TRANSFORMATION OF AGRICULTURAL AND UNDEVELOPED LAND IN THE BOLAND REGION OF THE WESTERN CAPE

BERNARD NIEMAND

Thesis presented in partial fulfilment of the requirements for the degree of Master of Arts in the Faculty of Arts and Social Sciences at Stellenbosch University

Supervisor: Prof JH van der Merwe

March 2011

DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date:…28 February 2011.

ABSTRACT

Land for agricultural development gets scarcer as more and more agricultural land is being transformed by non-agricultural uses. The increased agricultural land use change in the Western Cape Province results in transformation, fragmentation and loss of productive agricultural land.

With the A2 planning area of the Department of Environmental Affairs and Development Planning (DEADP), in the Boland region of the Western Cape, as its study area, this study investigates the role of legislative control measures on changes of land use from agriculture to a different form of development, by analysing the Environmental Impact Assessment (EIA) applications for the change of agricultural land use and agriculture applications for the conversion of undeveloped land for the period 1 January 1998 to 3 July 2006 . The study examines the role that the relevant legislation plays in agricultural land use control; considers the nature, extent and reasons for agricultural land use change in the study area (under the Environment Conservation Act (Act 73 of 1989) (ECA)); determines the impacts associated with the transformation of agricultural land use in the study area by assessing transformation of undeveloped land applications (captured under the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA)); and measures the amount of agricultural land potentially lost to development through EIA change of land use applications (according to the DEADP database) opposed to the amount of agricultural land potentially gained through conversion of undeveloped land (according to the DoA database).

Two databases were created, based on variables obtained from EIA change of agricultural land use applications authorised by DEADP [DEADP's database] and conversion of undeveloped land for agricultural use, authorised by the Department of Agriculture (DoA)[DoA's database]. The variables used to create DEADP's database are the applicant, property owner, type of property, development function, year of authorisation, municipality, town, size of property, permanent and temporary jobs created, percentage of property developed, footprint of development, existing land use and unique source. The variables used to create DoA's database are the year of authorisation, new and existing land use, year of authorisation, municipal area, property owner, percentage of property converted and footprint of development. The variables in the two databases are analysed using cross tabulations, with the variables measured against each other using pivot tables. The final tables are investigated

through interpretation of the results and making recommendations for better management and planning in the future, based on relevant literature.

The main findings are that DEADP gave authorisation for 416 agricultural land use change developments between 1 January 1998 and 3 July 2006, resulting in 2855 hectares of agricultural land potentially being developed. It was also found that DoA gave approval for 118 undeveloped land conversion applications, converting a total of 2589 hectares for agricultural purposes. The findings also revealed that 1707ha of this undeveloped land were covered with indigenous vegetation, while only 299ha were covered with alien vegetation.

The challenge is to use valuable agricultural land optimally and sustainably for agricultural purposes. Non-agricultural developments should be kept within the urban edge and away from valuable agricultural land. If such development must take place on agricultural land, it must be done on the poorest soils and should not jeopardise agricultural activities.

Keywords: land use change, undeveloped land, applicant, property owner, type of property, development function, year of authorisation, municipality, town, size of property, permanent jobs, temporary jobs, percentage of property developed, footprint of development, existing land use, new land use and unique source.

OPSOMMING

Grond vir landbou ontwikkeling word al hoe skaarser namate meer en meer landbougrond omskep word vir ander grondgebruike. Die gevolg is dat meer landbougrond in die Wes-Kaap omskep word vir ander ontwikkelingsdoeleindes, wat lei tot transformasie, fragmentering en verlies van produktiewe landbougrond.

Met die A2 beplanningsgebied van die Departement van Omgewingsake en Ontwikkelingsbeplanning (DOeOB), wat geleë is in die Boland streek van die Wes-Kaap, as studiegebied, ondersoek hierdie studie die rol van wetgewende beheermatreëls op grondgebruiksverandering vir die periode 1 Januarie 1998 tot 3 Julie 2006, deur Omgewingsimpakbepalings (OIB) aansoeke wat ‘n verandering van landbougrondgebruik insluit, asook landbou aansoeke wat die omskepping van onontwikkelde grond insluit, te ontleed. Die studie ondersoek die rol wat relevante wetgewing in landbougrondgebruikskontrole speel; analiseer die aard, omvang en redes vir landbougrondgebruiksverandering in die studiegebied soos voor aansoek gedoen in terme van die Wet op Omgewingsbewaring (Wet 73 van 1989); die impakte wat geassosieer word met transformasie van landbougrond deur verandering van landbougrondgebruik soos voor aansoek gedoen in terme van die Wet op Bewaring van Landbouhulpbronne (Wet 43 van 1983); en vergelyk die hoeveelheid landbougrond wat potensieel omskep is vir ontwikkeling deur middel van OIB verandering van grondgebruik aansoeke (volgens DOeOB databasis) teenoor die hoeveelheid nuwe landbou grond wat potensieel geskep is deur onontwikkelde grond te omskep vir landbou (volgens DvL databasis)..

Twee databasisse is geskep, gebaseer op veranderlikes wat verkry is uit OIB-aansoeke wat ‘n verandering van landbougrondgebruik ingesluit het en deur DOeOB goedgekeur is [DOeOB databasis] en aansoeke wat ‘n verandering van onontwikkelde grond vir landboudoeleindes insluit, goedgekeur deur die Departement van Landbou (DvL) [DvL databasis]. Die veranderlikes in die DOeOB databasis te skep sluit die volgende in: aansoeker, eienaar, tipe eiendom, tipe ontwikkeling, jaar van goedkeuring, munisipale area, dorp, groote van eiendom, permanente en tydelike werksgeleenthede geskep, proporsie van grond ontwikkel, voetspoor van ontwikkeling, bestaande grondgebruik, nuwe grondgebruik en unieke bron. Die veranderlikes in die DvL databas is: jaar van goedkeuring, nuwe en bestaande grondgebruik, munisipale area, dorp, grondeienaar, proporsie van

grond ontwikkel en voetspoor van ontwikkeling. Die veranderlikes in die twee databasisse is ontleed deur kruistabelle. Die finale tabelle word geanaliseer deur die resultate te interpreteer en voorstelle te maak vir beter bestuur en beplanning in die toekoms, gebaseerd op relevante literatuur.

Die hoof resultate van die studie toon dat DOeOB goedkeuring gegee het vir 416 landbougrondgebruiksveranderingontwikkelings tussen 1 Januarie 1998 en 3 Julie 2006, wat moontlik veroorsaak het dat 2855 hektaar landbougrond ontwikkel is. Die resultate dui ook dat DvL goedkeuring uitgereik het vir 118 ontwikkeling van onontwikkelde grond aansoeke, wat ’n totaal van 2589 hektaar grond potensieel omskep het vir landbou doeleindes. Die bevindinge bevestig ook dat 1707 hektaar van die onontwikkelde grond bedek was met inheemse plantegroei, terwyl slegs 299 hekaar bedek was met uitheemse plantegroei.

Die uitdaging vir die toekoms is om vrugbare landbougrond optimaal en volhoubaar te gebruik vir landbou. Nie-landbou ontwikkelings moet binne die stedelike grens geskied, weg van vrugbare landbougrond. Indien ontwikkeling op landbougrond plaasvind, moet dit op lae-potensiaal landbou grond geskied en geensins landbou aktiwiteite benadeel nie.

Kernwoorde: grondgebruiksverandering, onontwikkelde grond, aansoeker, eiendoms eienaar, tipe eiendom, tipe ontwikkeling, jaar van goedkeuring, munisipale area, dorp, groote van eiendom, permanente werksgeleenthede, tydeike werksgeleenthede geskep, persentasie van grond ontwikkel, voetspoor van ontwikkeling, bestaande grondgebruik, nuwe grond gebruik en unieke bron.

ACKNOWLEDGEMENTS

First, I thank my Father in heaven for giving me the opportunity and providing me with the ability and perseverance to complete this study.

Special thanks to my mother for encouraging and motivating me throughout.

Thanks to my family and friends for their understanding and sympathy.

Many thanks to Mandy Aubrey for allocating me all the required files and to Ayub Mohamed, Mare-Liez Oosthuizen and Gerhard Gerber for their advice and editing my thesis in their private time.

Much appreciation to Wollie Alheit for assisting me with the allocation of the conversion of undeveloped land applications on the Department of Agriculture's database and Rudolph Roscher for providing me with relevant information regarding this study.

Thanks to the Directorate: Spatial Planning (Department of Environmental Affairs and Development Planning), especially Shaheen Jamaloodien, and Lucille Pietersen for assisting me with the geographical information systems software and maps.

Finally, thanks to my supervisor Prof. JH van der Merwe for guiding me with his expertise and sustained input.

CONTENTS

Page

TABLES

Page

FIGURES

Page

ACRONYMS

ARC	Agricultural Research Council
BWI	Biodiversity and Wine Initiative
CARA	Conservation of Agricultural Resources Act, Act No. 43 of 1983
CFK	Cape Floristic Kingdom
CN	CapeNature
CSIR	Council for Scientific and Industrial Research
CoCT	City of Cape Town
CoCT: OA	City of Cape Town: Oostenberg Administration
CoCT: TA	City of Cape Town: Tygerberg Administration
CONEPP	Consultative National Environmental Policy Process
DALR	Department of Agriculture and Land Reform
DEADP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DoA	Department of Agriculture
DTEC	Department of Tourism, Environment and Conservation
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, Act 73 of 1989
EIA	Environmental Impact Assessment
EMI	Environmental Management Inspector
GIS	Geographic information system
GN	Government Notice

HWC	Heritage Western Cape
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
LUPO	(Western Cape) Land Use Planning Ordinance, Ordinance 15 of 1985
MoU	Memorandum of Understanding
NEMA	National Environmental Management Act, Act 107 of 1998
PPP	Public participation process
RoD	Record of Decision
SALA	Subdivision of Agricultural Land Act, Act 70 of 1970
SALRA	Subdivision of Agricultural Land Repeal Act, Act 64 of 1998
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SoER	State of the Environment Report
SUAR	Sustainable Utilisation of Agricultural Resources Bill
WCPSDF	Western Cape Provincial Spatial Development Framework

CHAPTER 1: A FRAMEWORK FOR LAND USE RESEARCH IN THE WESTERN CAPE

Sustainable agricultural development plays a vital role in maintaining, supporting and promoting development in the developing world; the agricultural sector providing food security, economic growth and employment opportunities. The agricultural sector is, however, also important for other reasons, including efficiency in land use, water resource management and environmental protection, and these aspects require careful consideration (Bennett 1994). Recognition of these matters has led to some changes in policies to address the problems regarding inappropriate land use such as improper resource use, overexploitation, deforestation, overgrazing and non-sustainable agricultural practices (Kuyvenhoven & Van Pelt 1994). This chapter gives a general indication of the importance of conservation of agricultural land nationally and provincially. The chapter also provides a framework for land use research in the Western Cape by analysing land use dilemmas in the Western Cape and illustrating the research problem, aim and objectives as well as the study region, data and research methods explored, the research design and report structure for this study.

1.1 Importance of agricultural land

Agriculture plays an important role in meeting the demands of future populations, especially in terms of eradicating poverty, providing food security and empowering rural communities in countries such as South Africa (United Nations 2002). Agricultural land is also essential for the survival and well-being of people throughout the world. In spite of losing agricultural land to urban and industrial uses, many efforts to improve and increase land productivity have continued over the years. Many of these efforts can be ascribed to the desire of farmers to pass farmland on to their successors, in just as good a condition as when they inherited it (Greenland, Gregory & Nye 1998).

The world's population is not likely to stabilize until it reaches between 8 and 13 billion people, and even at the lowest estimates there will be a great need for agricultural production to increase substantially if the necessary nutrition levels are to be ensured (Kirkby, O'Keefe & Timberlake 1995). Sub-Saharan Africa's per capita food supplies are lower than any other region in the world, with factors that contribute to the continent's crisis including declining food imports, high population growth rates, declining stocks of cropland, increasing soil erosion due to unsustainable agricultural practices and increasing environmental degradation (Kent & Myers 2000). Food production in Sub-Saharan Africa is unlikely to grow annually at a better rate than 2.3% until 2010, while population growth remains at

around 2.5% per year (United Nations Development Programme 1999; United States Department of Agriculture 1999). The subcontinent plainly faces a constant food supply crisis.

Agricultural land is the most important component of South Africa's natural resource base and provides an indication of the country's development potential and the future food security of its inhabitants (Fuggle & Rabie 1992). An adequate supply of quality agricultural land is essential for the economic, social and environmental well-being of the citizens of a country (Lyson & Olson 1999). According to Vink (2003), agriculture plays an important role for communities in the Western Cape Province by:

- Ensuring food security of the nation, especially for its poorest households;
- Creating employment opportunities in rural areas which have positive effects, such as enhanced social security, development of rural areas and lower rates of crime;
- Benefitting the environment, and leading to further positive effects such as the maintenance of biodiversity;
- Attracting foreign investment, such as the case with the wine and fruit industries over the last 10 years. It is estimated that approximately 20% of the investment in the Western Cape wine industry comes from outside South Africa; and
- Inducing research which stimulates development in the sector through the development of new technologies such as biotechnology, production management processes, supply chain integration and environmental care.

Agriculture in the Western Cape provides approximately 23% of South Africa's total agricultural production while it contributed 5.2% of the Western Cape's gross regional product of R185.4 billion in 2004 (Agriculture Sector Brief 2005/2006). Agricultural activity in the Western Cape covers an area of 11.5 million hectares. Although this is only 12.4% of the total agricultural land available in South Africa, the Western Cape produces between 55% and 60% of national agricultural exports, valued at more than R7 billion per year (Agriculture Sector Brief 2005/2006).

The Western Cape agricultural sector not only stimulates economic growth but it also plays a major role in creating sustainable job opportunities. The agricultural sector is responsible for 13% of all formal job opportunities in the Western Cape. These include 8 500 commercial farmers, 2 500 development (novice) farmers and 220 000 farm workers, who in turn support over 1.5 million

dependents (Agriculture Sector Brief 2005/2006). Clearly, agriculture is one of the pillars of the Western Cape economy.

1.2 Land use dilemmas in the Western Cape

The competitiveness of the agricultural sector and increase in producer prices often force farmers to consider alternative ways of generating income, which include rezoning and/or subdividing and selling the land for non-agricultural uses (CAPE Info Sheet 2001). The great need for housing, services and infrastructure in most communities in the Western Cape is contributing to urban sprawl, and this is putting pressure on agricultural land to be rezoned for non-agricultural uses. Not only urban development put pressure on agricultural land, but also rural development such as afforestation, desertification and fragmentation of agricultural land into non-economical units (Bergstrom, Goetz & Shortle 2005). The challenge is to prevent the rezoning of valuable agricultural land to non-agricultural uses by preserving land with agricultural potential as a national asset (South Africa 1998a). The following sections investigate the main contributors and cause of development pressure as well as the associated impact on agricultural land.

1.2.1 Development pressure and land use dynamics

Development pressures are mostly driven by human activity which creates the need for the development of necessities such as housing, infrastructure and services, which in turn gives developers an opportunity to gain some economic benefits (Bockstael 1996). The main factors causing development pressure on agricultural land are the increase in human population, instability of currencies, farming systems, disturbances of different land use types and the need for infrastructural development (Ouadba et al. 2008). The intensification and diversification of different land uses, caused by development, influences the functioning of natural processes and landscape dynamics, which in turn affect human well-being (Knickel 2007). It is therefore important that the negative impacts associated with these interlinked processes are assessed and steps taken to prevent any further negative occurrences.

The main cause of inappropriate land use change in the Western Cape is the clearing of land for socio-economic uses such as urban settlements (Giliomee 1994). Other forms of unsuitable land use change in the Western Cape are inappropriate road construction, forestry planting, and inappropriately located rural and informal settlements which all contribute to land degradation (Garland, Hoffman & Todd 1999). These inappropriate agricultural land use changes, as well as the construction of recreational

activities and the expansion of urban settlements (including associated infrastructure), put additional pressure on the remaining agricultural land as it leaves less land for farming. Another factor that contributes to development pressure on a piece of land is limited water resources. As urbanisation accelerates, the competition for water between urban and agricultural uses increases (DEADP 2005a). The Western Cape has high levels of urbanisation because of its favorable location and high environmental quality, putting pressure on natural resources and undeveloped rural areas. It is therefore important to ensure a suitable balance between economic development and the conservation of agricultural land and biodiversity in these rural areas (DEADP 2005b).

The problem with land use change is that role players do not always consider the agricultural, cultural, demographic and socio-economic characteristics of an area before the land is actually developed, resulting in unsuitable land use changes (Lockeretz 1988; Werner 1993). These land use changes often result in negative impacts such as congestion, air and water pollution, loss of biodiversity, fragmentation of agricultural land and flooding (Polyakov & Zhang 2008). Land use changes also entail the expansion of existing urban areas resulting in the deterioration of ecosystem services when development is not properly planned (Polyakov & Zhang 2008).

1.2.2 Agricultural land under pressure

Inappropriate land use practices in South Africa have been in the foreground of agricultural and political debates for many years (Fey & Mills 2003). Developments on agricultural land in the Western Cape have been a sensitive topic in the media in the recent past. Examples are numerous (*Cape Times* 2001, 2006; Carter 2004; *Die Burger* 1990; Duvenhage 2006; Essop 2005, 2006; Herman 2005; Jordaan 2001; MacLennan 2004; Morris & Yeld 2004; *Paarl Post* 2001; Powell 2007; *Saturday Weekend Argus* 2004a, 2004b; Steenkamp 2006; Thamm 2006; *The Herald* 2005; Visser & Van Huyssteen 1997) and they indicate the seriousness with which agricultural land use change in the Western Cape is viewed.

The remaining undeveloped land in the Western Cape is mostly agricultural land and given the population growth in the Western Cape there is an increased demand to acquire some of this undeveloped land to expand the urban edges of the cities and towns in the province. This puts the remaining agricultural land, especially the land surrounding urban areas, under great development pressures. The development of these rural areas for urban uses places increased pressure on rural land used for agriculture, as agricultural land use is replaced by urban developments (Lockeretz 1988). It

also has serious implications for the conservation of biodiversity and for the prospects of sustainable agriculture (Rookwood 1995). The establishment of conservancies and reserves are also contributing to agricultural land being rezoned to non-agricultural uses. As this market is fairly new and still being explored in the Western Cape, it has the potential to contribute to large amounts of agricultural land being rezoned in future (CAPE Info Sheet 2001). Factors such as the instability of the Rand, increasing international competition and a rise in property taxes place additional pressure on agricultural land as farmers are forced to consider alternative ways to generate income on farms, which mostly results in the subdivision or rezoning of agricultural land for non-agricultural development and resort purposes (Duvenhage 2006).

