	**Purpose**
Areas of arable production	Maize Field	Peanuts Sugar cane Pumkins Beans Casava Maize
	Home Garden	Vegetables , Maize
	Community Garden	Vegetables
Areas of Animal Husbandry	Bushveld	Donkeys grazing
	Grazing area (Goats and Cattle)	Goats Grazing Cattle grazing Income Traditional Purpose
Areas of Natural Resource Collection	Trees / Woodland	Traditional Medicine Fence for Fields / Garden House Building Protect house from dust Hunting Grazing Income Cooking (Firewood)
	Water source areas / river	Washing Drinking Cattle drinking Cooking Building Beer making Irrigating
	Building Mud / Soil for house	Building Cultivating
	Grass Areas	Roofing Mats Income (selling harvest) Brooms
	Traditional medicine area	Income Healing people
	Marula tree area	Beer Juice Peanuts Income
	River reeds *(Ikhwane)*	To sell bunches
	Sisal plants	Rope making Roofing Poles for fences
Other	Government provided taps	Easy water access Washing Drinking
	Schools	Learning
	Sports field	Football
	Road	So clients can find him (traditional healer)

Table 2: Summary of perceived strengths and weaknesses concerning landscape components across the study site, revealed by participants. Selected perceived strengths and weaknesses shown here relate with the goals of ecoagriculture.

Landscape Component	Perceived Strength	Perceived Weakness / Threat
Woodlands	There are many Available throughout the year Nature supplies Beautiful wood Provides for cows	Snakes Alien species Far away
Usuthu Gorge Community Conservancy Area	Income / jobs Cheap meat	Not allowed to hunt Not allowed to cut grass
Grasslands	There is enough for everyone Grass will always be there Easy to disperse Important for income	Snakes
Water sources	Drinkable We find it underground: this means that it will not finish We do not have to go far There is enough for the animals	Cows make it dirty Far away Drought Snakes People steal the fence Fence gets broken by cows
Garden	Very productive, rich in minerals Water always available We survive We do not buy vegetables, just plough	Insects Needs a fence made of wire (from Government) Water is scarce Goats
Field	Rich soils Food for the whole year Surrounded by grass - good fertiliser	Far distance (transport issue) Cattle enter due to bad fence No rain Alien species
Grazing lands	Enough grass	Not fenced Alien trees - *Sandanezwe (Chromolaena odorata)* Too many trees
Soil	Good for ploughing	
Building Mud		Distance
Traditional Medicine Area		Warthog eats roots
River bed		Snakes Cows get in (No fence) and trample

Table 3: Comparisons of the perceived importance of different landscape units across different social groups, showing mean scores and Kruskal-Wallis p-values. Values with an asterisk indicate statistically significant differences (p<0.05).

Landscape Component	Mean score across social groups				Kruskal-Wallis *p*-value
	Older women	Older Men	Younger Women	Younger Men	
Drinking Water	5	5	5	5	0.3520
Irrigating Water	4	4	4	4	0.3476
Field	5	5	4	4	0.1388
Garden	5	4	4	4	0.2895
Woodlands	3	4	3	3	0.1005
Grazing Land	4	4	3	4	0.0783
Grassland	4	4	4	3	0.0662
River reed (*Ikhwane*) area	5	4	3	3	<0.0001*
Tap	5	4	4	5	0.2219
Traditional Medicine area	3	4	3	3	0.4116
Building Sand	2	2	3	3	0.4116
UGCCA	5	4	4	4	0.8138
Playing Ground	4	3	4	4	0.2745
Termite mound	0	0	0	0	0.7271

Table 4: Comparison of the importance of different landscape units across agro-ecological zones, showing mean values and Kruskal-Wallis p-values. Values with an asterisk indicate statistically significant differences (p<0.05).

Landscape Component	**Mean Score across Agro-ecological Zones**			**Kruskal-Wallis *p* -value**
	Lower	**Middle**	**Upper**	
Drinking Water	5	5	5	0.4162
Irrigating Water	4	4	4	0.0061*
Field	4	5	5	0.6663
Garden	4	4	5	0.1178
Woodlands	3	3	3	0.8641
Grazing Land	4	3	4	0.0135*
Grassland	4	4	5	0.2413
River reed (khwane) area	3	3	4	0.5729
Tap	4	4	5	0.4506
Traditional medicine area	4	3	3	0.389
Building Sand	0	3	4	<0.0001*
UGCCA	5	4	4	0.0238*
Playing Ground	3	4	5	0.0056*
Termite mound	5	0	0	<0.0001*

Chapter 2: Figures

Figure 1: Map of study area indicating the upper, middle and lower agro-ecological zones.

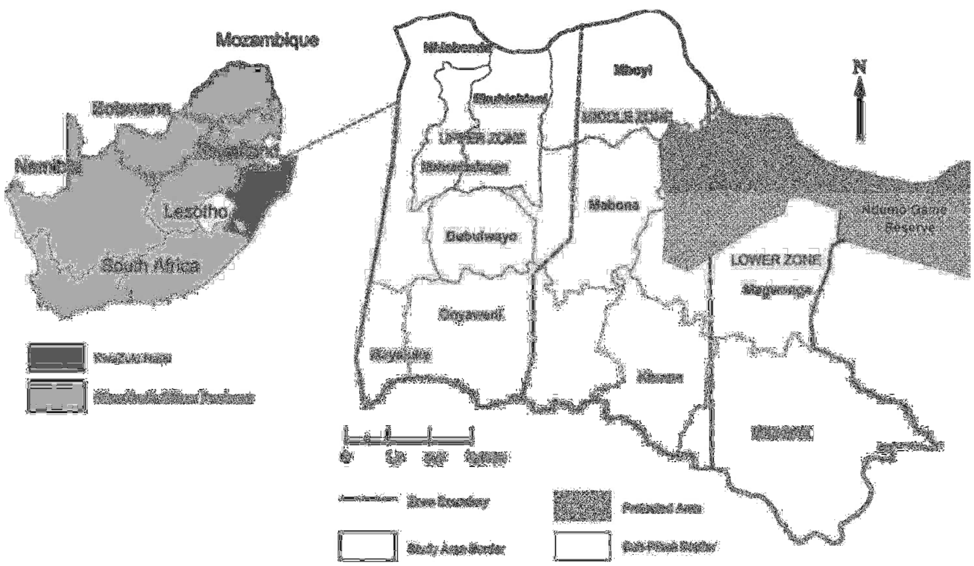


Figure 2: Hand drawn illustration representing the spatial assemblage of subjectively identified landscape components by interviewees during a typical transect walk.

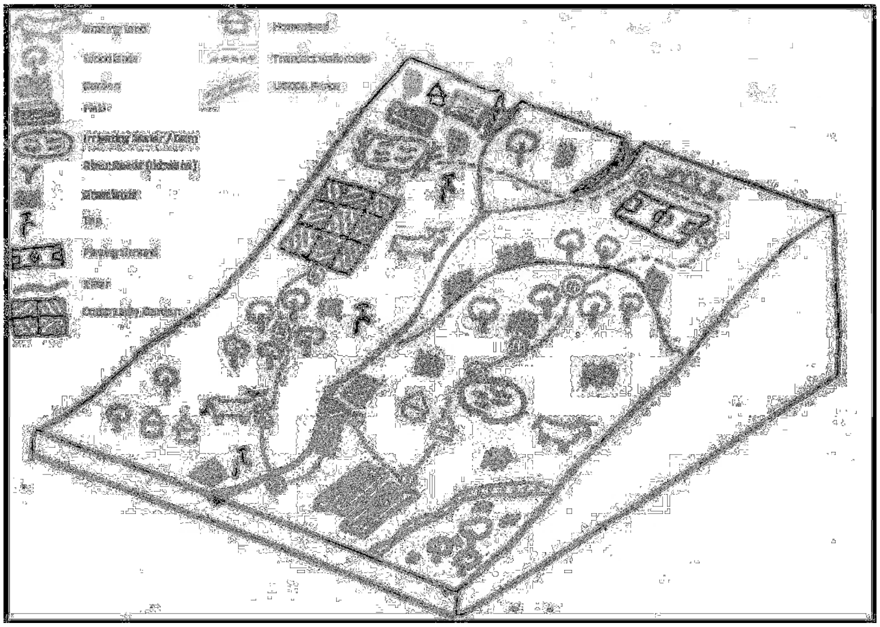


Figure 3: Boxplot representing the data for River Reed (*Ikhwane*) area across social groups. Statistically similar groups identified by Kruskal-Wallis multiple comparisons test are indicated by either an "a" or a "b" above each bar.

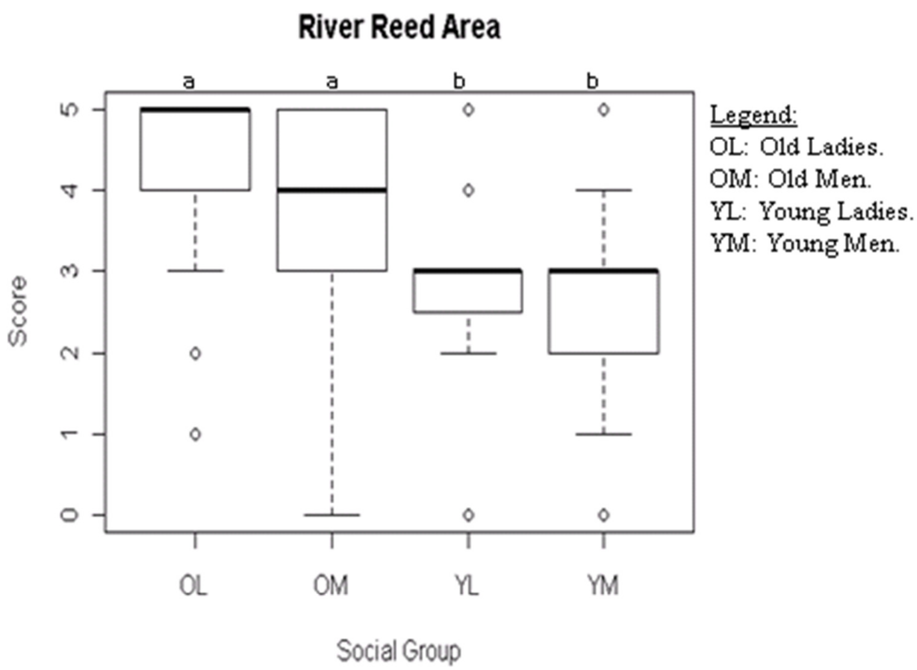
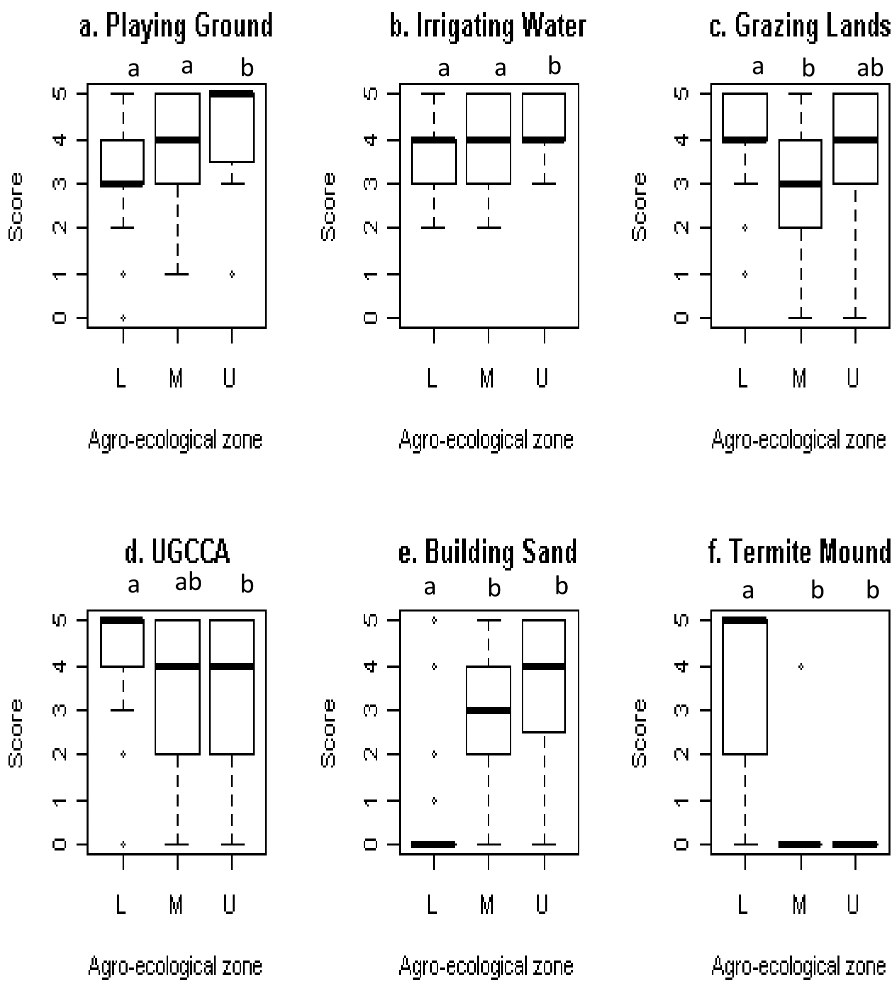
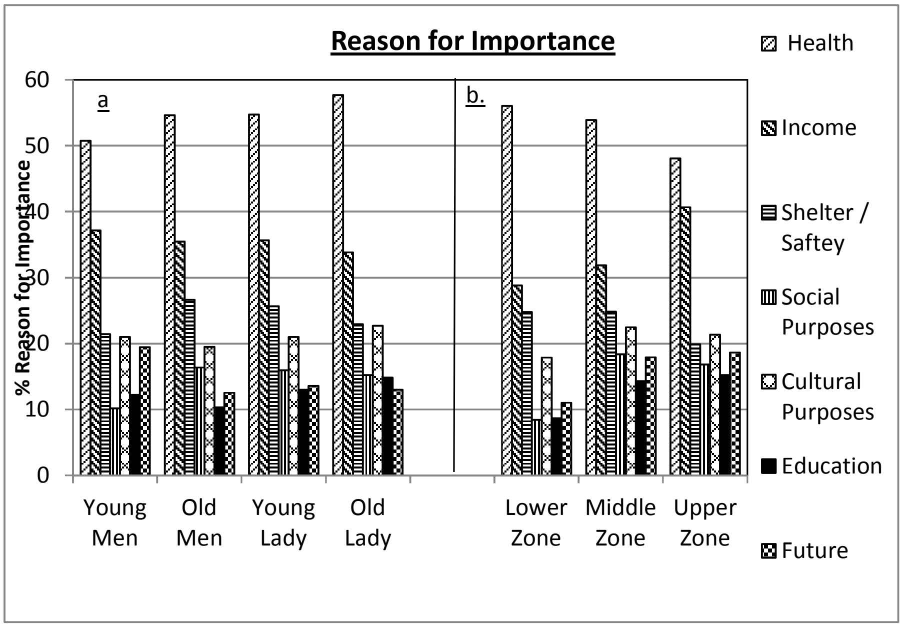


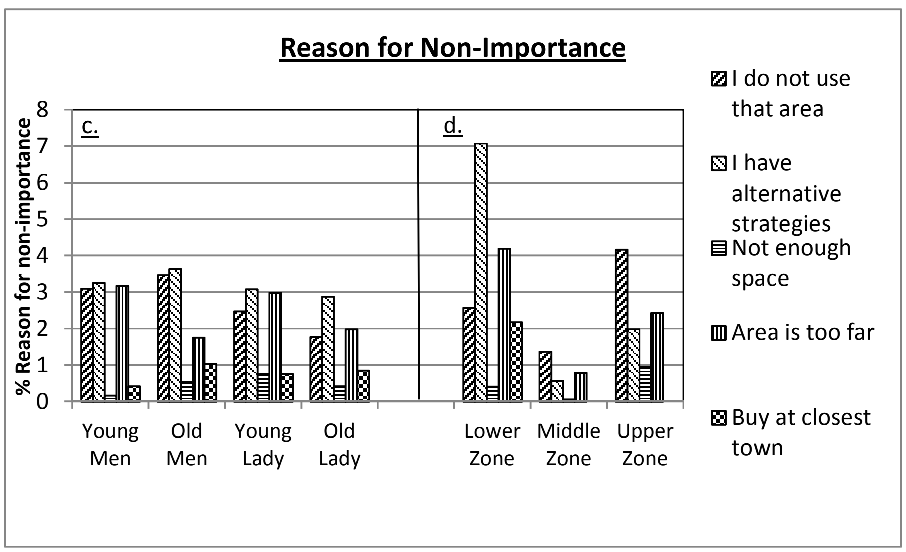
Figure 4: Boxplots of the rankings of landscape components that revealed statistically significant differences across agro-ecological zones (Kruskal-Wallis test). Within individual boxplots statistical differences according to Kruskal-Wallis multiple comparisons test are indicated by the alternative letters above each bar (i.e. "a" as opposed to "b").



Legend
L: Lower agro-ecological zone
M: Middle agro-ecological zone
U: Upper agro-ecological zone

Figure 5: The most significant causative mechanisms that motivate the perceived importance (a & b) or non-importance (c & d) across all landscape components.





Chapter 3

Local Farmers portray their perceptions of landscape through photographs: towards integrated landscape understandings and sustainable livelihoods

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Abstract

Ecoagriculture is an innovative approach to land use management which synergises agriculture, livelihoods and biodiversity conservation at landscape scale and requires an awareness of landscape-level issues by land users, a condition which is not always necessarily met. We employed photo-elicitation with marginalized rural farmers in an area in South Africa identified as holding ecoagriculture potential. The photographers were invited to articulate their bottom-up understanding of the landscape concept. Local conceptualisations of landscape were compared with those held by the ecoagriculture approach to landscape management. A comparative analysis of photograph ranking across social groups and geographical areas contributed to local expressions of the landscape concept. Landscape conceptualisations differ from those held by ecoagriculture, since landscapes were mainly viewed as a function of resource amenity. Local people perceive land-use multifunctionality but at a smaller scale than expected depending on both social and biophysical interpretations suggesting that ecoagriculture may have a positive effect on livelihoods. Landscape scale projects, however, should be pursued with a prior analysis of local landscape understandings.