Often unsustainable agricultural practices such as overgrazing and soil erosion reduce the production potential of agricultural land, leading to the rezoning of the land to alternative land uses that are more economically viable on degraded agricultural land (Fraser & Mabusela 2003). In these instances it is argued that it is more appropriate to develop the land as it will mean that degraded, unused land will be optimally (from an economic point of view) used. Fragmentation of agricultural land in the Western Cape also contributes to a large quantity of agricultural land being lost to non-agricultural developments. This often entails the subdivision of farms into smaller unsustainable agricultural units, where the subdivided units are then used for non-agricultural purposes (Van der Westhuizen 1998). Fragmentation makes supervision and protection of the land difficult and results in small and uneconomic sized operational holdings (Bizimana, Ferrer & Niewoudt 2004). Farm tourism also contributes to the subdivision and rezoning of agricultural land in the Western Cape by stimulating the establishment of a variety of activities such as guest houses, conference facilities and off-road tracks (Jordaan 2001). Field sports such as golf, horse racing, polo and tourism resorts are greatly contributing to the rezoning of agricultural land uses. An example is the approval of the multibillion Rand lifestyle developments along the south and east coast of South Africa, where 77% of the proposed sites are on high potential agricultural land (Thamm 2006). Urban sprawl and luxury housing estates are two of the main contributors to agricultural land use change in the Western Cape (*Cape Times* 2006). There is an environmental price to pay as either large tracts of natural vegetation or some agriculture uses are being replaced by resort and urban developments (Mannion 2002).

One of the greatest concerns is that agricultural land in the Western Cape has more or less reached its capacity in terms of expansion, leaving very little land for future agricultural expansion. This puts a heavy responsibility on current generations to preserve the existing agricultural land for future

generations. Undoubtedly, there are numerous challenges facing the preservation of agricultural land in the Western Cape (Organisation for Economic Cooperation and Development 2006).

1.3 Research problem

Farms in the Western Cape are struggling because of the instability of the Rand, increased international competition, changing environmental conditions and water scarcity. Farmers are being forced to consider alternative ways to generate additional income, such as small tourist facilities (Duvenhage 2006). These tourist attractions on farms are mostly associated with non-agricultural activities, resulting agricultural land being rezoned and fragmented into uneconomical units (DEADP 2005c). According to the Department of Environmental Affairs and Development Planning (DEADP), 416 environmental impact assessment (EIA) applications for agricultural land use change were submitted within the study period ranging from 1 January 1998 to 3 July 2006, signaling a loss of agricultural land. This rapid change of agricultural land use also resulted in a change of undeveloped land for agricultural purposes, as agricultural land was getting scarcer and farmers wanted to expand their production. This was confirmed by the Department of Agriculture (DoA), namely that in the same period, 118 land owners applied for a change in land use from undeveloped land to agricultural use. These land use changes do not hold a threat only to agricultural land, but also to biodiversity, as potentially large areas of undeveloped land (mostly covered with indigenous vegetation) are being converted. Comparison of the applications received by the two departments indicates that 52 applications for conversion of undeveloped land did not obtain the necessary EIA authorisation, implying that these land conversions most probably commenced without proper environmental assessement. These unauthorised land conversions pose a serious threat to biodiversity and water sources in the Western Cape (De Villiers & Hill 2007). Consequently, it is important to investigate these land use changes to determine the degree and amount of agricultural and natural land transformed.

1.4 Research aims and objectives

The purpose of the study was to analyse agricultural land use changes gauged by EIA and conversion of undeveloped land applications in the Boland region of the Western Cape for a 102-month study term (active period of the ECA EIA listing regulations) to establish the status quo of agricultural land transformation. This was achieved by creating two databases. The one comprised variables obtained from EIA applications for change of agricultural land use (to the DEADP), hence called the “DEADP database”. The other database consisted of applications for the transformation of undeveloped land (to

the DoA), hence referred to as the "DoA database". These two databases were used to determine the total amount of agricultural land potentially lost through developments changing agricultural land use and the total amount of agricultural land potentially gained by transformation of undeveloped land to agricultural use developments respectively. The databases also provide information to establish extent, nature andreasons of agricultural land transformed to non-agricultural land uses, as well as undeveloped land transformed for agricultural land uses. The study also examined the intended role and function of legislative control measures on agricultural land use change.

The aims will be achieved by addressing six research objectives, namely to:

1. Undertake a literature review on the importance of agricultural land and land use dilemmas in the Western Cape as well as relevant legislation, and changes in legislation pertaining to land use change control pertinent to the Western Cape;
2. Survey literature on EIAs as a land management tool and their role within agricultural land use change and also how local management strategies and programmes aim to prevent loss of agricultural land;
3. Determine the nature, extent and rationale of agricultural land use change in the study area through analysis of EIA applications in the DEADP database;
4. Determine the nature and extent of undeveloped land conversion in the study area through analysis of undeveloped land conversion applications in the DoA database;
5. Measure the amount of agricultural land potentially lost to developments through EIA change of land use applications (on the DEADP database) as opposed to the amount of agricultural land potentially gained through conversion of undeveloped land (on the DoA database).

The first two objectives aim to provide some background on agricultural land use change in the study region with insight on all the applicable legislation. The third objective will focus on the impacts associated with agricultural land use change, while the fourth objective will focus on the impacts associated with the conversion of undeveloped land in the study area. The last objective analyses the footprint associated with land use change by measuring the amount of agricultural land potentially lost through change of agricultural land use against the amount of agricultural land potentially gained through conversion of undeveloped land.

1.5 The study region

For administrative purposes the DEADP has divided the Western Cape into four management regions. These regions, shown in Figure 1.1, are A1 (Garden Route and Central Karoo), A2 (Boland), B1 (Overberg and South Peninsula) and B2 (City of Cape Town and West Coast).

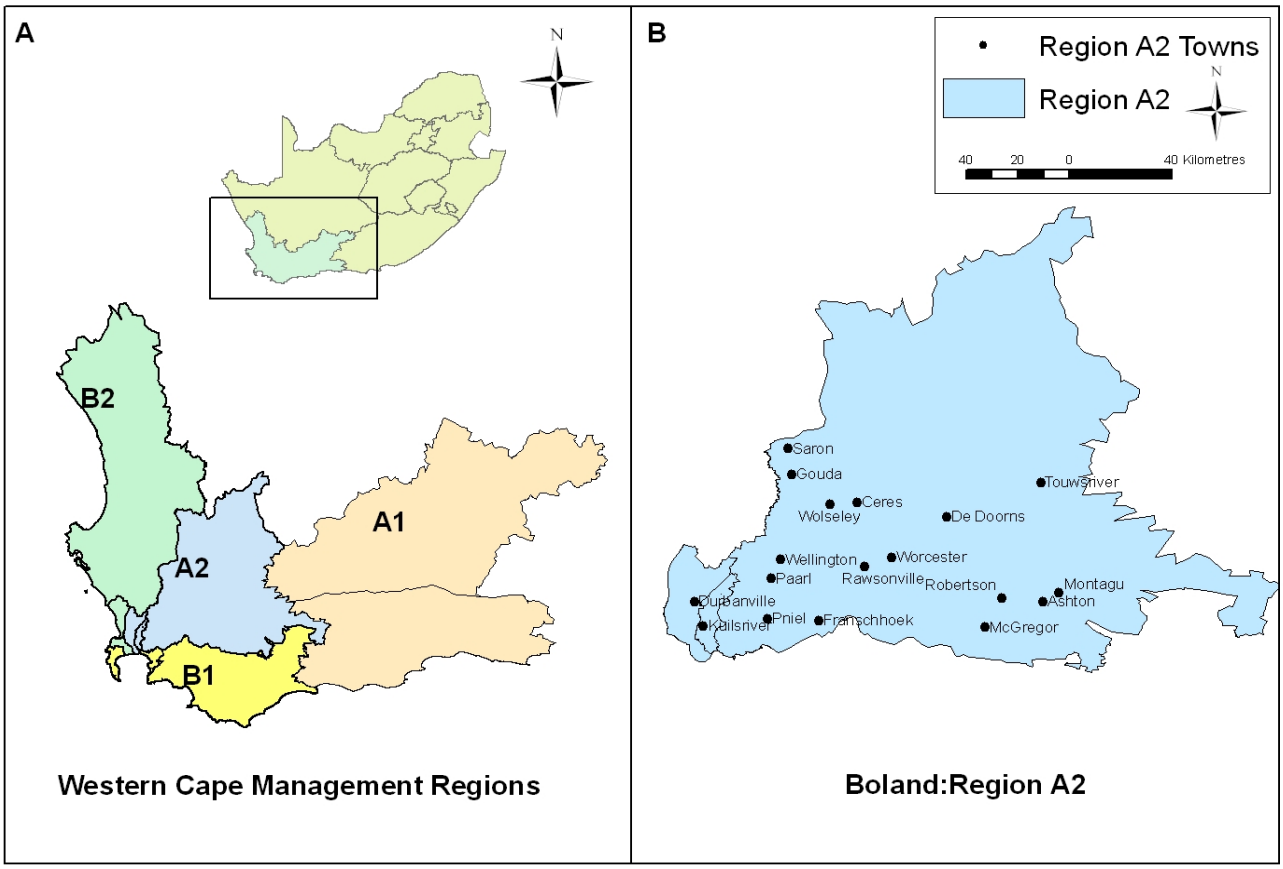


Figure 1.1 The study area

Figure 1.2 illustrates the administrative structure of the study area in terms of the municipalities. Municipalities in the study region include the CoCT: TA and CoCT: OA. CoCT, Stellenbosch, Drakenstein, Witzenberg, Breede River Winelands and Breede Valley municipalities of which Breede River Winelands is the largest and CoCT: Oostenberg Administration is the smallest. Table 3.5 lists the size of the different municipalities, proportional percentage covered by each municipality and percentage of conversion applications in each municipal region. Figure 1.2 also depicts the five main urban settlement hubs in the study area consisting of McGregor, Ashton, Montagu and Bonnievale located in the east; Worcester in the centre of the study area; Wolsely, Ceres, Tulbagh, Saron and Gouda in the north-west; Paarl and Franschhoek in the south and Kuilsriver in the west, bordering on the Cape Metropolitan Area (CMA). The main towns congregate around these main settlement hubs and this is where most of the applications originate.

1.6 Data and research methods

The data used for this research were obtained from a range of secondary sources and empirical databases. The former sources are books, documents, theses, academic journals, subject journals, the

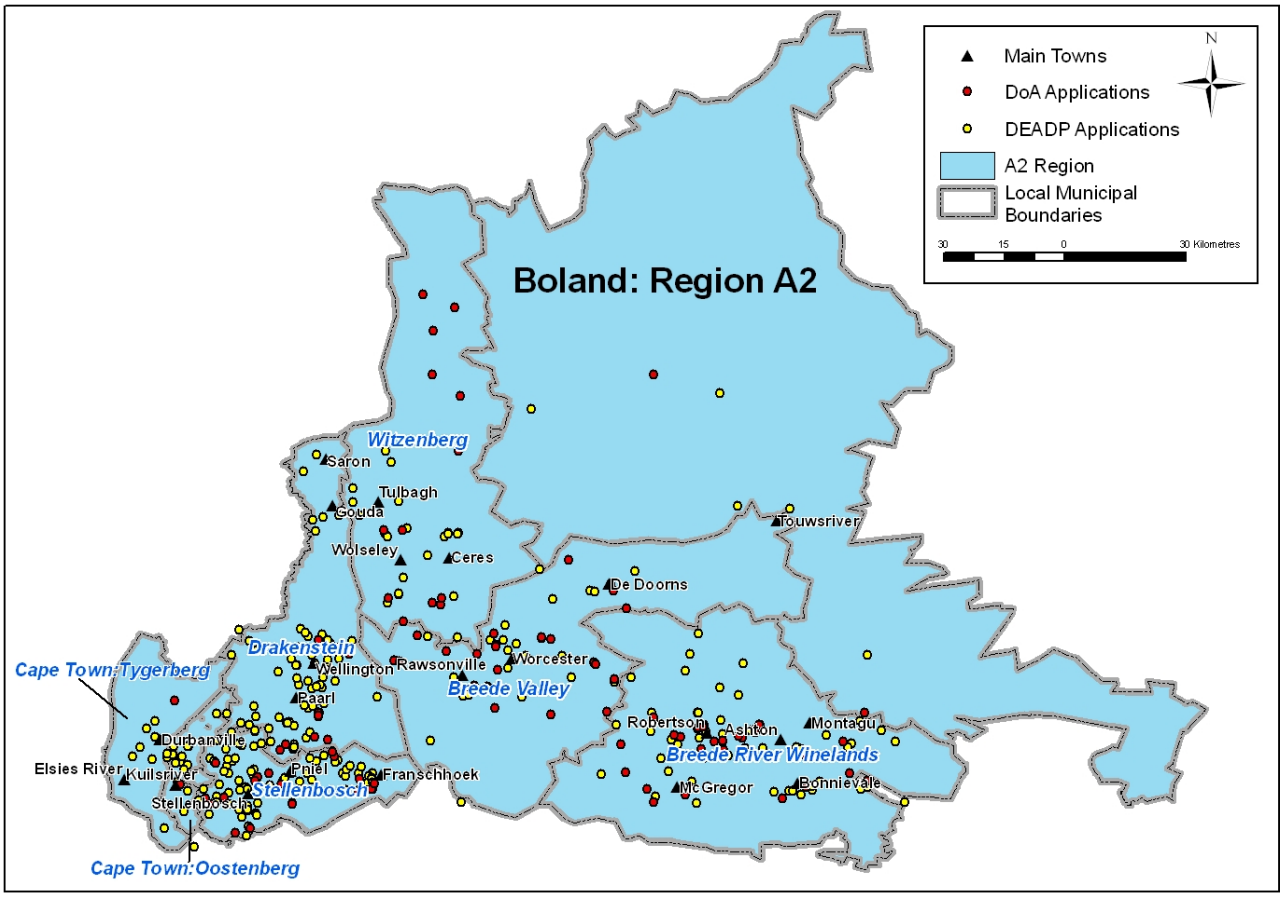


Figure 1.2 Local authorities in the Boland A2 study area

South African electronic media database (Sabinet Online, Science Direct, CAB Abstracts and South African Studies), internet sites and personal communications. Empirical data regarding the change of agricultural land use were obtained from the DEADP database and the transformation of undeveloped land drawn from the DoA database. These sources are discussed separately in the next two sections.

1.6.1 Literature sources

The literature used for this study was mainly obtained from Stellenbosch University's JS Gericke library, where the library catalogue and databases provided a variety of books, journals, and theses. Subject librarians assisted graciously in this regard. The libraries of the Agricultural Research Council

(ARC) (Infruitec) and the Council for Scientific and Industrial Research (CSIR) were consulted but they did not contain much relevant literature. Information documents, guidelines and links to other useful sources were provided by various officials working on topics relevant to this search, employed by the National Department of Agriculture, the Provincial Department of Agriculture, the South African National Biodiversity Institute (SANBI), the Botanical Society of South Africa and the DEADP.

The keywords used for the information searches were: land use change, agriculture, subdivision, transformation, conversion, sustainable agriculture, sustainability, land use conversion, irreversibility, ecological sensitivity, conservation, biodiversity, landscape consistency, environmental law, legislation and LandCare Areawide Planning. These keywords helped to find relevant information and links to other useful sources, which made a large contribution to literature sources. In this way a satisfactory coverage of conceptual and factual background to the research was obtained.

1.6.2 Empirical databases

With most of the activities earmarked for regulation listed in terms of ECA coming into effect during early 1998, and with the activities listed in terms of ECA being repealed by the activities listed in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) on 3 July 2006, the study period of 1 January 1998 to 3 July 2006 was chosen (active period of the ECA EIA listing regulations). The DEADP database recorded variables from all application files for change of agricultural land use (authorised in terms of the ECA), between 1 January 1998 and 3 July 2006. A total of 416 applications obtained from the DEADP registry in Cape Town were processed for the study area, representing a 100% sample. Each application was systematically examined for information on the selected variables listed in Table 1.1 and stored in Microsoft Excel format. For the same study period, 1 January 1998 to 3 July 2006, all the records in the DoA database for applications in terms of CARA for the cultivation of new land which had not been disturbed previously i.e. undeveloped or natural land, were processed. All 118 cultivation of undeveloped land applications for the study area, likewise representing a 100% sample, were obtained from DoA's registry in Bellville. There are a number of differences between the two data sets and the uses to which they were put. The DEADP database contains variables recorded from EIA applications for change in agricultural land use according to the DEADP registry in Cape Town, whereas the DoA database comprises variables recorded from applications to cultivate new land as documented in the DoA registry in Bellville. The two types of applications follow more or less the

same administrative path, the difference is that the DoA applications are submitted by the applicants (mostly farmers), who submit it to DoA, who then send a copy to DEADP for their comment in terms of the EIA regulations, while the DEADP applications is submitted directly to DEADP by the applicant

Table 1.1 Variables in two databases for the analysis of agricultural land use change

Variables in the DoA database	**Variables in the DEADP database**
File reference	File reference
Property owner	Property owner
Year of authorisation	Year of authorisation
Town	Town
Municipality	Municipality
Point coordinates (latitude)	Point coordinates (latitude)
Point coordinates (longitude)	Point coordinates (longitude)
Footprint of proposed development (ha)	Footprint of proposed development (ha)
Size of property (ha)	Size of property (ha)
Percentage of property developed	Percentage of property developed
Previous land use	Existing land use
New land use	New development or upgrading of existing development
	Development Function
	Applicant
	Permanent jobs created
	Temporary jobs created
	Land use adjacent to proposed development
	Unique source on proposed site
Number of Records: 118	**Number of Records: 416**

(mostly developers) with all the required information (including comment from Department of Water Affairs and Forestry (DWAF), CapeNature (CN), Heritage Western Cape (HWC) and DoA which will be used to make a decision in order to authorise or refuse the change of agricultural land use. The DEADP database was analysed to determine the nature, extent and rationale of agricultural land use change through analysis of the variables in the database, while the purpose of the DoA database was to support an analysis of the implications of the transformation of undeveloped (virgin) land. Analysis of the DEADP database specifically considered the total amount of agricultural land potentially rezoned to a non-agricultural land use (agricultural land lost to other land uses), whereas the analysis of the

DoA database specifically considered the total amount of new land potentially developed for agricultural use (agricultural land gained), conversely contributing to loss of undeveloped (virgin) land, consisting mostly of natural habitat. The DoA database was also analysed to determine the size and type (e.g. alien and natural vegetation) of converted undeveloped land.

The DEADP and DoA databases were analysed statistically in the Excel programme. Initial analysis entailed the generation of descriptive statistics for relevant variables. This was followed by relational tables to expose significant underlying relationships among variables.

1.7 Research design

The research design divided the research into four phases that guided this study. The first phase consisted of the research design and data gathering, comprising mainly the first chapter which includes the study rationale and research approach as well as the compilation of the DoA and DEADP databases. The second phase was partially a literature review process, consisting mainly of obtaining relevant literature to support the importance of agricultural land use change analisys, conservation and EIAs. The second part of this phase reviews the role that relevant legislation, management strategies and programmes are playing to prevent the loss of agricultural land (the second chapter). The third phase is an empirical data analisys which consist of a statistical analysis of the DEADP and DoA databases in order to determine the nature and extent of land use changes (agricultural land use change and conversion of undeveloped land) in the study region (third and fourth chapters). The last phase of the research is a synthesis of the conclusions and recommendations from the study (the final chapter). Figure 1.3 is a graphical depiction of the research design and its different phases.

1.8 Research report structure

This study consists of five chapters, each addressing an integral part of the study in order to achieve the desired outcomes. Figure 1.3 shows the interrelation between those various structural elements.

Chapter 1 provides background regarding the land use problems in the Western Cape and states the research problem, aims and objectives, describes the study area, explains the origin of the database and presents the research design.

Chapter 2 focuses firstly on the literature about the issues that stimulated this study and the development of integrated environmental management (IEM) and environmental impact assessment (EIA) as procedures to manage the change of agricultural land use.

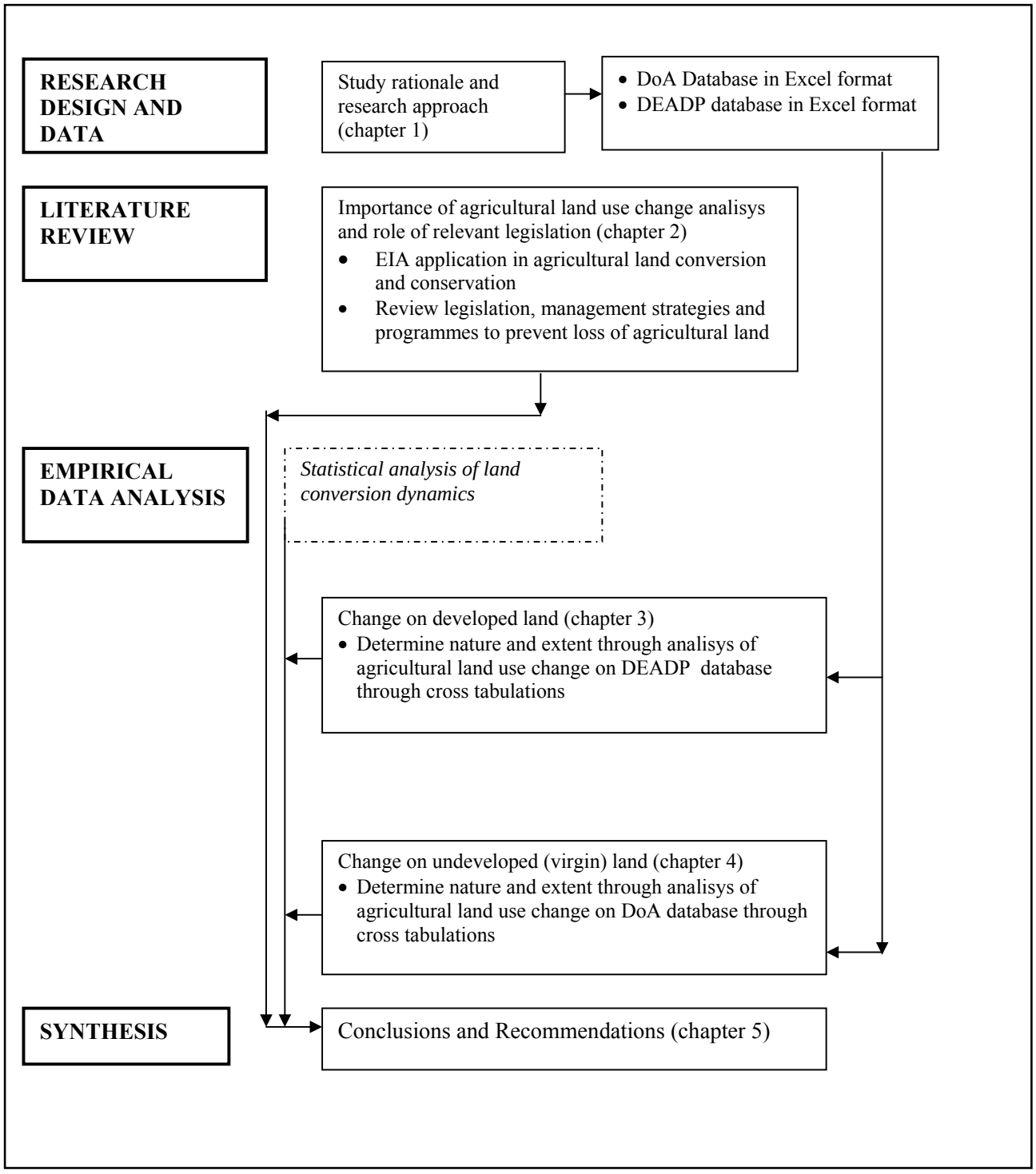


Figure 1.3 Research design

The latter section of this chapter examines the role of legislation in the conservation and transformation of agricultural land and examines the Environment Conservation Act, the National Environmental Management Act, the Conservation of Agricultural Resources Act, the Sustainable Utilisation of Agricultural Resources Bill and the Land Use Planning Ordinance. The chapter also examines strategies and programmes implemented to prevent the loss of agricultural land, such as LandCare Areawide Planning and the Western Cape-specific Biodiversity and Wine Initiative, and the Western Cape Provincial Spatial Development Framework.

Chapter 3 presents the first set of empirical findings about the investigation of the nature, extent and rationale of agricultural land use changes in the study area. It entails an analysis of authorised EIA applications in the study period. The chapter concludes by assessing the sustainability and implications of agricultural land use conversions.

Chapter 4 analyses the impacts associated with the transformation of undeveloped land to an agricultural land use, implying the cultivation of land. The chapter investigates the extent and nature of the transformation of undeveloped land that underwent an EIA. The second section of the chapter reports on the amount of agricultural land potentially lost through change of land use as opposed to agricultural land gained through transformation of undeveloped land to agricultural uses. The chapter is concluded with an assessement on the status of natural habitat as a reflection of the integrity of indigenous vegetation.

Chapter 5 concludes the study by summarising the results, revisiting the research aims and objectives, drawing conclusions and making recommendations.

CHAPTER 2: THE ROLE OF AGRICULTURAL LAND USE CHANGE ANALYSIS, CONSERVATION AND LAND USE RELATED LEGISLATION IN AGRICULTURAL LAND TRANSFORMATION

Land use involves human manipulation of, and impact on land cover. People use land for a wide range of purposes which can be divided into two categories: existentialities (necessities of life) and wealth generation (Mannion 2002). The term *"land use"* reflects the function of land units including the human use of land, which mostly has economic significance. Land use change is also dependent on natural factors such as climate, soil type and condition, hydrology and geology, which provide the environmental limitations which affect all life (Mannion 2002). This chapter concentrates firstly on the importance of an analysis of agricultural land use change, through EIAs and the effect it has on agricultural land conversion and conservation. It starts by focusing on the impact that these land use changes have on agriculture and the need to conserve the land to sustain food security, economic growth and job security in the Western Cape. This second section assesses the importance of EIAs and agriculture, and the complexities associated with EIAs and agriculture in order to achieve sustainable agriculture. The last section studies the role of land use related legislation in the agricultural land use transformation process by examining the development op environmental law in SA, law processes associated with land use change, legislative flow of applications between DoA and DEADP and lastly management programmes to protect agricultural land.

2.1 Agricultural land use change

Research on agricultural land use and agricultural land use change is important as these land use changes affect the growth and development of the Western Cape. Agricultural land determines where economic activity takes place as well as where and how towns and communities develop. It impacts on the built environment where we live, work and recreate. It also impacts on the natural environment, impacting on water quality, water supply and biodiversity. Fundamentally, agricultural land use change becomes an important issue, as one person's land use choices impact on the economic and social well-being of an area or community (Bergstrom, Goetz & Shortle 2005). Examples are government interventions to construct a highway or residential development on the urban fringe, forcing the farmers on the town's periphery to sell their land (Glaeser & Kahn 2003).

The unexpectedly high rates of agricultural land use change and changes in land management pose major challenges for the future. Agricultural land use change mainly results from the complex interaction between changes in social and economic opportunities in conjunction with the biophysical environment. These changes often lead to a modification or complete replacement of the regional character of an area (Lambin, Lepers & Geist 2003). Land use conversions do not only change the landscapes in which we live, but also more indirectly, components of our physical and social environment, such as climate, biodiversity and food security. Ongoing urbanisation results in a loss of recreational space, natural areas and agricultural land. The global significance of agricultural land use conversion makes the study of land use and land cover change extremely important in all discussions on the future of agriculture, land use and climate change (Brouwer & McCarl 2006).

2.2 Agricultural land conservation

Worldwide changes in agricultural landscapes in recent years have generated the need to implement planning legislation and management strategies to conserve agricultural land. This was mainly due to the pressures that farmers are facing, ranging from the need to produce food efficiently, the increasing demands for conserving the rural environment and biodiversity, and the need to acquire land for urban expansion (Howarth & Rodgers 1993). Land conversions through development also affects biological diversity which plays a crucial role in agriculture as it provides ecological services such as water provision, nutrient cycling, regulation of microclimate and suppression of undesirable organisms (Altieri 1999; Thrupp 1998). The need to conserve agricultural land has also evolved as a result of losses in soil productivity due to soil degradation through erosion and compaction of agricultural land (United Nations 2001). The agricultural sector also has a very important role to play in terms of biodiversity conservation and ecosystem health, since large portions of indigenous vegetation are located in agricultural areas. In this regard, it is important that biodiversity on agricultural land in the Western Cape is conserved as the region has the highest percentage of threatened plant species, and the highest extinction rate in the world (Wynberg 2002).

Managing agricultural landscapes for conservation calls for more than simply conserving a few rare and endangered plants and reacting to management and land use planning issues (Bennett 2003). It is about conserving agricultural land, but crucially also about biodiversity, affected resources (e.g. water, land) and the impacts on humanity. It is therefore important that sustainable practices, such as sustainable and organic/biological farming are implemented. This method of farming works with natural systems by encouraging biological cycles and minimising the use of pesticides and fertiliser

using local knowledge and farming skills to farm more productively on less land (Heap & Kent 2000; Lampkin 1990; Madeley 2002). Proper planning, an improved knowledge of the agricultural landscape's functioning and consideration of human actions are required to manage agricultural land sustainably (Dale & Haeuber 2001).

2.3 Implementation of environmental impact assessment (EIA) as a land use management tool

Land use management is complicated by the wide range of people and institutions including communities, government, developers, land owners and the different perspectives and values they hold on land management. The complexity of agricultural land use management also reflects on the importance of sound management as it influences the future of agriculture (Randolph 2004). As early as 1976 the *South African Council for the Environment Report* proposed methods and procedures for environmental assessment in South Africa. It was, however, the Council for the Environment publication, *Integrated Environmental Management in South Africa*, in 1989 that marked the formal introduction of the concept of IEM in South Africa. During 1989 amendments to ECA for the first time provided for the promulgation of EIA Regulations. It, however, took another eight years for EIA Regulations to be promulgated, and for EIA to, for the first time, be formally legislated in South Africa, on 5 September 1997.

EIA is used as a planning tool to gather and analyse information to make sound development decisions regarding land use changes (Randolph 2004). The ultimate purpose of EIA is not just to assess impacts, but to improve the quality of decisions (Ortolano & Shephard 1995). The following sections concentrate on EIA as a tool to manage agricultural land use changes. It firstly introduces the aim of EIAs by examining the process, purpose, objectives and ways to enhance sustainable land use conversions. It concludes by assessing the important role that EIA plays in agriculture as a land management tool to protect good quality soils.

2.3.1 Aim of environmental impact assessments

EIA is a systematic process which holistically examines the anticipated impacts associated with developments, trying to prevent all negative impacts (Chadwick, Glasson & Therivel 1994). The Department of Environmental Affairs and Tourism defines an EIA as a "detailed study of the environmental consequences of a proposed course of action. An environmental assessment or evaluation is a study of the environmental effects (both positive and negative) of a decision, project,

undertaking or activity. It is most often used within an IEM planning process, as a decision support tool to compare different options" (DEAT 1998: 8). The United Nations Economic Commission for Europe (1991) explains that an EIA is an assessment of the impact of a planned activity on the environment. The aim of EIA is to gather information from various parties (organs of state, the public and specialists) to assess all the possible environmental impacts (both positive and negative) associated with a proposed development. This information must be accessible to all interested and affected parties including decision-makers and stakeholders (DEAT 2004b). When an applicant proposes a development, a report must be submitted to a competent authority as defined in the law. The report is assessed to determine whether it meets EIA requirements, including, but not limited to, information such as the terms of reference, alternatives, impacts associated with the proposed development, mitigation measures, public participation and whether enough information was provided to make an informed decision (Sadler 1996). Table 2.1 sketches the functioning of the EIA through various stages.

Table 2.1 The purpose and objectives of review at each successive stage of the EIA process

Sequential stage in the EIA Process	**Purpose**	**Criteria for Review**
Scoping	Define the scope of the assessment	• Have all issues been captured? • Is there a logical differentiation between issues that are assessed and those that are not? • Is there a logical linkage between the issues identified and the terms of reference for the assessment?
Stakeholder engagement	Present opportunity for stakeholders to participate in the EIA process	• Have all stakeholders been identified? • Is there a fair opportunity for participation and comment? • Is there a logical mechanism for including the issues raised and an indication of how the issues were addressed?
Assessment	Conduct the assessment as defined by scoping	• Have all the issues been addressed and is there a logical linkage between the issues and the assessment? • Is the assessment technically and scientifically valid? • Does the assessment address the terms of reference? • Is the assessment clear and easy to follow?
Decision	Project authorisation or refusal	• Is the decision based on the content of the EIA? • Are there clear reasons given for the decision? • Are the conditions of the decision logical?
Implementation	Implementation of the EIA recommendations and conditions of authorisation	• Is there proper provision for the implementation of the recommendations/conditions in the form of an environmental management plan (EMP)? • Have the recommendations/conditions been adhered to?

Source: DEAT (2004b:5)

Table 2.1 also states the purpose of each stage and criteria to be considered when reviewing an EIA application. Sadler (1996) points out that when reviewing an EIA the objectives must be to examine:

- adequacy of information provided (e.g. is there sufficient information and does it meet the study objectives?);
- reliability of analysis (e.g. consistent with scientific knowledge and methods?); and
- relevance for decision-making (e.g. were all the significant environmental issues addressed and mitigation provided where necessary?).

EIA plays an important role in decision-making, development actions and sustainable development. The most important property of EIAs is that they assist by providing the decision-makers with all the possible impacts foreseen and issues associated with a development which can be used to prioritise areas for development, conservation and agriculture. An EIA is not a substitute for decision-making but it helps the decision-maker to weigh the trade-offs linked to a proposed development (Chadwick, Glasson & Therivel 1994).

Consideration of an EIA, early in the planning stages of a development can promote sustainable land conversion, improve relations between the local authority and local communities and lead to a smoother planning process (Chadwick, Glasson & Therivel 1994). The ultimate role of an EIA is to ensure sustainable development by promoting development that does not harm the environment and those who depend on it, but rather will result in positive impacts. An EIA can also contribute to sustainable development by mitigating harmful impacts before they cause environmental degradation. In other instances refusing a development to take place may result in harmful impacts being avoided altogether (Chadwick, Glasson & Therivel 1994).

EIAs are frequently perceived by developers (referred to as the “greedies” by the “greenies”) as an unnecessary process, an administrative burden or even something that aims to prevent development. The people or institutions striving to conserve biodiversity (referred to as the “greenies” by the “greedies”) claim that EIAs do not address all the environmental impacts associated with developments. This is the general perception in the development industry mainly because developers consider EIAs as costly and time consuming and not adding value. Environmental authorities have therefore realised that EIAs must be more flexible and implementable by all role players (Sowman, Fuggle & Preston 1995). This approach was implemented in South Africa with the promulgation of the amended National

Environmental Management Act (NEMA) regulations in July 2006 which introduced time frames for every phase of the EIA. The implementation of time frames shifted the onus from environmental authorities to environmental assessment practitioners (EAPs) and applicants, as informed decisions are only made once all the required information is submitted (Rossouw & Wiseman 2004). This ongoing battle between "greenies" and "greedies" illustrates the importance of an EIA in seeking harmony between the environment and development.

There are, however, ways to avoid unnecessary time delays. One is to conduct a strategic environmental assessment (SEA), where a strategic EIA approval (one authorisation for all the agricultural activities in a certain area) can be given. The drawback of a SEA is that it only focuses on the opportunities and constraints that the environment presents for development, but it does not consider the impacts that a development, plan, policy or programme may have on the environment (Dalal-Clayton & Sadler 2005). Reactive project-level EIA often does not allow for enough time to follow a proper EIA process. By rushing an EIA process, not all the EIA information is integrated in decision-making, and the cumulative impacts extending beyond the development, are not assessed (Randolph 2004). These problems mostly occur because of an expedited decision-making process in circumstances where there is great need for development, such as low-cost housing on limited available land, at times resulting in the development of sensitive environmental areas.

Efforts should be made to generate information early so that it can be integrated into the planning decisions to consider impacts beyond the development's primary impacts (Randolph & Ortlano 1976). It is also important that effective compliance monitoring is conducted and ecosystem management measures are implemented to address the cumulative impacts of development in an environmentally sensitive area (Phillips & Randolph 2000). EIAs must ensure that negative impacts are prevented, or if prevention is not possible, mitigation to acceptable levels, while positive impacts are to be maximised (DEAT 2004c).

2.3.2 Environmental impact assessments and agriculture

Fragmentation and subdivision of natural habitat and agricultural areas in South Africa chiefly result from uncontrolled urban and industrial expansion driven by rapid population growth, migration and the need for employment opportunities and economic growth. Such fragmentation and subdivision occur mostly in agricultural land adjacent to the urban edge. The underlying problem is that urban areas are

expanding and developable land within them is scarce and extremely expensive. Decisions allowing these urban expansions into agricultural land are largely the result of poor planning by local municipalities (DEAT 1999). Proper planning is therefore called for with prioritisation of land use options and the optimal land use for each area to be determined. This is exactly what a credible municipal Spatial Development Framework is supposed to address, with prioritisation and land use classification through the determination of an urban edge being vital in this regard. The solution is to restrict any urban development outside the urban edge. If development must take place outside the urban edge, all high-potential agricultural areas must be avoided (DEADP 2005b; Giliomee 1994).