Keywords: Landscape, photo-elicitation, simultaneity, multifunctionality, South Africa, Transfrontier Conservation Areas.

1. Introduction

Biodiversity conservation objectives cannot be reached within the spatial limits of Protected Areas (PAs) only (Persha *et al.,* 2010; Lindenmayer et al. 2008).This has become one of many reasons why conservation has shifted paradigms from centralised decision making and PAs towards inclusive decision making, engaging communities and stakeholders as resource users. This is vital within the broader objectives of conservation outside protected areas in the long run (Lele *et al*. 2010, Büscher and Dressler, 2010). By approaching sustainability through multifunctional landscapes the challenge of multiple issues such as population growth, food security and biological conservation can be simultaneously addressed as they are elements that are connected spatially. Simultaneity in land-use also implies that land multifunctionality (e.g. agriculture, conservation, and provision of public goods such as ecosystem services) is an accepted objective among relevant stakeholders with the objective of improving their livelihood.

"Landscapes" are geographical constructs that include many components such as biophysical, socioeconomic and cultural dimensions (Sayer *et al.* 2007; Wiggering *et al.* 2003). This reinforces the necessity to transfer knowledge across disciplines as they have spatial consequences. This approach towards multi-purpose landscapes is also advocated by the concept of Transfrontier Conservation Areas (TFCAs), i.e. large areas that cut across two or more international boundaries, include within them at least one PA and other multiple resource use areas, including human dwellings and cultivated areas (Peace Parks Foundation, 2011). These areas foster simultaneity through the sustainable utilization of biological and cultural resources whilst fostering regional socio-economic development (Sandwith *et al.* 2001, Smith *et al.* 2008).

The simultaneity between nature conservation and agricultural production at a landscape scale manifests as multipurpose landscape mosaics. McNeely and Scherr (2001) coined such landscapes as "ecoagriculture" landscapes. This is an approach integrates agriculture, biodiversity conservation and rural livelihoods through a mosaic landscape structure (McNeely and Scherr, 2003; Scherr and McNeely, 2008). This is also similar to what Pertfecto *et al* (2009) considered "Nature's Matrix" where the importance of focusing at landscape scale was highlighted considering the fact that if a piece of land is subject to rigorous conservation, it will fail if surrounding areas are degraded. Additionally, it has been shown that agriculture often benefits from the nearby presence of natural areas for parameters such as pollination, pest management, and erosion control (Tscharntke *et al.,* 2012). As such, the benefits of agricultural and biodiversity functions can be synergized through effective landscape management (Lindenmayer *et al.* 2008). This is pertinent since it has been recognised that small scale farmers, not large scale monocultures, are the key to global food security, as the former more effectively links agricultural intensification to hunger reduction (Tscharntke *et al.,* 2012, Horlings and Marsdin, 2011; Chappell and Lavalle, 2011). TFCAs and ecoagriculture thus share the purpose of combining agricultural production and environmental protection objectives.

Ecoagriculture Partners (2008) further functionalise an ecoagriculture landscape through the inclusion of three main "pillars":

- Enhancing rural livelihoods.
- Conservation of biodiversity
- Sustainable and productive agricultural systems.

Ecoagriculture Partners (2008) further suggests that collaboration between key stakeholders is vital as local communities are viewed as the "stewards of ecosystems".

For this reason, we employed participatory methods to assess whether ecoagriculture can be deliberately fostered within a TFCA and we analysed the way people who live in a TFCA conceptualise their landscape. Conceptually, landscapes are not finite in themselves; however are the product of humans and their activities. This results in a landscape perception held by those who act upon it (Greider and Garkovich, 1994; Tress *et al*., 2001). We selected an area in Northern KwaZulu-Natal, South Africa, known as the Mathenjwa Tribal Authority (MTA) as an example of an area holding ecoagriculture potential (Torquebiau *et al*., 2012) and being part of the Lubombo TFCA, a transfrontier conservation area connecting KwaZulu-Natal, South Africa with equivalent areas in Swaziland and Mozambique. The community of the MTA rely heavily upon subsistence living as well as social grants. Almost all families have a vegetable garden and a maize field whilst depending upon the landscape for other resources such as water and fuel wood. Many people own livestock that graze in the open vegetated areas (Torquebiau *et al*., 2012). We used Photo-Elicitation (PE), i.e. a method where pictures are taken by farmers themselves and are discussed and analysed with them during follow-up interviews and photograph ranking exercises. This was in order to assess how local people perceive their landscape and the level of simultaneity between the multiple features therein that contributes to their livelihoods.

PE has been employed in numerous occasions within landscape and agricultural studies. PE has previously been employed in studies to usefully uncover how local people viewed landscape issues such as land-use change, tree encroachment, grazing management and landscape values (Sherren *et al.,* 2011; Beilin, 2007; Sharp *et al.,* 2012). Thus land-users could articulate, through the medium of a photograph and accompanying dialogue, their values in relation to landscape issues.

Specifically, we asked the following questions:

- What landscape conceptualisations are revealed by PE?

- Are these local conceptualisations of landscape consistent with those of ecoagriculture as defined by Ecoagriculture Partners (2008)?
- What are the determinants of these conceptualisations?
- How do these conceptualisations differ across geographical areas and social groups?

We hypothesized that firstly PE is a powerful tool to uncover landscape conceptualisations and secondly that local landscape conceptualisations will be consistent with concepts from ecoagriculture. Thirdly the differences in these conceptualisations across geographic zones and social groups will contribute to an integrated understanding of this landscape. Finally these results can be put forward for policy consideration within this local area.

2. Study Site

The MTA Landscape falls in the Northern most reaches of the KwaZulu-Natal Province of South Africa (26°48'S to 26°54'S; and 32°00'E to 32°09'E). The area has been characterized climatically as having "hot rainy summers" and "warm dry winters" (Earle, 1979) with a low potential for agriculture due to low rainfall and high annual evaporation potential (Mucina and Rutherford, 2006; Jozini Local Municipality, 2011). The total area of the MTA landscape is 547km^2, 19% of this area being covered by the Usuthu Gorge Community Conservation area (UGCCA), a conservancy under the management of the local community (Figure 1). The vegetation type of the area falls within a mixed savanna, woodland and grassland biome to the west and to a sub-tropical forest nearer to the coast (Earle, 1979; Mucina and Rutherford, 2006). The lower reaches of the Mathenjwa landscape have wooded acacia vegetation with the higher areas being more forested, especially in the deep valleys. The area belongs to the Maputaland Pondoland Albany biodiversity hotspot (Conservation International, 2007) and hosts some endemic and vulnerable flora species (Mucina and Rutherford, 2006). In 2000, the governments of South Africa, Swaziland and Mozambique signed a tri-lateral agreement for the creation of the Lubombo TFCA, encompassing the MTA within it (Peace Parks Foundation, 2011).

For the purpose of the present study (and other, related studies; see Chitakira *et al* 2012), the landscape was divided into three agro-ecological regions (zones) (Figure 1) based on altitude, climatic, social and biophysical features of the area. The lower zone (approximately 150 m ASL) is a low lying plain, the middle zone (approximately 350 m ASL) is a rugged mountainous area and the upper zone (above 550 m ASL) is a plateau.

Insert figure 1 about here

The MTA is largely comprised of untouched natural areas whilst being home to about 50,000 small-scale farmers. This mosaic of land use constitutes a de facto ecoagriculture landscape. The presence of unique combinations of stakeholders in the area (farmers, tribal institutions, conservation agencies, etc.) creates conditions conducive to effective ecoagriculture planning (Chitakira *et al*, 2012). The area has been identified as a priority environmental intervention zone by the local Jozini Municipality. However, no development plan has been proposed (Jozini Local Municipality, 2011). According to the Jozini Integrated Development Plan (2011 -2012), the area lacks access to basic institutional support for development. This results in poor communities who depend on subsistence livelihood strategies that are supplemented by social grants.

3. Methods

3.1 Volunteer Employed Photography (VEP)

VEP is a "photo elicitation" process whereby a participant is given a camera and asked to take photographs based on a specific theme (Garrod, 2008), in this case specific instructions regarding how people perceive their landscape. At least three participants from each agro-ecological zone captured five images each. Participants selected were local farmers who had grown up in the study site. This is judgemental sampling based on the prior knowledge that the area holds ecoagriculture potential and is inhabited by small-scale farmers (Torquebiau *et al.* 2012). Across the entire study site a total of eleven farmers participated in this exercise. Prior to this process, the researcher (assisted by an isiZulu interpreter) spent significant time with the farmers (including exploratory walks in the farms and the landscape) and explained to them that the aim of this exercise was to unravel their understanding of the landscape that they inhabit. The VEP exercise was part of a broader research project aiming at gaining an understanding of people's perception of the landscape concept (Alexander *et al*. submitted).

In follow-up interviews, participants were shown printed copies of the five photographs they had taken themselves and were asked to provide 'photologs', i.e. comments that accompany each picture. These are necessary to make inferences regarding the content of the pictures. Photologs detailed the reasons as to why they took certain photographs, what included features were important and what the key challenges in these areas were. Participants responded in a story-like manner allowing rich qualitative expressions to surface. This method is therefore an effective way to disclose local knowledge regarding potential ecoagriculture landscapes and unveils important considerations for policy makers.

Within photo-elicitation, there are two approaches. One deems the quality of the landscape to be inherent in the physical setting whilst the other suggests that landscape quality sits within the eyes of the beholder (Jacobsen, 2007). Findings from related studies suggest that interactions exist between these viewpoints (Gross, 2001, Stedman, 2003, Tress and Tress, 2001). Key expressions from the photologs were coded into categories "natural" or "social.", the former suggesting the influence of the material world and the latter an influence of the mental world upon landscape understandings. Expressions coded into the natural category reflected physical amenities such as rich soils and resource endowments. Key expressions that were coded according to the social dimension showed elements of the landscape that confirmed at least one of the following:

- Mental constructions through experience (Stedman, 2003).
- Reflections on cultural identities (Greider and Garkovich, 1994).
- A conferred meaning to nature (Greider and Garkovich, 1994).
- Encompassing social or cultural contexts (Tress and Tress, 2001).

We remained open to further qualitative trends and categorisations of photolog comments. Surveys of literature and visual material were conducted in order to establish the equivalent ecoagriculture viewpoint of landscape. This is the reference against which the results from the VEP were compared.

3.2 Q-sort procedure for ranking photographs

Twelve photographs were selected from the VEP exercise as a sample based on their representation of the population of photographs and the landscape (Appendix 1). The sorting of pre-selected photographs has proved effective in gaining insight into subjective landscape conceptualisations (Real *et al.,* 2000; Green, 2005) and can be used for comparative purposes (Zube and Pitt, 1981). We used a rank of landscape photograph significance based on a scale from 12 to 1, where 12 represented highest importance. Individual respondents were categorised according to both and agro-ecological zones (n = 37-40) and social groups (men, women, young, old) (n = 29-30) resulting in a total of 117 exercises. Young or old participants were classified as either older or younger than 30 years of age. This figure was decided considering the low life expectancy in South Africa (49.33 years at the time of the study) (IndexMundi, 2011). We applied a Friedman test in order to perform an analysis of homogeneity of rankings within each group together with Kruskal-Wallis comparative analysis of landscape photograph scores across agro-ecological zones as well as across social groups (young men, old men, young women and old women).

4. Results

4.1 Ecoagriculture conceptualisation of landscape

Ecoagriculture embraces landscape as an interconnection between rural livelihoods, agriculture and biodiversity conservation (McNeely and Scherr, 2003; Scherr and McNeely, 2008). For example Ecoagriculture Partners (2008) suggested that Figure 2 is a representation of an ecoagriculture landscape whereby this interconnectedness can be visualised. The photograph dialogue reveals the importance of multiple landscape functions such as agriculture, ecosystem services, hydrological functions and biological corridors (Ecoagriculture Partners, 2008). This photograph was not shown to participants, but was used as a reference landscape considered by the researcher during the entire VEP methodology.

Insert figure 2 here.

4.2. Qualitative assessment of the VEP exercise

4.2.1. How local people photographed their landscape

Table 1 is a summary of all the photograph's headings from the VEP exercise. The majority of photographs represent the local conceptualisation of landscape as individual resource areas (Figure 3). Only four photographs from the entire VEP exercise (n=55) depicted areas of multiple resource usage such as combined grazing, hunting, honey and wood collection within a single landscape picture (Figure 4), similar to an ecoagriculture understanding (Figure 2).These photographs were captured only a short walking distance from a participant's homestead and represent utility derived from these features suggesting a strong local identification with landscape as a function of subsistence livelihoods. This result proves that photo-elicitation is an effective technique to unravel how local people understand their landscape.

Insert table 1 about here

Insert figure 3 about here

Insert figure 4 here.

Across all photographs taken by VEP participants, the photographs can be categorised according to the three pillars of ecoagriculture (Ecoagriculture Partners, 2008):

1. *Enhancing Rural Livelihoods*: All the photographs match the first pillar of ecoagriculture as they relate directly to livelihoods in rural areas. For example, landscape components such as field and garden relate to food security; grasslands and woodlands relate to natural resource collection and grazing lands relate to animal husbandry (Table 1).

2. *Conserve or enhance biodiversity and* e*cosystem services*: Ecosystem services are the benefits that human derive from their surrounding ecosystem and are thus dependent upon them for wellbeing. Ecosystem services, in turn, are dependent on biodiversity (MEA, 2005). As such, rural livelihoods are therefore highly dependent upon ecosystem services for the provisioning of natural resources and support of agricultural production. The VEP pictures represent ecosystem services as they reflect these properties of nature. For example, the

photographs of woodlands, grasslands, fields and gardens depend on ecosystem services (Table 1).

3. *Agriculture*: Photographs from the VEP exercise entitled field and garden confirm that agricultural systems are considered important within local landscape conceptualisations. Scherr and McNeely (2008) suggest that, within ecoagriculture landscapes these areas need to provide food security. Comments such as "I live using this garden" (Table 2) substantiate this component of ecoagriculture.

Although the different components of ecoagriculture are portrayed in the different photographs, there is however little evidence that people do perceive the potential interaction between these components.

4.2.2. Photolog results: The dialogues behind the photographs

These discussions revealed the perceived supportive function of the landscape (Table 2 & 3). The availability of resources within pictures had a tendency to dominate discussions. People included what they appreciate about the functioning of the particular landscape unit such as agricultural potential and the provisioning qualities of nature. This is substantiated through comments such as "I live using this garden" and "The land is good because it saves me money" (Table 2). Some participants also shared some concerns and struggles they experience upon the landscape such poor soils, access to water and landscape mismanagement, for example, inadequate fencing and free roaming cattle. Local responses to these difficulties were raised such as community rules that ensure the sustainability of resource areas. This method has thus effectively unveiled the perceived strengths and weaknesses of this landscape held by the local people.

The photologs also brought to light the discrepancies in land-use practices emerged across spatial areas according to differing resource endowments. In Table 1, for example, every participant from the lower agro-ecological zone took a photograph of their woodlands as a landscape and commented on the importance of them. The perceived importance of grasslands, however, was only mentioned by participants in the middle and upper agro-ecological zones revealing a gradual change in the abundance of these resources across the study site. Participants further revealed that the different abundance of resources such as these leads to trade across the agro-ecological zones of the study site.

The photologs can be classified to reveal that people combine notions from both natural and social interpretations of landscape (Table 2). This is because the physical amenities of the landscape together with the encompassing social contexts were mentioned at length. Photologs also revealed the linkage of tacit knowledge to corresponding areas of the landscape (Table 3) as people spoke about the unique ways they interact with the landscape in order to ensure sustainable cultivation and resource collection. Such ways of interacting with the landscape are unique to this area. For example, the identification of specific local trees and grasses that are harvested as necessary resources towards house construction.

Insert Table 2 here

Insert Table 3 here

4.3 Quantitative Analysis of the Q-Sort Method

4.3.1 Comparisons of photograph ranking across social groups

Table 4 shows a summary of the Q-sort method across social groups. Photographs representing drinking water areas, garden and tap are ranked consistently highly whilst *muti* areas (areas of traditional medicine collection) are ranked last. Strong ranking trends are confirmed through the Friedman test p-values across social groups (Table 4).

Insert Table 4 here

Statistically significant differences according to the Kruskal-Wallis test across social groups emerged for photographs representing garden and natural area (Figure 5). According to a Kruskal-Wallis multiple comparisons test the photograph representing garden showed statistically significant differences between old ladies and old men as well as between old men and young men. The Kruskal-Wallis multiple comparison test for the photograph representing natural areas, however, showed no intergroup statistically significant values.

Insert Figure 5 here

4.3.2. Comparisons across Agro-ecological zones

Table 5 summarises the Q-sort method across agro-ecological zones. The range of data for photographs representing water sources (drinking water and tap) and garden show consistently high ranges of data whilst the photograph representing traditional medicine area (*muti* area) was ranked last. Friedman test values indicate strong trends in photograph ranking across each agro-ecological zone. The photographs that displayed statistically significant differences according to the Kruskal-Wallis test ($p < 0.05$) were garden, reed area *(ikhwane)* and playing ground.

Insert Table 5 here.

According to the Kruskal-Wallis multiple comparisons test, statistically significant differences occurred across the lower and middle agro-ecological zones regarding the photograph representing garden as it was considered less significant in the middle agro-ecological zone (Figure 6.a). Additionally, the photograph representing the river reed (*Ikhwane)* area showed significant differences across the lower and upper agro-ecological zone as it was considered less significant in the lower agro-ecological zone (Figure 6.b).

Finally, the photograph representing playing ground revealed statistically significant differences between the lower and the middle agro-ecological zones (Figure 6.c).

Insert Figure 6 here.