EIAs are often used as a way of alerting farmers in developing countries to the lack of sustainability of their practices (Duffy 1992). The implementation of EIAs aids in preserving the resource base on which agriculture depends and plays an important role in the optimal utilisation of land, thereby promoting sustainable land use management (McKercher 1993; Romeril 1989). It is essential that the impacts associated with the conversion of agricultural land to a different type of land use are adequately assessed to ensure sustainable development in South Africa. The ECA requires that all potential impacts (positive, negative, environmental, social and economic) associated with a development which triggers the activities listed in terms of Government Notice (GN) No. R. 1182 of 5 September 1997 are to be assessed and adequate information provided to the relevant organs of state for review to inform the decision of whether or not to authorise such a development (DEAT 1999).

Many complexities are inherent to environmental impact assessment and agriculture, with a number of factors hindering the effectiveness of an EIA in addressing biodiversity conservation issues and in ensuring sustainable agriculture. Sustainable resource management is a crucial challenge in the Western Cape as agriculture contributes approximately one quarter of the total income of the Province and is an important employer and supporter of the majority of rural communities (De Villiers 2007a). In terms of the ECA EIA Regulations the clearing of undeveloped land was only regulated if that clearing resulted in a change of land use from grazing to any other form of agriculture. These ECA regulations were not widely known among farmers and as a result were poorly implemented in the agricultural sector. In addition, DEADP had insufficient capacity at the time to monitor and enforce compliance with the regulations. This led to unsustainable land clearing, contributing to loss of natural biodiversity. The challenge is to try and remedy the situation by striving to ensure that sustainable agriculture is encouraged through the implementation of the EIA regulations. It is, however, acknowledged that farmers are often faced with numerous challenges, including the complexity of the

EIA process and high costs associated with the EIA process. In addition to the abovementioned obstacles, De Villiers & Hill (2007) identify additional limitations hindering the effectiveness of an EIA in addressing biodiversity issues in an agricultural context, namely:

- A piecemeal focus on cultivation-related impacts at farm level rather than assessing environmental impacts not confined to property boundaries and which cause spillover/downstream effects;
- An inability to manage cumulative impacts arising from repeated, or similar, farm-level developments that individually may not seem significant but pose a threat on a larger scale;
- A lack of 'sustainability targets' that give strategic guidance to land use planning and decision-making in areas with high biodiversity levels and agricultural value;
- The relative isolation of farms and their distance from major centres influence the value of the public participation process because in most cases it is difficult to inform all the interested and affected parties, such as communities and adjacent land owners that will be affected by the development; and
- Lack of skilled EAPs and language issues experienced during public participation in rural areas.

Due to the above complexities associated with EIAs, farmers often do not comply with EIA regulations, the requirements of the relevant authorities (DWAF, CN, HWC and DoA) and regulatory requirements such as biodiversity guidelines. Hence it is important that farmers are sensitized and informed of the procedures to be followed when conducting an EIA and all other applicable legislation (De Villiers 2007a).

The implementation of sustainable agriculture in South Africa is crucial as it will ensure the utilisation of agricultural resources in ways which will not jeopardise the future of agricultural resources or biodiversity and environmental integrity. This accords with the definition of sustainable development given by Lewandowski, Hardtlein & Kaltschmitt (1999:220) who state that "*Sustainable agriculture is the management and utilisation of the agricultural ecosystem in a way that maintains its biological diversity, productivity, regeneration capacity, vitality and ability to function, so that it can fullfill today and in the future significant ecological, economic and social functions at the local, national and global levels and does not harm other ecosystems*''.

Agriculture has the single greatest impact on habitat loss across South Africa, with its effects on biodiversity patterns and processes being particularly significant in the intensively cultivated and poorly protected lowlands of the Western Cape (Cowling 1999). Biodiversity in the Western Cape is

dangerously threatened with less than 9% of its original extent still existing (Driver 2004). Biodiversity conservation in the Western Cape is essential as three of the 34 global biodiversity hotspots and 66% of South Africa's 21 critically endangered terrestrial ecosystems occur in the Fynbos Biome, which exists almost exclusively in the Western Cape (De Villiers 2007b).

EIAs therefore play an important role in supporting sustainable agriculture, firstly by encouraging resource preservation technologies and secondly by aiming to conserve and regenerate rural landscapes (Bowers & Hopkinson 1994; Campanhola, Kitamura & Rodrigues 2003; Neher 1992). EIAs can also contribute to sustainable agriculture by helping farmers to maximise the use of agricultural resources and improving the efficiency of agricultural processes. An EIA can help a farmer to implement more sustainable agricultural practices by exploring secondary uses for waste products and how to use water more efficiently (Den Hartigh 2006). EIAs help to conserve endangered and critically endangered biodiversity ecosystems by ensuring agri-environmental decision-making in cases where agricultural and environmental authorisation needs to be obtained for agriculture related activities such as the cultivation of natural vegetation. It is important to implement sustainable agricultural practices by, *inter alia*, minimising and rectifying disturbance of ecosystems and loss of biodiversity on agricultural land and implementing management strategies and planning procedures to conserve sensitive, vulnerable, highly dynamic or stressed ecosystems (De Villiers 2007b).

In order to evaluate all possible ecological impacts and to manage biodiversity efficiently, the focus of agri-environmental planning and EIAs has to shift to concentrate on a sectoral or ecosystem level rather than on a particular development (farm level) (Convention on Biodiversity 2001; Payraudeau & Van der Werf 2005; Ryskowski & Jankowiak 2002; Smith & McDonald 1998; Treweek 1996). Treweek (1996:198) asserts that "*An EIA will have to be used pro-actively, rather than reactively if environmental problems are to be tackled 'at source' and it will not be possible to rely on EIA as an effective mechanism for achieving sustainable development unless its scope is widened and its scientific base strengthened*".

This section laid the foundation for the importance of the study by focusing on the impacts associated with agricultural land use changes, agricultural land conservation and the implementation of EIA as a management tool. The implications of land use conversion of agricultural zoned land will be assessed in more detail in Chapter 3, while the significance of land use conversion of undeveloped land will be evaluated in depth in Chapter 4. The next main section deals with the role that relevant legislation plays

in agricultural land transformation by focusing on environmental law in South Africa, legislation applicable to agricultural land use change, management programmes and guidelines to protect agricultural land and the sustainability of agricultural land use conversions.

2.4 The role of land use related legislation in agricultural land transformation

Environmental policy became more important during the 1990's as the human impacts on the biological systems of the planet were increasing (Roberts 2004). The United Nations Earth Summit, held in Rio de Janeiro in 1992, established Agenda 21, an action plan aiming to protect the environment by anticipating co-operation between national governments, local authorities, firms, organisations, communities and individuals. This upsurge in attention given to the environment through the implementation of environmental policies and legislation is mounting evidence that current and projected patterns of economic and social activities are threatening the continuation of a healthy environment and a sustainable development trajectory (Roberts 2004).

Legislation plays an important role in regulating land use based decision-making. It is therefore essential that legislation applicable to agricultural land use change be incorporated in this research. This section gives effect to the first research objective and consists of an overview of the relevant environmental law in South Africa, followed by an explanation of legislation administered by DEADP and DoA. It concludes with a discussion of management programmes and guideline policies aiming to prevent the loss of agricultural land.

2.4.1 Development of environmental law in South Africa

Environmental law is a relatively new and rapidly developing legal discipline fueled by a battery of prominent environmental concerns such as global warming, land degradation, pollution and natural resource depletion (Glazewski 2000). Section 24 of the South African Constitution entrenches environmental protection and a healthy living environment as a human right and subsequent laws strive to provide all South Africans with a healthy environment. Hence, it is the Constitutional duty of the state to protect the environment through reasonable legislative measures (Van der Linde 2006). The Constitution emphasises the principle of co-operative governance and reflects a fundamental departure from the past in that the three spheres of government – national, provincial and local are no longer regarded as hierarchical tiers with national government at the helm, but rather as three distinctive, interdependent and interrelated spheres of government. Although the Constitution does not refer to agricultural land and biodiversity conservation, it specifies various legislative competencies for the

three spheres of government in terms of environment, nature conservation and natural resources such as agricultural land, water and forests (DEADP 2005d).

Different forms of environmental law had been in force in South Africa since the early nineteenth century, for example the industrial revolution law which aimed at the protection of public health in the nineteenth century (Coggins & Smith 1976). The turning point for environmental legislation in South Africa was the early 1970s when political and legislative attention was given to environmental issues (Weale 1992). The legislative activity during the 1980s was piecemeal and could fairly be characterised as responding to environmental issues on an *ad hoc* basis (Kidd 1997). During the 1980s South Africa introduced its first dedicated environmental law, the Environment Conservation Act 100 of 1982, with the aim of establishing a link between conservation and economic development. This act was not particularly effective in coordinating environmental matters within government, and did not include any substantive provisions regarding environmental management. This led to the replacement of the act with the Environment Conservation Act 73 of 1989. This act was more far-reaching but not optimal. A dominant feature of this act was that most of its sections were triggered only by the exercise of Ministerial discretion in the form of policies and other directives, rather than being substantive provisions in its own right (Glazewski 2005).

In the early 1990s South Africa started to participate internationally in environmental law actions, such as the Earth Summit in Rio de Janeiro. The development of a new constitution and government in South Africa during 1994 caused unprecedented policy development over the next decade (Kidd 1997). Until 1994, stakeholder engagement was restricted to small groups of technical experts and public participation was limited to information distribution and occasional consultation with selected interest groups such as conservation organisations (Peart & Wilson 1998). In 1998 the National Environmental Management Act 107, which focused mainly on sustainable development and transition to democracy, repealed the Environment Conservation Act 73 of 1989 (Glazewski 2005). South Africa's law reform process after 1994 was characterised by a shift from natural resource management and conservation towards an approach that focuses more on human rights, access to natural resources, equity and environmental sustainability. This shift can be substantiated by the World Summit on Sustainable Development held in Johannesburg in 2002, which identified the following targets to promote sustainable agriculture:

- Improving people's standard of living by promoting food security and eradicating hunger and poverty.
- Sustainable use and protection of agricultural resources and water by creating awareness on local and community levels.
- Prevent land degradation by providing technical and financial assistance to farmers.
- Use existing information on agricultural land use patterns to encourage research and technological support to promote sustainable agriculture.
- Promote sustainable agriculture by providing appropriate technical and financial assistance to developing countries and communities.
- Support existing indigenous agricultural markets and enhance the development of new agricultural markets.
- Promote environmentally safe, effective and efficient agricultural practices, such as spraying of insecticides and fertiliser.
- Endorse and encourage cooperation of existing agricultural initiatives and programmes to promote sustainable agriculture.
- Encourage the conservation, sustainable use and management of local and indigenous agricultural practices (United Nations 2002).

There was thus a realisation that natural resources can only be sustainably managed through the participation of resource users and beneficiaries in the planning, control and conservation of the resource (The Presidency 2003). Although significant progress was made in South Africa's law process in terms of democracy, environmental health and justice, it was also characterised by some shortcomings, namely the lack of consultation with local government; the lack of recognition of the role played by local councils in environmental management; and the lack of ongoing consultation with civil society in the implementation and monitoring of policy (Rossouw & Wiseman 2004).

Something positive that recently evolved out of the South African environmental law process was the development of enforcement mechanisms to fight environmental crime. This resulted in the establishment of Environmental Management Inspectors (EMIs), better known as the "Green Scorpions". Natural resources protection and conservation, pollution and waste management are a few examples of areas in which the EMIs actively operate. The combination of legislative changes and the establishment of the EMIs convey the message that authorities will actively address cases of

environmental malpractice. These new conditions, coupled with increased awareness among stakeholders and investors, are a significant force in the drive for better environmental governance (DEAT 2006).

Most environmental problems originate in the way people decide to use and manage land. Environmental law therefore directs control instruments such as land use planning, environmental assessments and tenure systems (Tenure Reform 1998). The manner in which land is used and has its state altered through agricultural activities clearly impacts upon the environment, making land use planning a vital component of environmental management (Kidd 1997).

2.4.2 From environmental conservation to a management law process

Agricultural land use changes are regulated by a variety of laws which play important roles in the final decision-making about land use conversion from agriculture to other types of land use. The fact that agricultural land use and conservation are addressed by and implemented through many of South Africa's laws exemplifies the importance of preserving agricultural land nationally as well as the relevance of this study. Various authorities have traditionally regarded environmental law as a collection of different laws and not a distinct subject. According to Rabie (1999), environmental law is seen as a potpourri of legal norms encountered in a number of conventional fields of law such as medical law and labour law. Fuggle & Rabie (1992) explain that environmental law mainly consists of the three distinct but inter related areas of general concern, namely land use planning and development, resource conservation and utilisation, as well as waste management and pollution control. Environmental laws are inherently linked to land use planning and development, tenure systems and related matters. The form of tenure on specific land invariably has specific environmental consequences and is particularly relevant to the communal land in South Africa (Fuggle & Rabie 1983).

Resource conservation and utilisation embraces legal problems associated with conservation and exploitation of natural resources such as water, flora (forests, trees and plants) and fauna (ranging from wild animals and birds to all marine life). The conservation of biodiversity and habitat conservation also fall under this heading including cultural heritage and fossils. Waste management and pollution control are concerned with the negative side of resource development including pollution of land, air and water. The vast scope of environmental law makes it evident that the focus is somewhat generic in all environmental laws. One of the many challenges facing the new discipline of environmental law is to define its specific parameters more clearly and to sustain the development of emerging distinctive

principles of the subject (Glazewski 2005). This discussion considers separately the legislation applicable to land use changes which include different forms of legislation regarding land use planning, biodiversity conservation, agricultural land use control and conservation as well as sustainability of agricultural resources such as land.

Integrated Environmental Management (IEM) in South Africa evolved around international interaction with various organisations regarding environmental policy issues, management strategies and methods of implementing the EIA process to improve environmental management and to ensure a balance between conservation and development (Barnard 1999; DEAT 2004a). IEM is defined as "*a philosophy which prescribes a code of practice ensuring that environmental considerations are fully integrated into all stages of the development process in order to achieve a desirable balance between conservation and development*" (DEAT 2000:8).

EIAs in South Africa started to develop during the 1970's. It was however only during the 1980's when the first document was released - titled *Integrated Environmental Management in South Africa* – after which the concept around Environmental management started to evolve (Council for the Environment 1989). EIAs were seen by developers as unnecessary, as they were associated with costly time delays, legal conflicts and anti-developmental activities. Since 1990 IEM, through the implementation of environmental management measures, has become established in the South African development context. After 1994 the consideration of citizens' rights, were considered and included in our environmental policies for the first time. There was a distinct realisation that environmental assessment in South Africa must be acceptable, flexible and implementable to all role players (Sowman, Fuggle & Preston 1995). DEAT produced a set of guidelines to address these shortcomings by focusing on the phases of an EIA. This first step towards EIAs commenced with the promulgation in 1989 of the ECA which required that environmental policy should be implemented to guide integrated decision-making through EIAs (Sowman, Fuggle & Preston 1995). It was, however, only in September 1997 that the gazetted regulation to enforce EIA, in terms of ECA was promulgated (DEAT 2004a). The middle 1990s saw the start of a focus on environmental justice, health and management issues. These advancements resulted in the development of the first national environmental policy process, known as the Consultative National Environmental Policy Process (CONNEPP). The purpose of CONNEPP was to give all stakeholders in South Africa the chance to contribute to developing the new environmental policy. This resulted in the publication of the *Green paper on Environmental Policy for South Africa* in 1996 (draft policy) which went through a drafting and commenting process by selected environmental

experts in order to establish the more extended, political version, known as the *White Paper on Environmental Management Policy for South Africa* which was published in 1997 (DEAT 1997). This process culminated in the promulgation of the NEMA in 1998 providing the legal framework for environmental management in South Africa in terms of the latest EIA regulations in July 2006. NEMA is a framework law providing specific goals for sustainable development by promoting and maintaining cooperative governance and ensuring the implementation of IEM principles and EIA procedures. The challenge facing NEMA is to integrate the environmental, economic and social impacts associated with developments within an EIA process (Rossouw & Wiseman 2004).

ECA and NEMA both enact control over a set of land use activities which may have substantial detrimental effects on the environment, whether prescribed in general or in specific areas. This means that if a proposed development includes any of these activities an EIA is required. In the Act an EIA is defined as the regulatory or administrative process for the impact assessment by which the environmental effects of a project are analysed (Fuggle & Rabie 1992). The outcome of an EIA is to provide decision-makers with scientifically researched and documented evidence to support a reliable prediction on the likely consequences of the proposed actions (Wiesner 1995). The NEMA EIA Regulations replaced the ECA EIA Regulations on 3 July 2006. While the ECA EIA Regulations therefore controlled agricultural land use changes since early 1998, NEMA is currently the applicable Act for any new developments.

2.4.3 Legislation applicable to agricultural land use change

The two main controlling organs of state responsible for the administration of agricultural land use change are DEADP and DoA. DEADP is responsible for the administration of the Environment Conservation Act (Act 73 of 1989) (ECA) (South Africa 1989), the National Environmental Management Act (Act 107 of 1998) (NEMA) (South Africa 1998b) and the National Environmental Management: Biodiversity Act (Act 10 of 2004) (South Africa 2004a), and the Land Use Planning Ordinance (Ordinance 15 of 1985) (LUPO). DEAT, CapeNature and SANBI also have more roles to play in terms of the administration of the Biodiversity Act. DoA administers the Conservation of Agricultural Resources Act, 43 of 1983 (CARA) (South Africa 1983), the Subdivision of Agricultural Land Act, Act 70 of 1970 (South Africa 1970) and will in future administer the Sustainable Utilisation of Agricultural Resources Bill (SUAR) (South Africa 2004b) once it is enacted. Each Act is discussed separately in the sections below.

2.4.3.1 The Environment Conservation Act

The Environment Conservation Act (Act 73 of 1989) (ECA) is the successor to the Environment Conservation Act (Act 100 of 1982). The main aim of the 1982 Act was to remediate environmental impacts but it was an inadequate legislative response to environmental imperatives which were becoming increasingly important (Kidd 1997). The 1982 Act was amended to address environmental issues by controlling development activities which may have a detrimental effect on the environment and close the gap between conservation and economic development. This resulted in the promulgation of the ECA in 1989 which repealed and replaced the 1982 Act (Glazewski 2000). The main goal of the ECA was to conserve the environment through effective management strategies. This implied three objectives:

- ensure that the environmental effects of a development are considered before decisions are taken;
- promote sustainable development; and
- ensure that developments do not have a detrimental effect on the environment, and prohibit those activities that will (DEAT 1998).

Abrahams (2005) explains that the ECA empowered a competent authority to declare an area as a Protected Natural Environment if adequate grounds exist to presume that such an area will substantially promote the preservation of specific ecological processes, natural systems, natural beauty or biotic diversity. The ECA focused on the protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment (Glazewski 2000). ECA played an important role in agricultural land use change by regulating land use change and the impact thereof, through the EIA regulations, which were promulgated in 1997, with the aim of achieving sustainable development. The role of stipulating the EIA activities in terms of ECA was to protect the environment and its functional processes by preventing the potential negative impacts of developments on the environment. The following activities qualified as forms of change specifically in agricultural land use under the ECA EIA regulations (South Africa 1989):

- Activity 1(m): the construction, erection and upgrading of public and private resorts and associated infrastructure;
- Activity 2(c): the change of land use from agricultural or zoned undetermined use to any other land use;
- Activity 2 (d): the change of land use from use for grazing to any other form of agricultural use;

- Activity 2 (e): the change of land use for nature conservation or zoned open space to any other land use.