5. Discussion

5.1. The framing of landscapes: How local people photograph the landscape?

The conceptualisation of the landscape as individual resource components on a reduced scale instead of representations of landscapes as combinations between agricultural, biophysical and social elements according to ecoagriculture conceptualisations (McNeely and Scherr, 2003; Scherr and McNeely, 2008) can be visualised by contrasting Figure 2 against photographs in Figure 3. This understanding may be related to the fact that there exists no word in isiZulu (the local language) for landscape. The closest word is "*umhlabathi*" meaning land, or soil. Although we took care of explaining our accepted understanding of the word "landscape" before the exercise, we may here have fallen short of a meaningful concept for local people.

This local representation of the landscape as a function of livelihood strategies is an important concept that needs to be incorporated within ecoagriculture management. Although people did not take large view pictures of landscapes as we had expected, multiple photographs at smaller individual landscape scales do bring useful information. Multifunctional landscape mosaics are spatially present as participants would identify, across individual photographs, areas of the landscape consistent with notions of ecoagriculture. Thus, a multifunctional landscape as a support system essential for the formalisation of ecoagriculture has actually been revealed, but through separated landscape units, not through broad landscape views. This could perhaps be due to the difficulty for local famers to use a camera. Nevertheless, policy makers and ecoagriculture planners should make sure to incorporate an identification of all individual landscape units before arguing with farmers for an overall landscape-level thinking.

5.2. The 'photologs' behind the photographs: What people said about their landscape

The photologs (Table 2 & 3) link the photographs to landscape based livelihood activities. These activities reveal the utilities derived from landscape components as the determinants of landscape conceptualisations. These comments also reveal local knowledge such as community rules related to the utilisation of resource areas and agricultural practices (Table 2 and 3). The exposure of this knowledge from the bottom-up is vital in order to link the agendas of community, ecoagriculture towards sustainability at a landscape scale as collaboration between these agendas is required (Koontz, 2006).

Local people interpret the landscape from both natural and social viewpoints (Table 2). On the one hand, respondents attributed a great deal of significance to the physical amenities and functions. These relate to ecosystem services, revealing the perceived supportive function of biodiversity upon the landscape, an important indication that ecoagriculture can be fostered upon this landscape. On the other hand, key expressions showed that local people simultaneously interpret the landscape within social contexts (Table 2). For example, the photolog connected to a photograph of a grassland in the upper agro-ecological zone commented on "knowing your area". Here, the community respects each other through social agreements regarding resource allocation, demonstrating that the grassland, a physical entity, is encompassed by a social context (Tress and Tress, 2001, 147) whilst reflecting cultural identities (Greider and Garkovich, 1994, 2). Therefore both physical amenities and mental constructions influence landscape conceptualisations. This dualistic notion of the landscape reveals a community that is endowed with cultural and traditional land-use patterns whilst also depending upon it's physical resources. Thus this landscape is a function of both the biological and mental realms. In other words, people are both shaped and are shaping the landscape in a reciprocal fashion. Investigation into these landscapes would require integrated approaches whereby the natural scientist understands social processes and vice versa. Therefore, ecoagriculture should embrace this dualistic understanding that can contribute to a multifunctional landscape.

Participants further revealed that they are connected to the landscape through tacit knowledge (Table 3) that impacts interactions with the surrounding landscape. Studies from Iran (Taghvaei, 2008) have revealed that unique ways of interacting with the landscape become more pertinent in harsher environments where people have learned to balance their life with natural constraints, leading to tacit knowledge. This is applicable to the MTA as it is isolated from the mainstream economy (Kloppers, 2004) together with a low agricultural potential (Mucina and Rutherford, 2006; Jozini Local Municipality, 2011). Ecoagriculture embraces a paradigm that people, food and nature can be mutually reinforcing at a landscape scale (McNeely and Scherr, 2003; Scherr and McNeely, 2008). This means that local tacit knowledge can only add to the management of this framework.

5.3. How do people rank landscape photographs across spatial and social dimensions?

A high importance was attributed to the photographs representing areas that provided water (drinking water area and tap) and garden (Tables 4 & 5) suggesting high dependencies on these areas. Place dependence is a function of a person's perceived association with a place based on the satisfaction of a certain need over time (Stokols and Schumaker, 1981). On a temporal dimension therefore, it would seem that these rural people have built up strong connections with the provisioning features of the landscape. Shackleton *et al.* (2001), who have worked in South African rural areas, suggest that multiple land-use functions such as the above mentioned are vital for rural people.

The high importance attributed to water areas correlate with concerns of the Jozini Integrated Development Plan (2012) as less than 35% of the local population has access to water. This situation is aggravated due to irregular rainfall affecting agricultural production. Water is hence the main concern for local inhabitants (Jozini Local Municipality, 2012). This high dependence on natural water sources for drinking exists, even in light of government commitments to water services.

The photograph representing the *muti* area (areas of traditional medicine collection) was consistently ranked in last position (Table 4 & 5), unveiling a possible shift in cultural practice reinforced through the existence of local modern clinics. Reviewed needs within the study site also include the provision of mobile clinics into the more remote areas of the MTA (Jozini Local Municipality, 2012). Changing landscape practices as a result of modernity are therefore occurring even in remote areas such as the MTA. Such landscape dynamics should become an important consideration for ecoagriculture.

5.3.1 Discrepancies of landscape photograph ranking across social groups

Older women attached the greatest rank to the photograph that represented their gardens (Table 4). Baumann (1928) suggests that within Zulu culture, women tend to focus on agricultural activities whilst men are more involved with the economic activities. The length of time and the experience associated with a place is a focal variable in determining place attachment and dependence (Smaldone, 2006). This suggests that, because old ladies spend the most time there, they have fostered a corresponding place attachment. Ecoagriculture should therefore consider old ladies as key managers over gardens as agriculturally productive landscape units.

Another photograph representing 'natural area' also showed statistical differences across social groups (Table 4). This difference in perceived significance across social groups may be because of the diverse variety of utilities provided by these lush areas such as resource collection, animal husbandry and aesthetic significance. This photograph, however, did not score very high mean scores across social groups.

5.3.2 Discrepancies in photograph ranking across agro-ecological zones

The photograph representing garden was regarded least significant in the middle agro-ecological zone (Table 5), revealing statistically significant differences between the lower and the middle agro-ecological zones (Figure 6.a.). The middle agro-ecological zone is characterised by steep terrain compared to the upper (plateau) and the lower (nearer the coastal plain) agro-ecological zone and has poorer, stony soils compared to the other agro-ecological zones (Torquebiau *et al*. 2012). Two out of three respondents from the middle agro-ecological zone made reference to the fact that stones affect the quality of soils within their gardens and reveal dissatisfaction with these areas as they are difficult to work in. Thus a difference between place attachment and place satisfaction emerges both impacting on an individual's sense of place (Stedman, 2003, 676). The reduced sense of place satisfaction experienced by people from this area has therefore affected their perceived significance of this landscape component. Ecoagriculture should be sensitive to the differing attitudes that exist toward certain landscape components across space. These attitudes highlight pertinent areas of the landscape that require attention in light of improving livelihoods.

Statistically significant differences occurred for the photograph representing river reeds *(ikhwane)* area (Table 5). These are areas where *Cyperus latifolius* grows in abundance. These reeds are harvested and crafted into traditional mats for sleeping and sitting. This product has been identified as a potential marketing resource with the use of existing skills and materials in order to incentivise the sustainable use of this resource (Kotze *et al.,* 2000; Nel 2010). The discrepancies in significance suggest that people in the lower agro-ecological zone attribute a reduced significance to this resource as it does not grow at these altitudes (Table 5, Figure 6.b). VEP participants from the upper agro-ecological zone stated that river reeds only grows abundantly at this altitude and along the Usuthu river making the utilisation of this resource feasible only for people from this area. People from the middle and the lower agro-ecological zones claimed that they either purchase bunches of reeds before fashioning a mat or they travel long distances in order to locate this resource thus diminishing the perceived usefulness of this resource. Distance from reeds areas therefore plays a role in the corresponding perceived significance attributed to it. This suggests that local people tend to focus more on proximate resource areas, indicating a notion of a reduced landscape scale.

6. Conclusion

The people of the MTA conceptualise landscape as a milieu of individual resource areas that provide utility whilst not combining multifunctional notions of ecoagriculture within one landscape photograph. They confirm a dependency on different resources, different farming enterprises and different natural areas (associated with specific ecosystem services) but they may not conceptualize the relationships between these different entities. Multifunctional landscape mosaics do, however, emerge across photographs, albeit at smaller scales than expected. Landscape-based projects may have a positive impact on local livelihoods since the full set photographs were consistent with the three pillars of ecoagriculture (Ecoagriculture Partners, 2008).

The physical amenity, cultural contexts and local tacit knowledge that create a landscape influence people's conceptualisations. This clarifies how local people both shape the landscape, and are themselves shaped by the landscape. The history of the area (Torquebiau *et al*., 2012) reminds us that local people were successively mobile herders then sedentary farmers. They adopted today's lifestyle after adjusting to both the local landscape and changing socio-economic conditions. Although the MTA people live in a *de facto* ecoagriculture landscape, the formal development of ecoagriculture in this area would need to use different approaches compared to that in Western countries, especially considering local natural and social interactions with the landscape. The differences in landscape perception across social groups and agro-ecological zones suggest that a sub-landscape scale consistent with those used by local people should be used. Researchers and developers should not assume that their understanding of landscape is common sense for everybody. People should be made aware of alternative notions of 'landscape' if improved multifunctional land management is to be achieved. Photo-elicitation has therefore proved to be a useful technique to disclose differences in landscape conceptualisations between experts and local people.

Appendix 1


Drinking water


Fields


Garden


Grasslands


Grazing land


Ikhwane River bed


Irrigating water


Muti Area


Natrual areas


Playing ground


Tap


Woodlands

Chapter 3: Tables

Table 1: Summary of the photograph headings captured by participants during the VEP exercise.

Lower Agro-ecological zone		Middle Agro-ecological zone		Upper Agro-ecological zone	
Participant 1 (young man)	Field	Participant 1 (old man)	River	Participant 1 (old lady)	Garden
	Woodlands for fire		Garden		Dam for Irrigating
	Garden		Field		River reeds
	Water for drinking		Grassland		Grassland
	Woodlands for houses		Woodland		Dam for drinking
Participant 2 (old lady)	Garden	Participant 2 (old man)	River and bush	Participant 2 (young lady)	Drinking water
	Water for drinking		Grazing area		Cultivated land (field)
	Field		Soccer field		Firewood
	Traditional medicine		Water hole		Grassland
	Woodlands		River crossing		Water for washing
Participant 3 (old lady)	Water for irrigating	Participant 3 (old lady)	Grasslands	Participant 3 (young lady)	Field
	Tap for drinking		Firewood		Water for irrigating
	Grazing lands		Building wood		Garden
	Garden		Garden		River reeds
	Woodlands		Field		Building sand
Participant 4 (old man)	Woodlands			Participant 4 (young man)	Water for drinking
	Water stream				Grazing area
	Field				Chiefs grave
	Garden				Bushveld
	Grazing land				Garden.

Table 2: Key expressions from photologs showing interpretations of landscape from both natural and social viewpoints. This is a summary of photologs across participants from the upper agro-ecological zone.

		Photo Heading	Key Expression Category	
			Social Viewpoints	Natural Viewpoints
Upper Zone	Participant 1	Garden	I live using this garden.	There are beautiful vegetables.
		Dam	This dam is strictly for the community.	It does not dry up.
		Grasslands	You know your place to cut grass.	It grows even without much water
		Well	This is for the community.	It has good water that does not finish
		Reed area		The food grown here becomes good because it has manure.
	Participant 2	Digging area	We will not use this in the future to build.	
		Reed area	My mother taught me how to use this area. I will pass this on.	
		Field		The soils are not very rich.
		Garden		The soils are not very rich, over cultivated.
	Participant 3	Water	Do not dig here if you are a twin because the water will dry up.	It is healthy because it comes from the ground.
		Grazing Land	Cows are important for traditional clothes.	
		Chief's grave	When a chief dies we must plant a tree	
	Participant 4	Cultivation area		Rich in Minerals.
		Firewood	The land is good because it saves us money.	Always available.

Table 3: A selection of photolog comments that reveal the role of tacit knowledge that influences local landscape conceptualisations.

Landscape Photo	Tacit / Cultural Knowledge
Field	Cultivation How to fertilize soils Traditional fencing of field Identifying rich soils
Garden	Survival without money Cultivate fresh and healthy food Fertilise with cow dung Knowing the best time to plough
Woodlands	Building traditional houses Maintain stock of woodland: do not chop young trees Identifying strong trees for building
Water areas	Identifying drinkable water Keeping it clean to respect the community Drink water upstream; other uses downstream Knowing how to dig deep to find water Knowing the traditional beliefs around digging for water
Traditional Medicine	Healing people Prevent bad occurrences
Grasslands	Knowing your grassland's boundary. i.e. the tree line The best time to harvest Knowing your place Harvested grass can be used as a fertilizer
River reed (Ikhwane)	The best harvest time Crafting traditional mats
Digging place	Identifying good soil for construction
Sisal Plant	Crafting rope

Table 4: Comparisons across social groups showing mean scores and ranks of photographs with corresponding p-values according to the Kruskal-Wallis test. Statistically significant differences are shown with a star adjacent to the p-value. Friedman test p-values reveal strong trends in photograph rank across all social groups.

Landscape Component	**Young Men (n=29)**		**Old Men (n=29)**		**Young Ladies (n=30)**		**Old Ladies (n=30)**		**Kruskal-Wallis P Value**
	Mean Score	**Mean Rank**	**Mean Score**	**Mean Rank**	**Mean Score**	**Mean Rank**	**Mean Score**	**Mean Rank**	
Tap	10.1	1	8.2	2	10.1	1	9.8	1	0.1179
Garden	9.4	2	7.6	4	8.7	3	9.7	2	0.004593*
Drinking Water	8.4	3	8.7	1	8.9	2	8.4	3	0.4342
Irrigating Water	7.3	4	7.0	5	7.3	4	7.8	5	0.6919
Field	7.2	5	7.7	3	6.7	5	8.0	4	0.3283
Grazing Land	6.5	6	6.1	7	6.1	7	5.2	8	0.3381
Natural Area	6.1	7	5.0	10	5.9	8	4.1	11	0.04412*
Playing Ground	6.1	8	4.8	11	5.1	9	5.1	9	0.4749
Grassland	5.0	9	6.8	6	6.2	6	6.8	6	0.07319
Ikhwane Area	4.2	10	6.0	8	4.3	11	5.3	7	0.0769
Woodlands	3.7	11	5.5	9	5.0	10	4.5	10	0.2102
Muti area	3.7	12	4.0	12	3.8	12	3.1	12	0.6877
Friedman Test P Value	<2.2e-16		=2.006e-09		=1.412e-15		<2.2e-16		

Table 5: Comparisons across agro-ecological zones showing mean scores and ranks of photographs with corresponding p-values according to the Kruskal-Wallis test. Statistically significant differences are shown with a star adjacent to the p-value. Friedman test p-values reveal strong trends in photograph rank across agro-ecological zones.

Landscape Photograph	**Lower Agro-Ecological Zone (n=40)**		**Middle Agro-Ecological Zone (n=37)**		**Upper Agro-Ecological Zone (n=40)**		**Kruskal-Wallis Test p-value**
	Mean Score	**Mean Rank**	**Mean Score**	**Mean Rank**	**Mean Score**	**Mean Rank**	
Garden	9.4	1	7.2	3	9.3	2	0.03631*
Drinking Water	9.0	2	7.4	2	8.8	3	0.3905
Tap	8.7	3	9.4	1	10.0	1	0.05988
Irrigating Water	8.1	4	6.0	5	7.5	4	0.1096
Field	7.8	5	6.5	4	7.3	5	0.467
Grassland	6.6	6	5.8	6	5.7	6	0.4364
Grazing Land	6.2	7	5.7	7	5.5	7	0.4201
Natural Area	5.6	8	4.8	11	5.1	10	0.6203
Woodlands	4.7	9	4.9	10	4.1	11	0.3016
Playing Ground	4.4	10	5.7	8	5.3	9	0.0431*
Ikhwane Area	4.0	11	5.0	9	5.5	8	0.03181*
Muti area	3.2	12	3.9	12	3.6	12	0.281
Friedman Test P Value	<2.2e-16		=2.636e-12		<2.2e-16		

Chapter 3: Figures

Figure 1: Study area showing the upper, middle and lower agro-ecological zones.

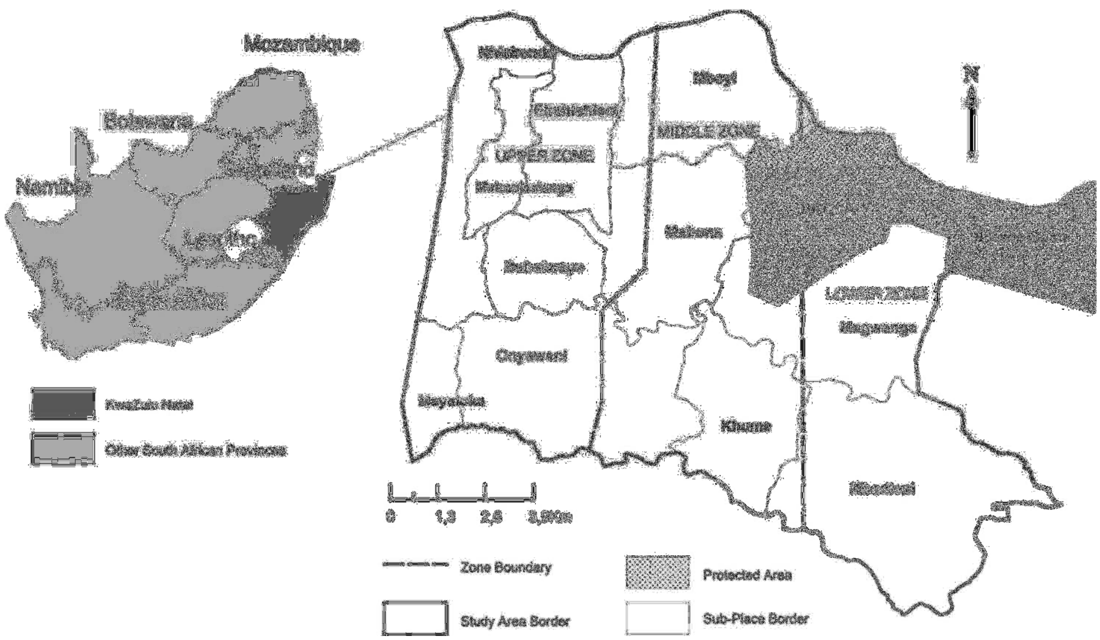


Figure 2: Visual conceptualisations of landscape from an ecoagriculture viewpoint.