Any development that triggered these activities had to obtain environmental authorisation before commencement of the proposed development. In practice this implies that most forms of land use change outside urban boundaries are subject to the provisions of the Act and its regulations.

The ECA regulations also specifically provided for public involvement in the assessment process, public participation being one of the main objectives of the ECA. In contrast with other legislation of the time, the ECA EIA regulations made provision for a formal public participation process as part of the application process. This resulted in a more informed decision-making process which created a greater level of trust in the process because the public were given a greater degree of "ownership" in the process. The public were given an opportunity to raise issues which had to be addressed before authorisation was given. Developments may be turned down if the public's issues are seen as valid. The public were also given a right to appeal if they felt that their issues were not addressed (Glazewski 2000).

2.4.3.2 The National Environmental Management Act

The foundation for NEMA was laid by the *Green Paper on Environmental Policy for South Africa* published in 1996 and the *White Paper on Environmental Management Policy for South Africa* published in 1997 which were driven by an extensive public participation process known as CONNEP (Rossouw & Wiseman 2004). This CONNEP process extended from May 1995 until May 1998 and provided the basis for NEMA. See Table 2.2 for a depiction of the evolution of the environmental policy process to develop NEMA. The main aim of the National Environmental Management Act (Act 107 of 1998) (NEMA) is to provide for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment. NEMA aims to promote cooperative governance by coordinating environmental functions exercised by organs of state and ensure enforcement of all relevant environmental management laws (South Africa 1998b). According to Andrews (1998), NEMA helps to protect the environment by making government ensure that all the possible environmental impacts of a development are assessed before it is allowed to proceed. The core environmental principle of NEMA also includes the promotion of ecologically sustainable development which includes sustainable land use conversions (Van der Linde 2006).

Table 2.2 Evolution of South Africa's national environmental policy process to create NEMA

Stages in the Policy process	Environmental policy Process	Policy Products
Agenda Setting	• National consultative process was initiated by the government in 1995. • Initiation of CONNEPP. • A multi-stakeholder management and advisory team was appointed in November 1995. • The team produced a document entitled *Towards a New Environmental Policy for South Africa*. • Provincial workshops were held as part of the nation-wide participation process. • First discussion document produced, which formed the basis for deliberations at the first national conference. • Revised discussion document *Towards a New Environmental Policy for South Africa* published in April 1996.	• First discussion document created, forming the basis for deliberations at the first national conference. • Revised discussion document *Towards a New Environmental Policy for South Africa* published in April 1996.
Policy Formulation	• Feedback received on the discussion document used as input for drafting a Green Paper (draft policy). • A second national conference held in January 1997 for stakeholders to comment on the Green Paper.	Green paper on a New Environmental Policy published in October 1996.
Policy Adoption	• Feedback received on the Green Paper used as an input for drafting a White Paper. • Cabinet approved the White Paper on Environmental Management Policy in June 1997 which was distributed for public comment. • National Environmental Management Bill published in 1998, to give effect to the policy in the White Paper.	• White Paper on Environmental Management Policy published in July 1997. • National Environmental Management Bill published in 1998.
Policy Implementation	• The policy implementation stage began with the enactment of the National Environmental Management Act (NEMA) in the Government Gazette on 27 November 1998. • CONNEPP reached its conclusion with the publication of the Act. • NEMA repealed many of the old legislative provisions for environmental management. • Policy process since 1998 has focused exclusively on policy and law revisions. • Implementation has largely been decentralised to provincial and local government, where existing capacity ranges from limited to non-existent.	National Environmental Management Act published on 27 November 1998.

Source: Rossouw & Wiseman 2004

NEMA plays an important role in agricultural land conversions, because it is based on a set of national environmental management principles which require that developments causing a change in agricultural land use are socially, environmentally and economically sustainable. In terms of Section 2 of the Act, an authority such as the DoA must consider factors such as avoiding, minimising and remedying the disturbance of ecosystems, avoiding jeopardising ecosystem integrity or paying specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic

or stressed ecosystems, especially when they are subject to significant human resource usage and development pressure, when exercising its powers under CARA (Section 2, Act 107 of 1998).

While this thesis deals with the processes as per the EIA regulations under ECA, on 21 April 2006 a new set of EIA regulations as well as two new lists of activities were identified in terms of GN No. R. 385, R. 386 and R. 387 of 21 April 2006 of NEMA (South Africa 2006). The 2006 EIA regulations and the new listed activities came into effect on 3 July 2006 and replaced the regulations and activities previously promulgated and identified under ECA. The one list of activities (GN No. R. 386) must be subjected to the Basic Assessment process, while the other list of activities (GN No. R. 387) must be subjected to Scoping-EIA process. The activities which must be subjected to Basic Assessment process are mostly smaller-scale developments such as the clearing of more than three hectares of indigenous vegetation for the planting of crops, while the activities that must be subjected to the Scoping-EIA process are generally larger-scape developments such as the clearing of more than 20ha of indigenous vegetation for the planting of crops. This means that either a Basic Assessment process for the smaller-scale developments or a more extensive Scoping-EIA process for the larger-scale developments is prescribed.

The following activities trigger a change of agricultural land use and must go through a Basic Assessment process:

- Activity 1(e): the construction of facilities or infrastructure, including associated structures or infrastructure for any purpose where lawns, playing fields or sports tracks covering an area of more than three hectares, but less than ten hectares, will be established;
- Activity 12: The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of Section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
- Activity 16: the transformation of undeveloped, vacant or derelict land to –
  - (a) establish infill development covering an area of five hectares or more, but less than 20 hectares; or
  - (b) residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than one hectare; and

- Activity 18: the subdivision of portions of land nine hectares or larger into portions of five hectares or less.

The following activities trigger a change of agricultural land use and must go through a scoping/EIA process in terms of GN No. R. 387 of 21 April 2006 of NEMA (South Africa 2006):

- Activity 1(t): the construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose where lawns, playing fields or sports tracks covering an area of 10 hectares or more, will be established;
- Activity 2: any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.

The greatest improvements in the NEMA EIA regulations of 2006 are the changes to processes to be followed when conducting an EIA and the fixed time frames for review. The first improvement is that either the more general Basic Assessment process or the more extensive Scoping-EIA process can be followed, which means that decisions can be expedited depending on the process being followed. The second improvement is the time frames for review specified in the regulations. This gives more certainty regarding the evaluation process, so that the evaluation of an application is no longer an "open-ended" process as was the case under the ECA regime. Applicants are thus in a much better position to do proper financial planning for their projects since the time frames for decision-making are more predictable. NEMA also embraces all three fields of environmental concern, namely resource conservation and exploitation, pollution control and waste management, as well as land use planning and development, making NEMA more comprehensive than ECA. NEMA provides more than just a coordinating function by providing a framework to set in place much needed environmental norms and standards and a basis for dispute resolution procedures. Moreover, it emphasises the public's interests (Glazewski 2005).

On 18 June 2010 a new set of EIA regulations as well as three new lists of activities were identified in terms of GN No. R. 543, R. 544, R. 545 and R. 546 of 18 June 2010 of NEMA (South Africa 2010). The 2010 EIA regulations and the new listed activities came into effect on 2 August 2010 and replaced the 2006 NEMA regulations and activities. The three new lists of activities (GN No. R. 544, R. 545 and R. 546) refined the original lists identified in terms of NEMA. Listing Notice 3 (GN No. R. 546) specifically only lists certain activities in certain sensitive environments. The listed activities also provide for the strategic identification of priority areas for agricultural land use. Within these identified

areas, undeveloped land conversions will only be listed if 100ha or more of indigenous vegetation are to be cleared. This allows for pro-active and strategic environmental assessments to be undertaken in consultation with the different role-players, and removed the need for re-active project-level EIAs.

The NEMA EIA regulations of 2010 contain a number of significant improvements to the processes to be followed when conducting an EIA. For example, the 2010 regulations allow for permission to be granted for an applicant to rather subject an application to Basic Assessment that should have been subjected to Scoping-EIA. While the 2010 regulations also for the first time allow for applications for exemption from some of the provisions of NEMA, the 2010 regulations also allow for permission to be granted for deviation from some of the public participation requirements, without exemption then having to be obtained from the requirements. Significantly, the 2010 regulations allow for improved co-operative governance, specifically allowing for formal co-operation agreements to be entered between the authorities to avoid duplication and allow for improved consultation and process integration.

2.4.4 Land use planning regulation in the Western Cape

South Africa's planning legislation is based on concepts from the planning systems in the United Kingdom and United States which provided for respective town planning ordinances which each of the provinces enacted well before the Second World War. The legislation in the Western Cape has remained more or less intact with the exception of the 1934 Township Ordinance which was replaced in 1985 with the Land Use Planning Ordinance (Ordinance 15 of 1985) (LUPO) (Glazewski 2000).

The objectives of LUPO are to: control the use of the land in order to ensure that land units are of a proper size and location in order to achieve proper usage for residential and other purposes; promote health and welfare for people living together in an urbanised society through the zoning of land uses in town planning schemes; prevent nuisance through the placement of land uses; promote proper and efficient exploitation of land as an agricultural and industrial resource through regional planning; and protect and conserve the natural environment by zoning sensitive areas for conservation use (Kidd 1997). LUPO is the planning legislation of the Western Cape that regulates land use planning in the Province. LUPO plays a major role in the development of the Western Cape by regulating the current and future use of land. LUPO ensures that the use of land is in accordance with its zoning, which is identified as a category of directives regulating the development of land and setting out the purposes for which land may be used and the development rules in respect of that category of directions, as

determined by the relevant zoning scheme regulations or zoning scheme bye-laws, and includes overlay zonings, performance zonings, impact zonings and other forms of flexible zonings (South Africa 1985). LUPO also consists of zoning schemes of which the general purpose is to promote and implement principles contained in an integrated development or sectoral plan applicable to the area of the zoning scheme and to determine land use rights in order to manage growth patterns as well as urban and rural land development (Kidd 1997).

The zoning schemes that have been promulgated under LUPO aim to prevent urban sprawl in agricultural areas by permitting only certain agriculture related developments in areas zoned for agricultural use, as allowed under Agricultural Zones 1 and 2 of the Ordinance. The difference between the Agricultural Zones is that Agricultural Zone 1 only allows developments that will be beneficial and/or associated with the primary agricultural use of the land such as a farm store, farmstall and horse-riding school, whereas Agricultural Zone 2 only allows developments that will be beneficial and/or associated with the primary use (intensive agronomy) such as extending a winery or shed to improve crop production and processing. LUPO also restricts developments on farms by only allowing the rezoning of agricultural land to Resort Zone 1 (holiday accommodation) and Resort Zone 2 (holiday housing such as guesthouse units where there can be a separation or alienation of units) where there is a unique source to exploit. A unique source is, for example, an area with significant archaeological findings or a thermal spring.

In practice LUPO has some advantages and disadvantages. Some advantages are that it manifests itself in new partnerships by bridging the gaps between governmental and nongovernmental organisations, and between conservation and social development agencies and the private sector, as all of these departments and agencies must take part in the decision-making process regarding land use planning in order to reach sustainable decisions. LUPO can also aid in biodiversity conservation being a local, decentralised and participatory planning process, it utilises planning instruments on local level such as community or micro-regional land use planning, which is valuable for achieving an adequate integration of sectoral policies with biodiversity conservation. These planning tools enable conservation policies to consider social and economic needs, and ensure that social and economic strategies contain pertinent criteria for maintaining biodiversity. LUPO also assists in integrated natural resource management at local level through community land use planning with the help of modern instruments such as geographic information systems, to generate agreements about the use of land, taking into account ecological characteristics and the level of conservation (Huntley & Petersen 2005).

A frequent problem in this regard is the relationship between the technical group, with its sophisticated cartographical tools, and the community, which frequently has a low educational level. As a result LUPO often fails to express the community's vision and their basic needs. This requires an adequate communication strategy between the technical group and the community (Huntley & Petersen 2005). Another problem is the technical nature of the public participation process, which plays a role especially in lower class areas where people tend to be less educated, resulting in people mostly not understanding the consequences of the planning procedures. This problem is exacerbated by the fact that many developers target these lower class areas because they can acquire land for much cheaper. This usually leaves the community surrounded by and impacted by development that does not address their needs, resulting in increased inequality and negative social impacts on poor communities.

With LUPO being 24 years old, some sections are however outdated and not in line with the new development strategies and programmes of local municipalities. While the EIA regulation under ECA only came into force in 1997 and NEMA in 2006, LUPO was already promulgated in 1985. While LUPO therefore had certain shortcomings, LUPO, prior to the EIA Regulations, was the only piece of legislation that regulated land use planning, preventing fragmentation of landscapes into uneconomical units in a great degree. One can only imagine what the status of the landscapes in the Western Cape would have been if land use change and subdivisions were not regulated by LUPO.

2.4.5 Biodiversity conservation

South Africa is fortunate to be blessed with a rich biodiversity heritage (Huntley 1989). Biodiversity consists of fauna, flora, a variety of living organisms and the ecological communities which they inhabit. Biodiversity can be defined as the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the natural processes of which they are part, including the diversity within species, between species and ecosystems (Sands 1995). Biodiversity thus refers to the natural life-support systems and natural resources upon which we depend (Glazewski 2000). The conservation of biodiversity is important because it provides an actual and potential source of biological resources (including food, pharmaceutical and other resources), it contributes to the maintenance of the biosphere in conditions which support human and other life, and lastly it is worth maintaining for ethical and aesthetic reasons (Sands 1995).

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (South Africa 2004a) was promulgated in June 2004 with most of its provisions coming into force on 1 September of that

year. This Act significantly reforms South Africa's laws regulating biodiversity. The overall purpose of the Act is to manage and conserve the country's biodiversity and its components, protect species and ecosystems that warrant national protection, promote the sustainable use of indigenous biological resources and encourage fair and equitable sharing of benefits arising from bioprospecting including indigenous biological resources. The scope of the Act includes all terrestrial environments, human activity affecting the country's biodiversity and the marine environment. The Act also gives effect to conventions affecting biodiversity to which South Africa is a party, including the 1992 Convention on Biodiversity, the Ramsar Convention, the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (Glazewski 2005). It is essential that there is an act that can protect these natural resources, especially in sensitive areas such as the Cape Floristic Region which is designated as one of the world's six plant kingdoms (Glazewski 2000). The Act also established the South African National Biodiversity Institute and in doing so South Africa became the first country to establish a national institution dedicated to the conservation, monitoring and sustainable use of its national biodiversity (Glazewski 2005).

2.4.6 Agricultural resources conservation

The aim of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) (South Africa 1983) is to control the utilisation of the country's natural agricultural resources by promoting the conservation of soil, water resources and indigenous vegetation as well as to eliminate invader plant species. The need for conservation of these resources arose from the main impacts caused by agricultural activities, namely: regular cultivation resulting in the long-term destruction of soil structure causing increased run-off and greater soil erosion; transformation of biological diversity resulting in the loss of biodiversity; high inputs of nutrients in the soil which contaminate water resources; abstraction of water for irrigation causing perennial streams to dry up and the loss of aquatic ecosystems; and chemical and pesticide usage which contaminates water sources causing major threats to the environment and human health (Giliomee & Glavovic 1992). CARA also provides for certain control measures to be prescribed to conserve agricultural resources relating to natural land; the utilisation and protection of land which is already cultivated; the utilisation and protection of vegetation; and restoration of eroded land (Kidd 1997). A ploughing permit, which may include some of these control measures, must be obtained from the national Department of Agriculture before natural land may be cultivated (South Africa 1983).

CARA stresses the fact that agricultural land use planning concerning short-term commercial interests should not compromise the future of efficient and sustainable agriculture. CARA is seen as the most important act dealing with agricultural resources in South Africa. However, there are some shortcomings with the implementation of CARA, one of which is the lack of enforcement personnel and shortage of technicians to provide support and advice to land users. Another shortcoming is the range of applicability of CARA as it is only applicable in South Africa and excludes the former self-governing territories (Transkei, Bophuthatswana, Venda and Ciskei) where some instances of extreme soil erosion are evident. CARA does also not apply to the following: any land situated in urban areas, for example wetlands situated in the local authority areas, as in the Cape Flats; land vested in the South African Development Trust (SADT), which refers to land which was held by the SADT under the previous government's homeland and self governing state policies; land which is declared under the Mountain Catchment Areas Act (Act 63 of 1970) and the burning of veld in private forests under the Forest Act (Act 72 of 1968). With the main goal of CARA being to promote the conservation of natural agricultural resources, which includes the eradication of weeds (Fuggle & Rabie 2000), regulations to control alien invasive plant species was also promulgated in terms of CARA.

CARA is administered by the National and Provincial DoA which implemented some controlling mechanisms relating mainly to the following: cultivation of virgin soil; utilisation and protection of cultivated land; irrigation of land; prevention or control of water logging or salination of land; protection of vleis, marshes, water sponges, water courses and water sources; regulating the flow pattern of run-off water, utilisation and protection of vegetation; grazing capacity of veld, expressed as an area of veld per large stock unit; maximum number and kind of animals which may be kept on veld; prevention and control of veld fires; utilisation and protection of veld which has burned; control of weeds and invader plants; restoration or reclamation of eroded land; protection of water sources against pollution on account of farming practices, the control of alien plant species and any other matter which the minister may deem necessary in order to achieve the objectives of this Act (South Africa 1983).

It is significant that the shortcomings with CARA will be addressed by the Sustainable Utilisation of Agricultural Resources Bill, 2004 (SUAR) which will replace CARA in future, so as to prevent any further degradation of agricultural resources by promoting sustainable agricultural practices (Kidd 1997). CARA is still the main act with regards to conservation of agricultural resources until the promulgation of SUAR as an act, which is still in process. The next section on the sustainability of

agricultural resources provides a summary on the aim, rationale and focus of SUAR and also examines the differences between SUAR and CARA.

2.4.7 Sustainability of agricultural resources

The aim of the SUAR is to provide for the establishment of incentive programmes, prescribing standards, control measures and law enforcement to ensure sustainable development, utilisation, management and protection of the natural agricultural resources in support of biodiversity and the combating of desertification (South Africa 2004b). The rationale of SUAR is to advise land users through the provision of appropriate incentive schemes and technical support services on the sustainable utilisation of natural agricultural resources. SUAR also ensures the conservation of natural agricultural resources and biodiversity by controlling and regulating subdivisions, change of agricultural land use, control of weeds and alien plants as well as prime and unique agricultural land through penalties of non-compliance and certification of title deeds (Glazewski 2005). The SUAR Bill focuses particularly on the conservation of agricultural land, especially "*prime and unique agricultural land*" and determines which agricultural land may be used for purposes other than agriculture by taking into consideration the value of that land relative to a particular province or area (South Africa 1998a).