(After: de Clerck, 2012).

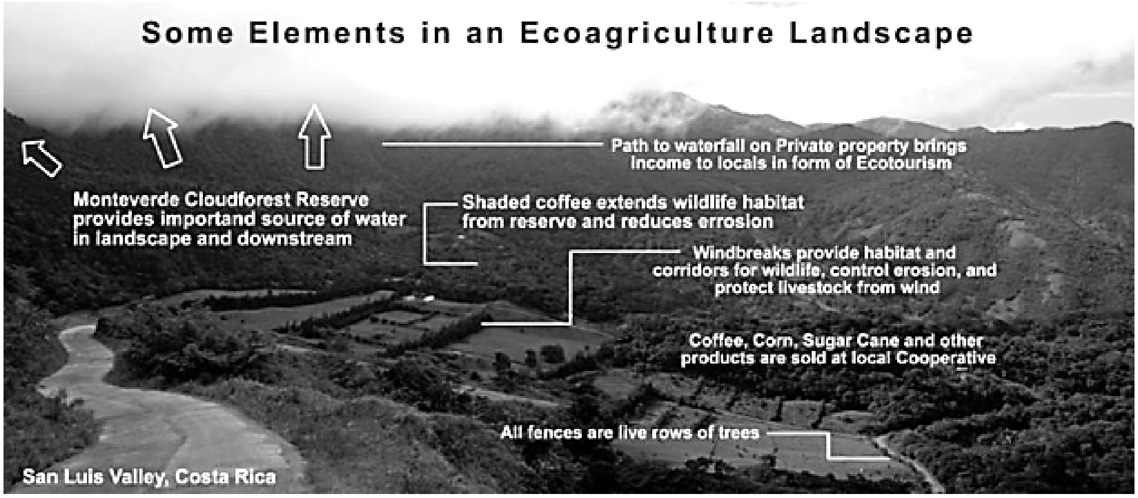
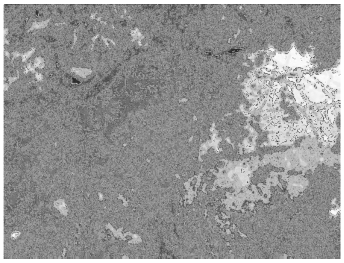
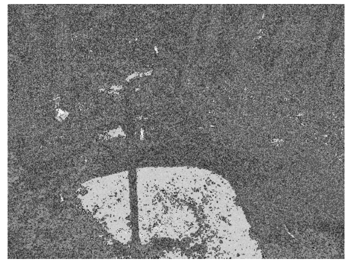


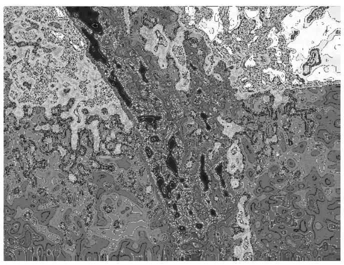
Figure 3: A sample of VEP photographs from the lower agro-ecological zone representing landscape as individual resource areas. The trend of capturing individual resource areas within landscape photographs existed across the study site.



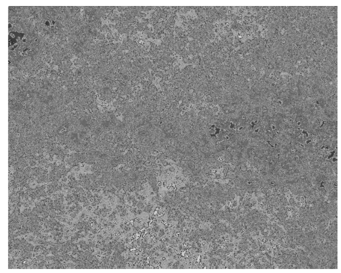
Drinking Water



Tap

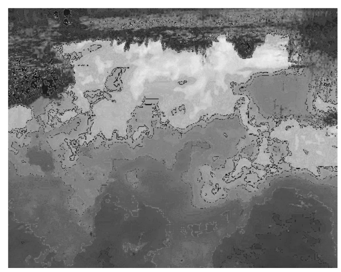


Woodlands



Grazing Land

Garden



Irrigating Water

Figure 4: The four photographs from the entire VEP exercise that participants ascribed with multifunctional purposes. Purposes listed under each photograph.

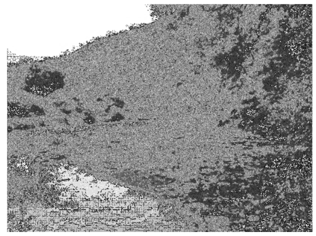
Cows grazing

Harvesting grass

Wood collection

Hunting

Honey collection



Fishing

Cows drinking

Harvesting medicine

Firewood

Hunting

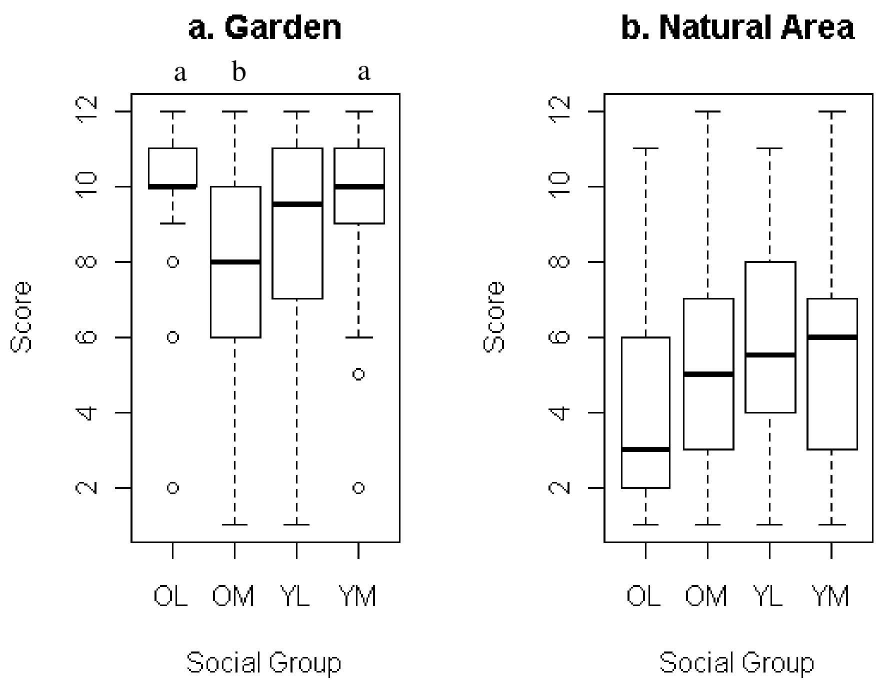
Grazing cows

Bees (Honey)

Water for washing, irrigating and building

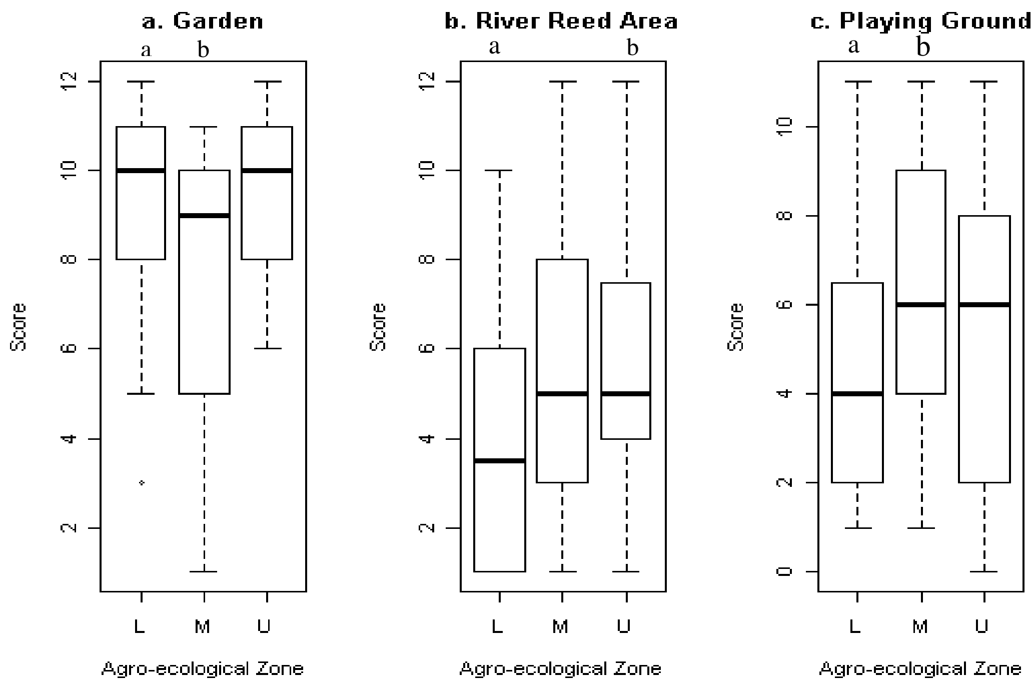
Bananas, River reeds (*Ikhwane*)

Figure 5: Boxplots showing rankings of landscape photographs that revealed statistically significant differences across social groups (Kruskal-Wallis test). Statistically different groups identified by multiple comparisons test are indicated by either an “a” or “b” above each bar.