One of the greatest differences between CARA and SUAR is that SUAR is more than a piece of legislation advising land owners on sustainable agricultural practices, because it provides additional support in the form of incentives and technical support such as the LandCare Areawide Planning. It also emphasises that the subdivision of farms should be sustainable from an agricultural perspective, and that the best use of the farm and farming practices be considered (Coetsee 2006).

These additional support systems will aid emerging farmers to be more competitive in terms of production while still being environmentally conscious. SUAR will replace CARA in future, placing further emphasis on the effective integration of biodiversity concerns in agricultural planning, development and management (Dalgliesh, Steytler & Breetzke 2004).

2.4.8 Legislative flow of applications between DoA and DEADP

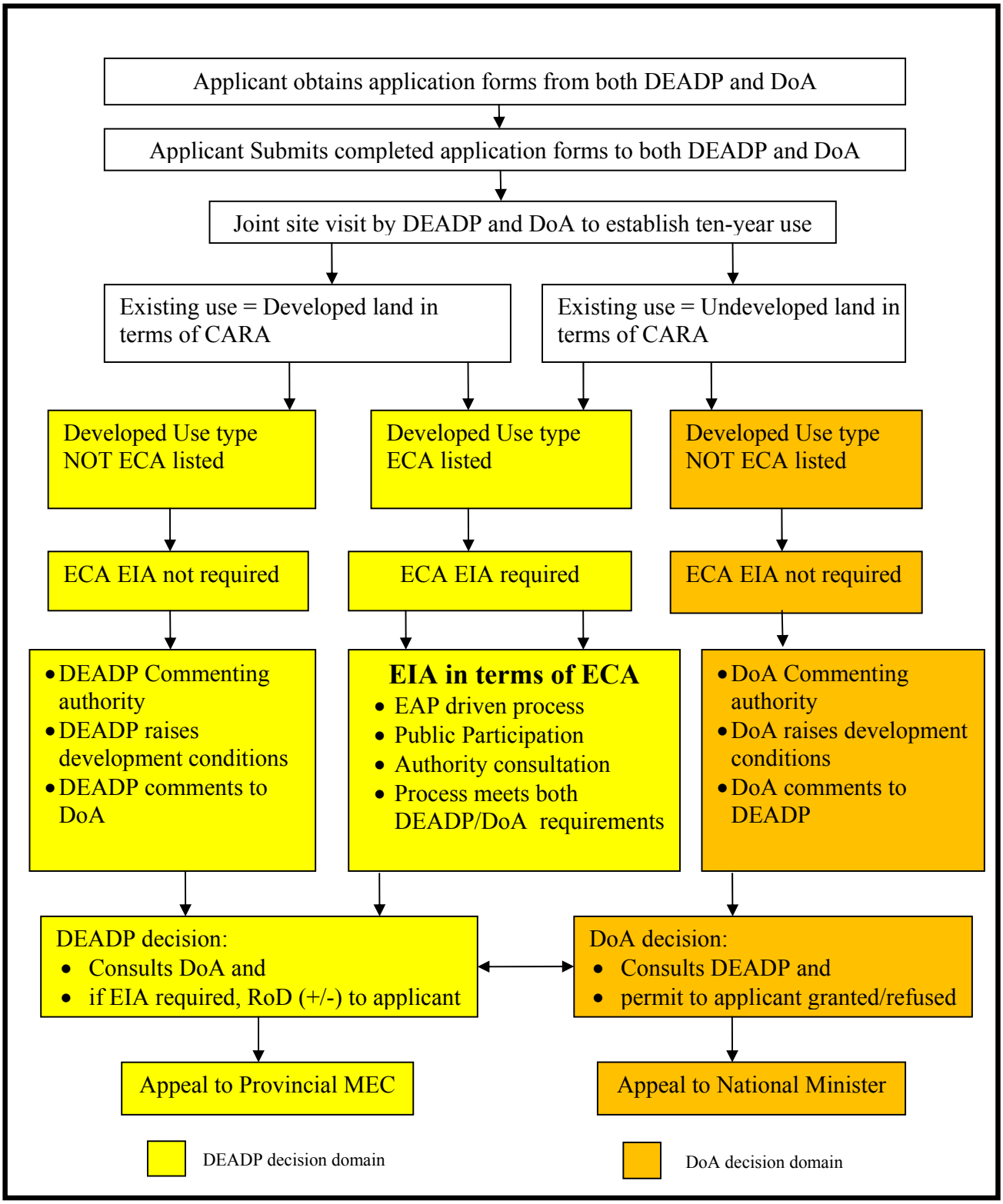
The purpose of an EIA is to avoid negative impacts, mitigate unavoidable negative impact, and maximise positive impacts. The role of an EIA in the process of conversion of undeveloped land is to steer all agricultural developments away from environmentally sensitive locations toward resilient locations that recover faster from the impacts caused by agriculture (Chadwick, Glasson & Therivel

1994). CARA provides for the conservation and optimal utilisation of agricultural resources. With both DoA and DEADP being responsible for administering legislation that regulate agricultural development, DoA in terms of CARA and DEADP in terms of ECA and NEMA, the two authorities need to work together in order to achieve sustainable agricultural development. More than just a practical necessity, cooperation between the two authorities is also a legislated requirement. Both CARA and ECA call for the authorities (DoA and DEADP) to consult with each other, with NEMA and the Constitution calling for cooperative governance, harmonisation and alignment. While both authorities have the responsibility to administer the legislation for which it has been assigned as the competent authority, both authorities also have a responsibility to participate in the other's process. As such, while DEADP is the administrator and decision maker in term of ECA and NEMA, DEADP is also a commenting authority in terms of CARA, while DoA is the administrator and decision maker in terms of CARA, but also a commenting authority in terms of ECA and NEMA. Communication and cooperation between the authorities result in harmonisation, alignment, improved efficiency and effectiveness – in order to ensure that the most sustainable alternatives are considered (Smith & Macdonald 1998; Glasson, Therivel & Chadwick 1999; Payraudeau & Van der Werf 2005).

The DoA only deals with agriculture related developments, which include approval of applications for the conversion of undeveloped land (the cultivation of "virgin soil") under CARA (South Africa 1983). The term virgin soil is defined by CARA as *"land which in the opinion of the executive officer has at no time during the preceding ten years been cultivated"* (South Africa 1983: 4) and is hereafter referred to as "*undeveloped land*". When the conversion of undeveloped land constitutes a change of land use from stock grazing to any other form of agriculture, it is also regulated by ECA, being one of the listed activities which must be subjected to an EIA.

The application flow process between DoA and DEADP is characterised by a degree of environmental oversight of agriculture-related developments (De Villiers & Manuel 2006). The process illustrated in Figure 2.1 below sets out the application flow as agreed to between DoA and DEADP (DEADP 2008) Agreement MoU. This following section explains the application flow process between DoA, DEADP and land owners and the necessary steps to be followed.

The application flow process for the conversion of undeveloped land by the two authorities entails the steps shown in Figure 2.1, namely: proponent approaches both authorities simultaneously and submits



Source: DEADP (2008)

Figure 2.1 The flow process of an application for the conversion of land

the relevant prescribed application forms to the authorities; the relevant assigned departmental case officers undertake a joint site visit; if the proposed activity is listed in terms of ECA, an EIA process must be followed in terms of ECA and DEADP must decide, in consultation with DoA, on the application; if not listed, DEADP is only a commenting authority and must submit comments to DoA; if considered undeveloped land ("virgin soil") in terms of CARA, then an assessment process must be followed in terms of CARA and DoA must decide, in consultation with DEADP, on the application; if not considered virgin soil, then DoA is only a commenting authority and must submit comments to DEADP; if both ECA and CARA are applicable then the assessment process (a single process) must meet the requirements in terms of both authorities; the assessment process will also include public participation and authority consultation (DWAF, HWC, and CN).

The applicant must also meet their general duty of care in terms of Section 28 of NEMA, which states that *"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment"* (South Africa 1998b).

While the process shown in Figure 2.1 shows the ideal that the authorities aspire to in terms of process efficiency, the reality is that challenges are still at times experienced. In spite of the coordination process, problems with coordination and consultation are at times unfortunately still experienced. In the Western Cape a lack of consistency and interaction between the processes of CARA and ECA are still being experienced (Cox 2005). These problems are not present in the Western Cape only, but also in other provinces in South Africa (DEADP 2005a). The Northern Cape Department of Tourism, Environment and Conservation (DTEC) and Department of Agriculture and Land Reform (DALR), for example, are struggling with the flow of agriculture related applications between its agriculture and environment departments (DTEC & DALR 2009). Schumann (2007) has pointed out a lack of understanding about applying for the development of undeveloped land in the Northern Cape where there is a great need for improved communication between agriculture (Northern Cape Department of Agriculture and Land Affairs) and environmental affairs (Department of Tourism, Environment and Conservation) toward a more streamlined approach and for providing clarity on procedural matters that must be communicated to farmers (Schumann 2007).

2.4.9 Management programmes to protect agricultural land

In all parts of the world where farmers' knowledge about local complexities regarding management issues is broadened by outside management programmes and projects, the impacts on agricultural production alone can be significant (Ambatsha, Bharadwaj & Shah 1991). Management strategies and initiatives need to be developed to enhance cooperation and address issues between agriculture and biodiversity (Barret 1992).

The four management programmes introduced in this section are LandCare Area Wide Planning, the Western Cape Provincial Spatial Development Framework (WCPSDF), the Biodiversity and Wine Initiative (BWI) and the Guidelines for Resort Developments in the Western Cape. These programmes can be seen as guidelines to aid legislation in reaching its goals to ensure sustainable development by implementing management measures for sound natural resource management. These programmes analyse the type of issues facing the biophysical, socio-economic and built environment, provide a set of normative principles that guide the approach of sustainable agricultural land management, and also provide some policies to address issues that are evident. The BWI focus area is the whole industry of which the Cape Winelands municipal area is a major production area, while the Western Cape Provincial Spatial Development Framework and the Guidelines for Resort Developments in the Western Cape focus on the whole Western Cape, whereas the LandCare programme is being implemented nationally (Biodiversity and Wine Initiative 2008; DoA 2008; DEADP 2005b). These management programmes will be analysed separately in the following sections.

2.4.9.1 The LandCare Areawide Planning programme

LandCare Areawide Planning is a programme aiming to sustain and improve environmental health through a natural resource management approach that addresses social, economic and ecological concerns over defined geographical areas. The LandCare Areawide Planning programme consists of two components: the LandCare part which focuses on the conservation of natural resources in the agricultural sector and the Areawide Planning part which considers the opportunities and constraints of a geographical area and implements future plans to improve the situation. This includes community awareness campaigns by educating people on fauna and flora, alien vegetation and water conservation measures in their respective environments. This locally led effort enables communities to become knowledgeable about their environment and the ways in which to address problems and use opportunities (DoA 2003).

LandCare Areawide Planning is a national community-based and government-supported programme initiated by the national and provincial Departments of Agriculture to sustain and improve the wellness of biodiversity through a natural resource management approach that integrates with locally-driven initiatives. LandCare Areawide Planning also aims to prevent activities which put the sustainability of agriculture in jeopardy or which, as a result of agricultural actions, cause wider environmental damage (DoA 2003). The overall goal of the South African LandCare Areawide Planning programme is to "*optimize productivity and sustainability of natural resources resulting in greater productivity, food security, job creation and a better quality of life*" (DoA 2008:6).

LandCare Areawide Planning encourages people to take responsibility for their own environments with the support of government at national and provincial level (South Africa 1998a). The Western Cape has benefited from LandCare Areawide Planning projects since 1998. Examples of projects conducted are eradication of invasive and alien vegetation, farm planning, fire belt construction, fynbos rehabilitation as well as water quality and consumption planning (Agriculture Sector Brief 2005/2006).

The LandCare Areawide Planning programme is directed towards the conservation of agricultural natural resources and the avoidance of activities which put in jeopardy the sustainability of agriculture or which as a result of agricultural activities cause wider environmental damage. This includes activities such as the subdivision of farms into uneconomical units and the conversion of fertile agricultural land for non-agricultural activities such as a golf resort or residential estate (Glazewski 2000). LandCare Areawide Planning also consists of an initiative called area wide planning, which focuses on the opportunities (employment, social upliftment, education, conservation and farming) of a specific agricultural area by analysing the constraints and future possibilities of that area.

The Slanghoek Valley near Worcester is one of the examples where LandCare Areawide Planning has been successfully undertaken. LandCare Areawide Planning focuses specifically on rehabilitation of eroded areas (especially along the river banks) and alien vegetation clearing, encouraging farmers to cultivate these previously degraded areas, rather than rezoning it to a non-agricultural use. There are also several pilot LandCare Areawide Planning projects underway in the Witzenberg municipal area with plans to expand the programme to other provinces. LandCare Areawide Planning is also linked to other agricultural conservation and biodiversity plans to mainstream the use of systematic conservation plans in land use planning and decision-making with the purpose of restricting habitat loss in priority

biodiversity conservation areas and the loss of fertile agricultural land. These LandCare Areawide Planning projects mainly focus on the conservation of the Cape Lowlands Renosterveld with four pilot projects functioning in the Drakenstein, Swartland, Cape Agulhas and Theewaterskloof municipal areas (DEADP 2005b).

2.4.9.2 Western Cape Provincial Spatial Development Framework (WCPSDF)

The purposes of the WCPSDF (approved in June 2009 in terms of LUPO) are to: express provincial growth and development; guide municipal (district, local and metropolitan) Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs); prioritise and align investment and infrastructure plans of provincial and national departments; provide clear signs to the private sector about desired development directions; increase predictability in the development environment by establishing “no-go”, “maybe” and “go” areas for development; and redress the spatial legacy of apartheid (DEADP 2005b).

The WCPSDF deals with issues that are explicitly spatial (for example, determining where future residential development and farming areas should be located) and with issues that to date have not been viewed in South Africa as part of spatial policy but which have significant spatial impacts (for example the conversion of agricultural landscapes, changing the sense of place in certain areas or expansion of the urban edge on agricultural land). It is therefore important that proper planning mechanisms are implemented to prevent development on fertile agricultural land and ensure development on land with poor agricultural potential.

The scope of the WCPSDF is broader than traditionally associated with land use planning. It is important to note that the broad provincial spatial planning categories set out in the WCPSDF should only be used as a guideline and should be refined and delineated in greater detail in district and local SDFs (DEADP 2005b). The WCPSDF aims to promote sustainable development in the Western Cape through effective land management. The WCPSDF ensures that agricultural developments which include a subdivision of agricultural land are based on sustainable agriculture. Sustainable agriculture is a concept that: incorporates biological processes such as nutrient cycling and pest-predator relationships; optimises the use of external and non-renewable inputs; encourages full participation of producers and consumers in problem solving and innovation; ensures more equitable access to entitlements; makes full use of local knowledge; diversifies the production system; increases self reliance; and has strong links to the local rural community (International Institute for Environment and

Development 1998). It is indisputable that sustainable agricultural practices should be implemented to prevent the degradation of agricultural land and the environment – the longer the wait for implementation of sustainable strategies, the greater the long-term impacts regarding loss of biodiversity, valuable soils, water and water quality as well as the increased costs to restore natural landscapes (Collins & Qualset 1999).

2.4.10 Biodiversity and Wine Initiative

In 2004, only a fraction (4%) of the Cape Floristic Region's unique Lowland/Coastal Renosterveld was remaining of which most was threatened. This stimulated the wine industry to develop a conservation partnership with the Botanical Society of South Africa, Conservation International and the Green Trust, leading to the establishment of the BWI in 2004.

The BWI is a partnership that depends on participation between wine farmers and the conservation sector in the Western Cape, consisting of the CapeNature stewardship programme, the DoA's LandCare Areawide Planning programme and the wine industry's Integrated Production of Wine (IPW) scheme. The key strategies of the BWI are to: adopt best-practice biodiversity management; enlist BWI members and champions who will be guided through the implementation of biodiversity guidelines in their wine production process; extend the conservation stewardship in the wine industry in areas with critically endangered Fynbos and Renosterveld; integrate our natural heritage into wine industry brands; and develop regional biodiversity wine routes to promote the unique biodiversity features of the different wine regions (Biodiversity and Wine Initiative 2007). The BWI provides a great opportunity for both the wine industry and conservation sectors to be more sustainable. The wine industry benefits from investing in biodiversity to use it as a marketing advantage and from using the BWI as a tool to achieve natural resource management. The conservation sector benefits from pioneering biodiversity best practices in the wine industry and from conserving threatened habitats for future generations (Biodiversity and Wine Initiative 2008). The main aims of this initiative are to minimise the further loss of threatened natural habitat, and to contribute to sustainable agricultural practices through the adoption of biodiversity guidelines by the South African wine industry (Biodiversity and Wine Initiative 2007).

Wine farmers have the option to become BWI members, which is the entry level, or as champions which is the exemplary level. In order to become a BWI-accredited member one has to comply with the requirements associated with the level of commitment one wishes to pursue. To become a BWI

member a minimum of two hectares of natural vegetation must be conserved; the producer must score 65% for the implementation of the biodiversity guideline and IPW criteria; the producer must provide a map indicating the location of the areas that will be conserved (>2ha); the producer must provide a copy of their latest IPW certificate for the last year of harvest; and farm owners must write up their biodiversity story highlighting all unique features and species occurring on the farm. To become a BWI champion 10% of the total farm area must comprise natural areas set aside for conservation; the producer must score 85% for the implementation of the biodiversity guideline and IPW assessment; a comprehensive environmental management plan must be developed and implemented, the producer must score a minimum of 75% for the entire IPW assessment for both the farm and cellar; and the farm's biodiversity story must be written up to include unique or special biodiversity on the farm and actions taken to manage biodiversity in harmony with farming activities. The number of BWI members and champions is growing constantly along with the total number of hectares of biodiversity conserved. The BWI in 2008 had 10 champions, nine cooperative cellar members and 105 members conserving a total area of 99 069ha of natural vegetation (Biodiversity and Wine Initiative 2008).

Between 2004 and 2008 the BWI had succeeded in setting more land aside for long-term conservation than total land already developed for the planting of vineyards. Wine producers have set aside more than 103 000ha of natural area through negotiations with the BWI to support the long-term sustainability and integrity of the Cape Winelands. South Africa is leading the world in the conservation of biodiversity vineyard landscapes where the conservation footprint now matches the total area under vineyards. This illustrates the South African wine industry's commitment to protecting their unique natural heritage, with an additional hectare under conservation for every hectare of vine planted by the wine industry (Kotze 2008). The BWI is highly applicable to this study, as more than 80% of all the BWI farms in the Western Cape are situated within the study area, confirming the fact that action is being taken with regards to biodiversity and land use planning issues previously raised within the agricultural industry.