Legend:
OL: Old Ladies
OM: Old Men
YL: Young Ladies

Figure 6: Boxplots showing rankings of landscape photographs that revealed statistically significant differences across agro-ecological zones according to the Kruskal-Wallis test. Statistically different groups identified by multiple comparisons test are indicated by either an “a” or “b” above each bar.



Legend:
L: Lower agro-ecological zone.
M: Middle agro-ecological zone.
U: Upper agro-ecological zone.

Chapter 4

Conclusion

This dissertation has examined the concept of landscape from the bottom-up in a Transfrontier Conservation Area (TFCA) of South Africa. Local conceptualisations of landscape have illustrated the importance of local knowledge which can be managed as important information within the sustainability agenda. This is because people need natural resources whilst these resources, in turn, need management from people (Jones, 2005). Shackleton *et al.* (2001) highlighted the utility that South African rural people gain from direct-use value of resources from landscape based activities.

Livelihoods and conservation were viewed as dual entities upon the landscape throughout this dissertation. Nakashima *et al.* (2000) explain that communities around the world have development rich sets of interpretations of the environment they are surrounded by leading to the development of local knowledge. For such reasons research into the socio-environmental field has increasingly embraced bottom-up approaches that encourage participation (Chambers, 2006). Therefore the consideration of the voices of local people contributes to the management of sustainability. In Chapters 2 and 3, participatory methods have unveiled insightful information concerning the concept of landscape. This unveiled local knowledge that can be integrated within ecoagriculture planning. Such process that unveils intricate details at local levels needs to occur in other socio-environmental agendas as it can contribute towards sustainability (Fraser *et al.* 2006).

Chapter 2 employed a transect walk methodology aimed at discovering local landscape perceptions. Rich qualitative and subjective information surrounding a local participant's perception of landscape was gained as a result of walking long distances in order to discuss specific landscape components on site. This local knowledge would otherwise not have been revealed had it not been for these lengthy walks. The SWOT analysis provided a guideline for discussions about the landscape, instead of an open ended discussion. The perceived strengths and weaknesses of landscape components provided insight into ecoagriculture management. This method revealed that the local people perceive the landscape as combinations of different types of resource units. These specific units were then used with a statistical comparative analysis unveiling further insights into the local perceptions of landscape.

Chapter 3 employed a visual technique (photo-elicitation) with a similar aim of understanding the concept of landscape from the bottom up within the MTA. People were asked to capture images of what they considered a "significant landscape." The use of a digital camera within rural participatory research is an innovative method (Harper, 2002; Beilin, 2005; Jacobsen, 2007; Garrod, 2008) and is highly recommended as it encourages enthusiasm and cooperation from potential participants, especially in remote rural areas where local people are thirsty to learn about modern technology. The process of taking photographs of landscape without the presence of the researcher ensures it is completely non-biased, allowing rich subjective data to surface. Photo-elicitation is therefore a powerful visual technique within the domain of participatory rural research. This created the articulation of a series of pictures that accurately represented a bottom-up landscape conceptualisation that was compared with corresponding ecoagriculture visual material. The open ended discussions surrounding the printed versions of photographs allowed for coding of key expressions from the dialogues. Photographs rendered from this exercise were further used for a statistical comparative analysis leading to the understanding of discrepancies of landscape understandings across social and spatial dimensions.

Both these participatory techniques provided insight into the bottom-up understanding landscape within the MTA and revealed similar qualitative results against which ecoagriculture understandings could be compared. Further research for the combination of livelihoods, agriculture and conservation should continue aiming at unveiling local knowledge through participatory methods and incorporate them into managerial practices. Livelihoods, however, are not dependent solely on landscapes but depend on external factors such as market and infrastructural access, as well as socio-political issues (Jones, 2005) requiring collaboration of local stakeholders with policy makers (Fraser *et al.* 2006). Fighting poverty at a landscape level is indeed one facet of the arsenal in the struggle against poverty.

From the bottom-up approaches used to understanding landscape at local levels key themes have emerged:

- Local, rural people are intertwined with their landscape in more complex ways than originally anticipated. These complexities, once understood, can contribute to the simultaneous synergy between people and nature.

- Participatory methods within the development and conservation agenda are vital. Local knowledge needs to be unveiled in order to effectively pursue mechanisms that effectively combine development and conservation.

- People's perception of landscape is based upon a subjective utility function that differs in many ways from the typical western view of landscape. Local people of the MTA landscape presented information that suggested this utility had a sharp connection with basic livelihood requirements such as food and shelter. This is different from that of a tourist in a beautiful area who subjectively views the landscape as a function of aesthetic utility.

- People perceive landscapes at different scales. Similarly to landscape perceptions the perception of scale is also a function of utility. A person from the MTA has a reduced sense of scale as utilities come from individual resource areas such as gardens, woodlands and water holes. Ecoagriculture, on the other hand, derives utility from broad scale combinations of livelihoods, agriculture and nature thus inspiring a greater perceived scale of landscape. As such, local people of the MTA understood landscape at a smaller scale than expected. At these scales, however, landscape mosaics that are consistent with the notions of ecoagriculture still exist.

- Within this study people's understanding of landscape was influenced by both the natural amenities of the landscape and the social context surrounding it. This is the result of a community that depends on a landscape milieu of natural resources that confines which undertakings are possible, whilst simultaneously existing within a rich cultural setting that conditions their connection with the landscape. This notion is consistent with Tress and Tress's (2001) approach to landscape as a transdisciplinary system whereby both natural and social sciences communicate. The landscape provides a link between these viewpoints whereby the social constructionist and the realist camps have interactions (Gross, 2001). Therefore the MTA landscape is no exception as people both shape and are themselves shaped by the landscape.

Within modern, western societies, people are increasingly adding to technocratic forms of capital that requires education and money. These forms of capital are continually distancing themselves from their foundation – natural resources (Beeton and Lynch, 2012). Within rural areas such as the MTA, People exist much closer to their natural resource base. Therefore, the landscape itself provides a form of capital as the local spatial arrangements of resource areas, natural areas and agricultural areas create a utility in itself. Supporting this statement, chapters 2 and 3 revealed that rural people have unique interconnected relationships with their surrounding landscape as it provides a means to a livelihood. Tscharntke *et al.* (2012) revealed the benefits of nearby natural areas to agricultural production areas for the function of pollination, pest management, erosion control, etc. As such, natural functioning of ecosystem services within these spatial arrangements also contributes to the value of this capital as it forms a framework whereby livelihoods can be improved. Lindenmayer (2008) argues that the benefits of agriculture and biodiversity functions can be synergized through effective landscape management. In this case, viewing the landscape as a form of capital is vital since it has been recognised that small scale farmers, not large scale monocultures, are the key to global food security, as the former more effectively links agricultural intensification to hunger reduction (Tscharntke *et al.,* 2012, Horlings and Marsdin, 2011; Chappell and Lavalle, 2011).

Within this context landscape capital is connected to other forms of capital:

- Natural capital: this relates to the value of goods and services derived from the natural environment (Costanza *et al.* 1998) such as values resources collected from natural areas.

- Environmental capital: This develops through unique awareness of nature held by rural people and forms the basis of rural people's identities (Beeton and Lynch, 2012).

- Knowledge capital: These are the understandings that people hold within memory that determine their values and beliefs (Pretty *et al.* 2009). This knowledge can be shared with the community regarding subsistence living upon this landscape. For example, people would refer to the importance of "knowing your landscape" within the study.

- Social capital: This is the measure of community cohesion that determines the community's ability to function (Beeton and Lynch, 2012). Within the MTA community rules exist that affect the way people interact with the landscape.

- Human capital: this is individual knowledge and skills needed to address the issue of sustainability (Beeton and Lynch, 2012). This could be an individual's knowledge on the spatial arrangements of unique landscape utilities that are available such as palatable water.

The findings of this dissertation found that local landscapes are understood from both social and natural dimensions and are at the nexus of nature and culture (Tress and Tress, 2001). These techniques that unveil bottom-up understandings of landscapes are therefore vital within the sustainability agenda. Fraser *et al.* (2006) advocate bottom-up processes within the sustainability domain. Specifically they suggest that mechanisms are necessary to bring top-down and bottom-up techniques together in order to measure sustainability initiatives. Additionally policy makers and local stakeholders need to collaborate in order to provide a framework for the implementation of local concerns whilst, at the same time, a sensitivity to scale is required when addressing issues from the bottom-up.

Finally it remains pertinent that agendas surrounding landscape initiatives remain sensitive the subjective utility function that a landscape presents to a local community. This subjective utility will change across physical and socio-economic contexts making each social-ecological system unique. Thus within landscape initiatives designed to achieve sustainability a dynamic sensitivity that embraces a collaborative bottom-up approach is required. By assessing local understandings of landscape this dissertation played a part of this role within the Lubombo Project and the Lubombo TFCA landscape initiatives.

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