2.4.11 Guidelines for Resort Development in the Western Cape

The guideline for resort developments in the Western Cape was initiated by DEADP and implemented from December 2005. Resort development is a result of the increasing affluence, mobility and available leisure time among the middle to high income groups which resulted in a rapid increase in the demand for tourist facilities worldwide, and especially in South Africa and the Western Cape because of it's rich biodiversity. Hood (2005:104) states that large scale resort related developments such as gholf

resorts increased rapidly in the Western Cape, reaching a total of 40, with another 13 being proposed at the time. The De Zalze Winelands Golf Estate near Stellenbosch, Arabella Country Estate near Kleinmond, Pinnacle Point Beach and Golf Club near Mossel Bay, Fancourt Hotel and Country Club near George and Pezula Golf Estate near Knysna are the most recent and largest developments in the Western Cape, all consisting of a minimum of 250 housing units, an 18-hole golf course together with club house conveniences, a hotel and resort related commercial facilities, such as a restaurant and resort shop (Van der Merwe 2006).

The Western Cape government is cautious about the numbers of these developments, especially in terms of their sustainability, the benefits to the community and the impacts on the environment, particularly with regard to the large amounts of water needed to sustain them. The Western Cape government is therefore considering measures to regulate the unsustainable expansion of these developments by proposing to place a moratorium on golf resort developments along the Garden route, mainly because of the scarcity of water resources in this region (Hood 2005:104). The development of these guidelines led to a debate between government officials, developers and prospective investors, who viewed this as an anti-development strategy, causing significant uncertainty and reluctance to consider investments in the form of large scale resort related developments (Dennis Moss Partnership 2004). Economists and developers argue that these developments are primary economic drivers that could play a vital role in the co-subsidisation of programs to eradicate poverty and inequality and rehabilitation of the environment (Urban-Econ 2005).

The aim of these guidelines is to assure sustainability, by making a positive contribution towards the wellbeing of relevant areas, through the development of viable and appropriate resort facilities. It gives particular attention to the criteria that are relevant to the evaluation of resort applications in terms of location, density and size requirements, environmental protection, sustainable infrastructural and design, construction and maintenance aspects (DEADP et al. 2005e). The guidelines address aspects relating to guesthouse/resort developments in rural and natural areas in the Western Cape. The guidelines provide opportunities for social and economic development and conservation of biodiversity in a sustainable manner and most importantly restricts any resort on land used for intensive agriculture, or within a category of potential valuable soils as determined by the relevant local authority (DEADP et al. 2005e). It emphasises that the subdivision of farms should be sustainable from an agricultural perspective, and that the best use of the farm and farming practices must be considered (Coetsee 2006).

The initiation and implementation of these guidelines sparked a wave of awareness among wealthy residents and visitors who became aware of the large portions of environmental resources their lifestyles consume. This resulted in the development of a more sustainable form of barely noticeable small scale luxury eco-lodges for tourism and short-term holiday accommodation, providing much needed rural employment. The implementation of these guidelines must take place in collaboration with the participation of relevant role players such as CapeNature (ensuring that resorts are not developed in sensitive biodiversity areas), DoA (ensuring that resorts are not developed on high-potential agricultural land), Heritage Western Cape (ensuring the protection of national heritage), DWAF (ensuring the availability of water) and local authorities (ensuring that appropriate resorts are incorporated in the IDP and SDF for that area) (DEADP 2005b; DEADP et al. 2005e).

Resort related development can have negative effects such as the consumption of water or benefits in terms of poverty and inequality eradication and rehabilitation of the environment. It is therefore crucial that strategies are implemented through strong partnerships and cooperation between the relevant role players (government officials, conservationists, developers and prospective investors) to give guidance in reaching the goals and objectives of the government regarding the promotion of sustainable development and the eradication of poverty and inequality (Van der Merwe 2006).

This chapter illustrated the important role that legislation, management programmes and guidelines play in agricultural land transformation with regard to conservation, management and planning. The next chapter studies the potential impacts associated with agricultural land use change developments by analysing application attributes statistically.

CHAPTER 3: LAND USE CONVERSION OF AGRICULTURALLY ZONED LAND

Humans are connected to the natural environment through complex interdependent actions, causing human industries such as agriculture to be linked to biodiversity, social well-being and the economy through complex interlinking impacts and challenges (United Nations Convention on Biological Diversity 1992; Jones & Pattayanak 2006). Agricultural land conversion in the Western Cape is therefore also impacting on economic growth and employment creation (Agriculture Sector Brief 2005/2006) and determines town and community development. Furthermore, it can contribute to the loss of natural biodiversity and the quantity and quality of water supply. Conversion patterns as manifested in its occurrence, extent and nature point to possible future trends of development, and management measures that may be required to promote sustainable use of land in the Western Cape. These sustainable land use conversion patterns are also encouraged by considering landscape ecological principles in land use conversion decisions (Bo-jie & Li-ding 1999).

3.1 The framework for analisys

The database, consisting of land use change applications contain the data variables which may be used to explain motivations and trends in the development process by cross-correlating them in combinations that may expose obscured explanatory relationships. These applications contain different data variables, which explain the potential relationships between variables and in doing so highlight hidden motivations and trends in the development and application process. Relational variables so correlated and analysed include: development function, year of authorisation, property ownership, applicant identity, intended type of conversion (applications), municipal location, size of affected property, number of permanent jobs projected, number of projected temporary jobs, proportion of property developed and the areal footprint of affected land use types. The most commonly used explanatory concepts such as development function and metropolitan shadow influence are defined in this context. The relationship between the development function intensity and the metropolitan shadow influence are analysed using frequency tables, which illustrate the number of applications per variable (regional location) motivated with proper reasoning. Bar charts are used to analyse and explain the spatial distribution of applications (DEADP and DoA) within the local authorities and areas with different agricultural soil potential within the study region.

The analyses present an indication of the amount, type and location of applications for agriculturally zoned land conversion to different development functions, in order to establish mitigation measures for the preservation of valuable agricultural land for agriculture and for related development purposes. The following sections examine, as dynamic explanatory frameworks, the:

- metropolitan shadow effect on agricultural land use change and the intensification of this process over time;
- the role of the type of applicant and property ownership in the decision to convert agricultural land;
- development function intensification and property ownership;
- inherent development potential of municipal areas in relation to their distance from the metropole;
- development function intensification and extent of the affected property;
- permanent and temporary job creation potential per development function; and
- development coverage effect and the potential loss of soil with agricultural potential through land conversion.

These elements form the framework for the analytical discussions that follow. To facilitate the analysis and discussion in the following sections, the subsequent concepts and variables: ‘development function’, ‘metropolitan shadow influence’, ‘ownership’, ‘applicant’, ‘development potential’ and ‘development coverage’, need to be clarified, since it is prone to misunderstanding if read in the wrong context. ‘Development function’ is the proposed development type that will replace the undeveloped agricultural land use due to the submission of the land use change application in terms of the EIA regulations. ‘Metropolitan shadow influence’ is defined as the impact that the Cape Town metropole has on the nature of development applications due to variance among service centres as well as economic dynamism increase closer to the metropole. Consequently places are spatially ordered according to distance from Cape Town. ‘Ownership’ is ordered according to the perceived entrepreneurial dynamic inherent to ownership and subsequent right and likelihood to develop the land: individual owners, family ownership (e.g. trust), commercial estate, private company or state (public land). The ‘applicant’ is the similar authority or organ that applies for the proposed land use change. ‘Development potential’ is expected to be indicated by the number of applications for land use change in a specific municipal area. ‘Development coverage’ defines the physical area that will be converted by the application for change of land use. This chapter commences with an assessment on the metropolitan shadow influence and development function intensification and concludes by assessing the expansion of urban areas, resulting in land use conversions.

3.2 Metropolitan shadow influence and development function intensification over time

This section studies the relationship between the development function intensification and the metropolitan shadow influence. This is important as it alerts the Department of Agriculture, programmes (e.g. LandCare Areawide Planning) and agencies (e.g. Wesgro) to the regional location where most development occurs. It is also essential to identify the most dominant development types to ensure that measures are implemented to ensure sustainable conversion of land and to preserve valuable agricultural land – i.e. sustainable land management and planning. As example of steering the different use functions to the most appropriate regions and locations, residential and commercial related developments could be confined within the urban edge, while agriculture and nature conservation could be encouraged outside the edge (DEADP 2005a). For analytical purposes functional variable classifications are argued first.

3.2.1 Classification of development function and municipal areas

In the analyses nine different types of land use functions were classified as converted end uses. They are listed here and used in the tables in this *order of conversion intensity* – i.e. ranging from the 'hardest' built-up to the 'softest' close-to-natural-veld use types – to signify the degree of land use change permanence and preferability guarded by public authorities.

- 'Bulk services' refer to municipal infrastructure such as water purification works, electricity distribution hubs, waste water treatment works, dump sites, pipelines and municipal sports grounds – new structures as well as the upgrades to existing plants.
- 'Commercial' includes industrial uses and refers to business related developments such as retail outlets, office and industrial parks.
- 'Residential' refers to all classes of housing – single and general.
- 'Resort development' is viewed as the conversion of agricultural land for such uses as holiday resorts and golf estates.
- 'Communication' refers to a conversion of agricultural land for the installation of communication infrastructure, including underground cables, cell masts, radio transmission towers, ground stations and related infrastructure.
- 'Hospitality' mainly encompasses tourism related structures on farms where agricultural land or buildings are converted to the building of or conversion into guesthouses, wine and food consumption facilities, conference facilities and restaurants.

- ‘Agricultural construction’ refers to additional agriculture related infrastructure such as sheds, processing plants, pig sties, chicken houses/broilers and irrigation plants (including pipelines and dams).
- ‘Agricultural cultivation’ logically refers to the initial conversion of virgin agriculturally zoned land for the production of crops.
- ‘Nature conservation’ refers to any land application formally requesting designation for natural protection and conservation – in some instances the land may be previously disturbed agricultural land, but preferably this would be undisturbed land. Typically this would entail land added to a larger existing conservancy.

The subregions in the study area have been classified according to distance from the metropolitan core as an indication of degree of rurality and hence subjection to the metropolitan shadow effect. The assumption is that places along the rural-urban intensity continuum would display differences in land use conversion dynamics as reflected in the application record. Consequently, radiating out from the Cape Town Metropolitan core the following classification from least to most rural was applied:

- Metropolitan (Durbanville, Brackenfell and Kuilsriver),
- Stellenbosch (Franschhoek, Stellenbosch and Klapmuts),
- Boland (Paarl and Welllington),
- Northern Boland (Saron, Gouda, Tulbagh, Ceres and Wolseley),
- Breede Valley (Worcester and Rawsonville),
- Breede River East (Ashton, Bonnievale, Montagu and Robertson), and
- Hex River (De Doorns and Touwsriver).

Similar to functional intensity, locations are used in the tables in this *order of rurality* – i.e. ranging from metropolitan to deep platteland. Relationships among these two explanatory variables and related independent variables were assessed by the cross tabulations reported in this chapter.

3.2.2 Location of development applications

Academics, regional planners and policy makers agree about the important role that small towns play in the local development of a region, through the services that these towns provide to their umland. Van der Merwe et al. (2004) state that the structure, role and development function in small towns are strongly influenced by regional and local conditions, such as natural resource endowment, population

density, market accessibility, political/economic structures, distribution of income and purchasing power. Recalling that these applications strictly refer to extra-urban locations, the question is then how location (in terms of the nearest town) determines the nature of local applications for land use conversion.

Table 3.1 illustrates that most of the applications applied for hospitality and agricultural construction related developments, contributing to more than half of all the applications.

Table 3.1 Relationship between development function intensity and metropolitan shadow influence

(Row %)	**Regional location**								
Development function	Metropolitan	Stellenbosch	Boland	Northern-Boland	Breede Valley	Breede River-East	Hex River	**Row total (n)**	**Total (%)**
Bulk services	6.7	26.7	23.3	13.3	6.7	23.3	0.0	**30**	**7.2**
Commercial	0.0	16.7	0.0	33.3	16.7	33.3	0.0	**6**	**1.4**
Residential	25.0	30.3	25.0	3.9	5.3	9.2	1.3	**76**	**18.3**
Resort	0.0	16.7	50.0	8.3	0.0	25.0	0.0	**12**	**2.9**
Communication	0.0	40.0	0.0	0.0	20.0	40.0	0.0	**5**	**1.2**
Hospitality	4.0	31.7	15.9	9.5	10.3	26.2	2.4	**126**	**30.3**
Agricultural construction	1.7	34.2	29.2	8.3	9.2	11.6	5.8	**120**	**28.8**
Agricultural cultivation	6.7	26.7	23.3	13.3	6.7	23.3	0.0	**16**	**3.9**
Nature conservation	0.0	16.7	0.0	33.3	16.7	33.3	0.0	**25**	**6.0**
Column total (n)	**29**	**127**	**98**	**34**	**34**	**83**	**11**	**416**	
Total (%)	**6.9**	**30.5**	**23.6**	**8.2**	**8.2**	**20.0**	**2.6**		**100.0**

On the other hand least of the applications were for communication and commercial related developments, contributing jointly to less than 3% of all the applications. It is evident that most of the applications applied for a change of agricultural land use in the Stellenbosch region, contributing to about one third of all the applications while Boland and Breede River East are almost conjointly second contributing both to about one fifth of all the applications. This observation seems to confirm the suspected metropolitan shadow effect – i.e. more conversions closer to Cape Town and in a more metro environment.

That begs the question whether these general distribution patterns hold between the various development functions amongst the different regions within the study area? More than one quarter of all the bulk service applications were in the Stellenbosch region, with just less than one quarter each in the Boland and Breede River-East regions – demonstrating the development vibrancy in the more urbanised realms. This development dominance in the more developed regions are also somewhat reflected in the commercial applications, with about a third located in Breede River East and just less than a fifth in Stellenbosch, contributing to half of all the applications. The mass of residential applications therefore not surprisingly hailed from these three dominant regions as well, with the Stellenbosch region contributing to almost one third of the total.

The metropolitan shadow effect also plays a significant role in the location of residential applications, resulting in more than three quarters of the applications being developed in the more urbanised regions namely the Metropolitan, Stellenbosch and the Boland, with about a third emanating from Stellenbosch. While resort applications were dominated by the Boland region, this category was rather small in number (only twelve in all). Nevertheless, some surprising prominence was attained in the less developed areas such as Northern-Boland and Breede River-East. The number of resort applications situated in Stellenbosch, Boland and Breede River-East attests to a combination of vacant agricultural land and marketability of such products close to the city to support this type of development (Sandwith et al. 2006). The development dominance are also reflected in the communication applications, with more than three quarters of the applications located collectively in Stellenbosch and Breed River East. Taking this point further, of all the large number of hospitality applications, nearly one third was located in the Stellenbosch region and just more than a quarter in the Breede River-East region showing where the two hubs of new tourism development is probably forming. Most of the hospitality applications were from the more agriculturally developed regions, because they possess existing infrastructure (large numbers of abandoned labourer cottages) which are generally converted into accommodation units and provide scenic agricultural landscapes to compliment the stay for their city guests (Redford 2005).

This pattern of dominance is also echoed by just more than one third of all the agricultural construction applications also coming from the Stellenbosch region – just more than those in the Boland region. These two regions together contribute more than half of all the agricultural construction change applications, signifying a capital intensive and high-density development dynamic in the rural areas on the metropolitan fringe. Although less so in terms of agricultural cultivation applications, these regions

still dominate in that class as well, with Breede River-East in some contention. More significantly, most agriculture related applications came from the dominant and economically viable viticultural regions (Stellenbosch, Boland and Breede River-East) as they are undertaking viticulture related developments in the form of wine cellars, storage sheds, cellar expansion to accommodate boutique wine makers and the cultivation of undeveloped land for the expansion of vineyards (Pascual & Perrings 2007; DoA 2008; SAWIS 2008).

As is to be expected from these more remote rural areas, most of the nature conservation applications were from the outlying Northern-Boland and Breede River-East regions. Yet, and contrary to expectation, half of the nature conservation applications were from the dominant viticulture regions with their viticulture dominance. But then this trend can mainly be ascribed to the development of modern sustainability initiatives such as the Biodiversity in Wine Initiative (BWI) and programmes such as LandCare Areawide Planning to mitigate or offset the ecological impact of the viticulture industry (Sandwith et al. 2005).

The regional patterns of dominance are ably demonstrated in Figure 3.1, which displays the number of applications at ever greater distance from Cape Town.

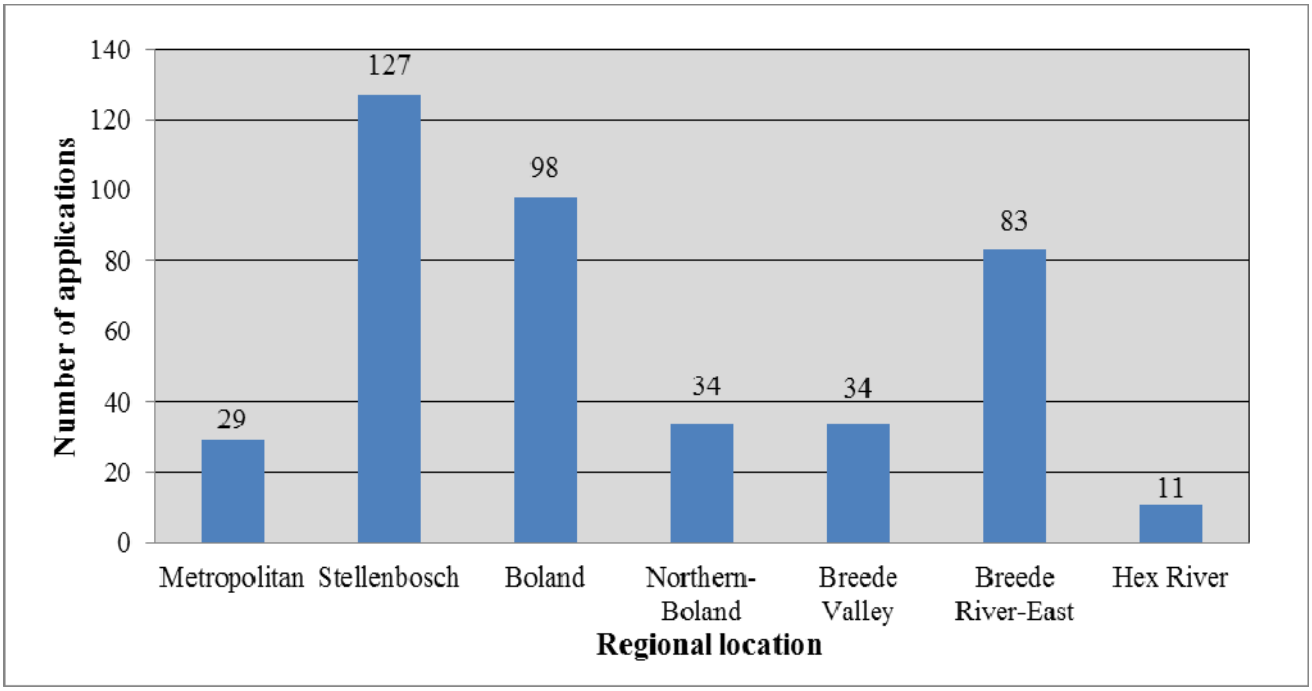


Figure 3.1 The metropolitan shadow influence on the number of applications per region

The metropolitan shadow influence on the locality of land use change applications is clearly shown in the numeric dominance in applications of the two regions closest to the metropole. The Breede River-East region which are the sixth furthest region from the metropole breaks the pattern and signifies the importance of Worcester as secondary city – its status confirmed by Van der Merwe et al. (2004).

Incidentally, the reason for the Metropolitan region being the second lowest contributor to land conversion is because of the dearth in developable land there – land in the metropolitan fringe had already been developed prior to the 1998 study period due to urban expansion.

In conclusion, it can be stated that viticulture plays a pivotal role in the intensification of land use, as galvaniser of economic growth which subsequently also stimulate development in the less developed areas (DoA 1996: vi). Closeness to the metropole remains significant in the increase of land use change applications because of development stimulus that the metropolitan region provides in the form of purchasing power, market accessibility and closeness of service centres (Drozd & Johnson 2004; Paterson & Boyle 2002). The closer a region is aligned with these driving factors the greater is the potential for development. Clearly, as Hendy (1998) argues, the viticulture industry and distance from the metropolitan region as well as the factors of location, distance to services, amenities, vistas, natural environment and surrounding development are what influence the intensification of land use

3.2.3 Temporal trends in authorised land use change applications

Since the period for analysis spans the historical period in which the EIA regulations had become operational and the latter had been adjusted a number of times during this period, trends in the nature of applications over time might show significant variation in developer's responses. Furthermore, development trends are similarly summarised for the period. These trends can be used to monitor land use conversions in the region, over time. This will provide valuable information on development trends, landscape functioning and human actions, which can be used to make informed decision for sustainable land use conversions in the future (Dale & Haeuber 2001).

Table 3.2 makes it evident that most of the applications for a change of land use were recorded since 2001, with a discernable peak in the most recent 2006. Clearly applications in the early years came in rather slowly, which can be attributable to a number of factors. The EIA regulations came into existence in 1998 only and became known slowly since that year. By 2006 implementation was well

under way (Rossouw & Wiseman 2004), developers understood the legal requirements for application, adhered to them more regularly and practitioners to conduct the investigations and file the applications were operational.

Table 3.2 Trends in application type over time

(Row %)	Year of Authorisation										
Development function	1998	1999	2000	2001	2002	2003	2004	2005	2006	**Row total (n)**	**Total (%)**
Bulk services	2.8	13.9	13.9	5.5	34.7	20.9	2.8	0.0	5.5	**30**	**7.2**
Commercial	0.0	0.0	16.7	0.0	0.0	0.0	50.0	33.3	0.0	**6**	**1.4**
Residential	3.8	11.5	2.4	15.4	6.0	10.4	7.7	22.5	20.3	**76**	**18.3**
Resort	7.1	7.1	7.1	7.1	7.4	7.1	7.1	25.0	25.0	**12**	**2.9**
Communication	0.0	0.0	0.0	0.0	60.0	0.0	20.0	20.0	0.0	**5**	**1.2**
Hospitality	0.7	11.6	3.6	15.9	12.3	15.2	6.3	13.2	21.2	**126**	**30.3**
Agricultural construction	5.9	6.6	9.4	10.4	20.7	10.4	8.5	8.5	19.6	**106**	**25.5**
Agricultural cultivation	0.0	6.7	10.0	13.3	23.3	13.3	10.0	6.7	16.7	**30**	**7.2**
Nature conservation	6.6	9.8	11.5	19.6	3.3	8.2	3.3	26.2	11.5	**25**	**6.0**
Column total (n)	**13**	**40**	**29**	**54**	**65**	**51**	**31**	**57**	**76**	**416**	
Total (%)	**3.1**	**9.6**	**7.0**	**13.0**	**15.6**	**12.3**	**7.5**	**13.6**	**18.3**		**100.0**

The fluctuations in the number of land use changes since 1998 was somewhat unexpected, as a more gradual increase in applications were expected. This fluctuating increase can most likely be ascribed to the upsurge in economic conditions since 2004 and the tendency among farmers to convert more of their land to permanent commercial farming in the form of viticulture, especially during the last decade, during which time this type of farming became more profitable and competitive than other use types (Matthews 2003).

The table shows that the various functions did not undergo identical time trends – in other words the various types peaked at different times and showed different variations over time – probably in reaction to different economical and related development stimuli. Some related functions like bulk services, residential and resort development peaked erratically with recent upsurges, while the more numerous groupings like hospitality and agricultural infrastructure showed a much more even and consistent

application format. Nature conservation applications show a similar consistency, but a more recent upsurge is evident.

3.3 Ownership type responsible for land conversion

This section examines the relationship between property ownership and the applicant type to establish which type of applicant is responsible for more agricultural land conversions than others. This observation is important as it will hint at possible future land use conversion trends that will afford governing authorities a better chance to anticipate and to influence the balance between conservation and development. The growth of a transitional society, such as South Africa in the present millennium, also requires appropriate use of privately owned land for sustaining development. For example, biodiversity rich areas should be conserved, medium and high potential arable land should be productively worked and appropriate land should be set aside for infrastructural development (The World Bank 2004).

Property ownership implies that the owner of the property is an individual owner, family, commercial estate, private company or public land (government authority). The applicant is not necessarily the owner of the property, but rather the legal entity that applies for the land use change. Association with these variables (applicant and property ownership) as illustrated in Table 3.3 was performed through cross tabulations to test for the relationship between applicant and the property ownership. It illustrates that a large majority of the properties involved were owned by individual owners, followed by private companies and families (almost 90% privately owned).

Table 3.3 Relationship between property ownership and applicant

(Row %)	**Property ownership type**						
Applicant type	Individual owner	Family ownership	Commercial estate	Private company	Public land	**Row total (n)**	**Total (%)**
Individual owner	88.1	3.4	0.9	7.6	0.0	**118**	**28.3**
Family ownership	2.3	95.4	0.0	2.3	0.0	**43**	**10.3**
Commercial estate	64.5	3.2	29.1	3.2	0.0	**31**	**7.5**
Private company	27.3	8.6	0.5	59.9	3.7	**187**	**45.0**
Public land	16.2	2.7	2.7	0.0	78.4	**37**	**8.9**
Column total (n)	**182**	**63**	**12**	**123**	**36**	**416**	
Total (%)	**43.8**	**15.0**	**2.9**	**29.6**	**8.7**		**100.0**

Private enterprise therefore dominates the property ownership scene where applications for land use change are made absolutely. It is therefore not surprising that individuals bring the majority of applications officially. Clearly individual and family owned entities bring their own applications and do not make extensive use of private companies to handle the application process. The latter trend would simply indicate a large extent to which the development process has become professionalised by the rigours that legislation and regulation has enforced, or it would raise the question whether privately owned development mechanisms have come to drive the development momentum – the answer being that it is not the case yet. The fact that the property owner was mostly responsible for bringing the land use change applications attests to an inherent privatised development dynamic and perhaps the cutting on additional costs of additional entities to handle the application process, deeds transfer and property divisions. Reed (2009) states that property developers buying farmland are mostly interested in increasing their profit and focus on cutting additional costs on external specialists such as EAP's. Another reason can also be ascribed to the aesthetics associated with farmland, which contribute to the demand and development potential of this property type. Therefore the evidence that more commercialised enterprises (estates) had their applications brought by private companies emphasise a strong trend toward a business-based approach – one that may be on the increase in future as Reed (2009) seems to predict.

This business orientation that may come to drive the conversion dynamic is likely due to a profit drive which is often not agriculture based and may point to a potential threat in loss of agricultural land in the future. Land conversion to another land use type such as business or residential or otherwise subdivision and selling the land in fragmented pieces in order to make a higher profit is a concern. Reed (2009) states that farm land in South Africa is mostly bought by private investors based on the recreational potential of the land, demonstrating the intention of the land owners to convert agricultural land to maximise profits even if it means that agriculture becomes secondary. The results in this section may demonstrate that agricultural zoned land could gradually be converted to ownerships outside the field of agriculture (individual owners and family ownership) to more economically orientated uses (commercial estate and private company), confirming the importance of this analysis for the future of agriculture in the study area (Brandt & Vejre 2004).

3.4 Development function intensification and property ownership

The relationship between property ownership and the development function illustrates how ownership type may indicate likely development functions that may be responsible for land use changes in the study region. Trends in the likely development function expected from different property ownership types and the uses to which agricultural land in the study region might be converted to can then be predicted. These potential land use changes are reflected in the South African context which is in the process of undergoing a transition from utilising agricultural land primarily for agriculture and income opportunities towards a more multi-functional environment where alternative non-agricultural uses are apparent (Green et al. 2005; Maybery et al. 2005). Such predictions may indicate proposed land use changes envisaged by property ownership groups and help to establish a land use change history which will assist in the prediction of future efforts to conserve arable land and sensitive biodiversity areas (Cramer & Hobbs 2007).

Table 3.4 illustrates that residential and hospitality related developments are responsible for almost half of all the land use change applications, while agriculturally related changes (mostly construction) account for just more than one quarter of all the applications.

Table 3.4 Relationship between property ownership and the development function

(Row %)	**Property ownership**						
Development function	Public land	Private company	Commercial estate	Family ownership	Individual owner	**Row total (n)**	**Total (%)**
Bulk services	68.3	14.9	0.0	1.9	14.9	**30**	**7.2**
Commercial	16.7	33.3	16.7	0.0	33.3	**6**	**1.4**
Residential	8.6	36.7	3.4	7.3	44.0	**76**	**18.3**
Resort	4.4	31.9	8.9	6.2	48.6	**12**	**2.9**
Communication	20.0	20.0	0.0	20.0	40.0	**5**	**1.2**
Hospitality	4.5	31.5	2.7	21.4	39.9	**126**	**30.3**
Agricultural construction	3.6	26.2	2.4	16.7	51.1	**120**	**28.8**
Agricultural cultivation	4.5	22.7	4.5	22.7	45.6	**16**	**3.9**
Nature conservation	0.0	17.3	2.9	13.9	65.9	**25**	**6.0**
Column total (n)	**36**	**123**	**12**	**63**	**182**	**416**	
Total (%)	**8.7**	**29.6**	**2.9**	**15.0**	**43.8**		**100.0**

Urban-like developments (the most invasive type) in infrastructure accounts for over one quarter – an indication of the inroads made into predominantly rural environments. Clearly the nature of change reported in this table leans heavily towards an intensification that that may hold serious consequences for the long term maintenance of a rural character in the affected areas.

As can be expected bulk service provisions are largely applied for from the public sector charged with service provision, but it must be noted that these services are normally delivered to urban areas – for which the rural setting pays the price. In all other instances the private entrepreneur (individuals, companies and family owned) brought the overwhelming majority (generally >80%) of applications. A striking result is the dominance that individual owners have in the applications for resorts and hospitality functions – closely followed by private companies. This clearly shows an entrepreneurial focus among perhaps smaller land owners to obtain maximum yield from their land in an era of mounting economic pressures, as authors often predict (Maybery et al. 2005; Roberson 1997). The fact that individuals also lead strongly in applications for conservancy declaration may be indicative of some perceived value to be derived from designating perhaps less economically viable land to a use function that may have long term worth (perhaps also economic-political?); nevertheless it is to the benefit of biodiversity conservation – especially in areas prone to conversion for viticulture (Gemmill & Varela 2004; Ferraro & Simpson 2004). The pattern of individual ownership dominance persists when agricultural conversion is considered, with private companies less prominent and family ownership maintaining its balanced involvement. The process of private individual lands being bought over by private companies to maximise the profit from the land may be a growing trend that would deserve close scrutiny (Maybery et al. 2005). It is after all so that most of the unexploited land outside the urban edge is owned by farmers and private developers are continually buying land from them with development intentions, bringing about a gradual shift in ownership of land (Brandt & Vejre 2004).

The trend towards hospitality and related agricultural constructions is significant, as one would expect that agriculture related developments would mostly occur on agricultural land rather than tourism related developments. However, agriculture can compliment tourism, because of its rural nature and the tourism does not necessarily have to hinder the actual agricultural production, but could rather be seen as utilising unused buildings and space on the farm, such as old sheds and labourer cottages being converted for guesthouses (Visser & Van Huyssteen 1997), wine tasting or facilities complimenting the primary use of agriculture through agri-tourism (Holmes 2006). Worrying examples would be where tourism/resort developments are constructed on fertile agricultural land and subsume the role of the

farm as a tourist centre rather than an agricultural entity. It is therefore important that the main activity on the farm remains agriculture and that tourism rather compliment agriculture in a sustainable manner (Reed 2009).

3.5 The role of development potential of the municipal region

Regional context and economic markets play an important role in the development potential of urban nodes within a municipal region (Hinderink & Titus 2002). The location and extent of a municipal region plays a definitive role in the development potential of that region, especially by providing an adequate client catchment base. Proximate location to urban cores enhance purchasing power, market accessibility and expansion of included service centres (Hinderink & Titus 2002; Drozd & Johnson 2004). It is therefore important to assess the regional context of the study area related to the amount and nature of land use change applications in each municipal area. The relationship between the size of the municipality and the impact of the metropolitan shadow effect in relation to the proportion of applications is assessed here.

The development dynamism of a municipal region can be gauged by the proportion of land use change applications submitted per subregion and allow prediction of future conversion of land to enhance development in various forms (Rosegrant et al. 2005). Table 3.5 illustrates that the three largest and outlying municipal regions, namely Breede River Winelands, Breede Valley and Witzenberg, together covering nearly 70% of the total municipal area, generate 35% of all the land use change applications – about as much as Stellenbosch alone.

Table 3.5 Proportion of land use change applications per municipal region

Municipal region according to distance from the metropole	**Municipal region area (km²)**	**Proportion of total area (%)**	**Proportion of land use change applications (%)**
CoCT: Oostenberg administration	655	5.0	4.2
CoCT: Tygerberg administration	894	6.8	3.1
Stellenbosch	956	7.2	32.3
Drakenstein	1538	11.6	24.5
Witzenberg	2851	21.6	7.7
Breede Valley	2994	22.6	10.1
Breede River Winelands	3334	25.2	18.1
Total	**13222**	**100.0**	**100.0**

Source: Western Cape Provincial Treasury (2006); Wikipedia (2008).

The two metro subregions can be largely ignored in this analysis, since they do not really have extensive rural land or an agricultural character like the other subregions. In summary it can be stated that the two small subregions in the urban shadow of Cape Town produce more than half the applications and the larger, outlying subregions proportionally far less. This illustrates the influence of the enhanced purchasing power, market accessibility and service centre size that the metropolitan region provides (Drozd & Johnson 2004; Paterson & Boyle 2002). It further exemplifies that the conversion of agricultural land is not necessarily linked to the proportional size of the municipality, but rather to location, agricultural activity and economy of the municipal region. It is therefore confirmed that the location of a region in this context, plays a more significant role on the development of region, than the extent (TSG 2004; Western Cape Provincial Treasury 2006).

3.6 Development function intensification and property size

Farmland is becoming scarcer as a result of non-farm factors such as population density and population growth, resulting in the expansion of urban fringes, consuming valuable portions of land (Platinga et al. 2002; Weerahewa et al. 2008). Development potential is mostly dependant on the size and availability of land for a proposed land use change, forcing land owners to develop and farm more intensely on the available land. Cowling et al. (2003) found that the expansion and intensification of viticulture as a result of new development converting portions of agricultural land, adversely threatens the lowland ecosystems of the Western Cape. These intensification methods of utilising land can also be beneficial, as it allows farmers to consider carefully the consequences of their actions, which creates a greater sense of care for the land and the community (Goerning, Norberg-Hodge & Page 1993). It is therefore important to assess the relationship between the specific development function and the size of affected properties to identify threatened agriculturally zoned land. This will assist the DEADP and DoA as well as management strategies such as LandCare Areawide Planning and BWI to introduce strategies and/or regulation measures to mitigate and/or prevent unsustainable land use changes to preserve valuable agricultural land and biodiversity.

Association between development function and property size, as illustrated in Table 3.6, is clearly evident. Nearly half of all applications involve small farms, and about a quarter smallholdings. This means that less than one quarter of applications were received from larger holdings (>100ha).

Table 3.6 Relationship between the development function and size of affected property

(Row %)	Size class of affected property (ha)						
Development function	**Large farm (>500)**	**Medium farm (100-500)**	**Small farm (10-100)**	**Smallholding (1-10)**	**Erf (≤1)**	**Row total (n)**	**Total (%)**
Bulk services	2.8	6.9	69.4	13.9	7.0	**30**	**7.2**
Commercial	0.0	0.0	0.0	50.0	50.0	**6**	**1.4**
Residential	1.1	9.0	29.8	51.2	8.9	**76**	**18.3**
Resort	18.5	44.5	37.0	0.0	0.0	**12**	**2.9**
Communication	0.0	20.0	60.0	20.0	0.0	**5**	**1.2**
Hospitality	1.6	23.5	47.3	22.8	4.8	**126**	**30.3**
Agricultural construction	2.4	20.4	62.9	12.6	1.7	**120**	**28.8**
Agricultural cultivation	7.7	38.5	53.8	0.0	0.0	**16**	**3.9**
Nature conservation	3.2	30.6	38.7	27.5	0.0	**25**	**6.0**
Column total (n)	**11**	**83**	**205**	**98**	**19**	**416**	
Total (%)	**2.6**	**20.0**	**49.3**	**23.6**	**4.5**		**100.0**

While this is of course a reflection of the smaller property sizes in the more intensively cultivated subregions in the urban shadow (Stellenbosch, Drakenstein) with their higher total number of applications, it does indicate a high measure of further fragmentation in areas already finely subdivided.

Table 3.6 depicts that almost three quarters of all the bulk service related developments, applied for a change of land use on small properties. This table also illustrates that all the commercial related applications, applied for a land use change on smallholdings and small erven. It is also apparent that most residential applications, apply for a change of land use on small properties – (smallholdings), about a third on small farms, contributing collectively to more than three quarters of all the residential applications. Contrarily, close to half of all the resort applications applied for a change of land use on medium farms, and again a third on small farms. Similarly more than half of all the communication applications applied for a change of land use on small farms, as do about half of all the hospitality applications. A slight shift (about a quarter of the applications) towards medium farms and smallholdings respectively is evident. Agricultural constructions also concentrate on small farms or on medium farms. Agricultural cultivation applications for change of land use dominate on small farms or

on medium farms – the slightly larger properties. The bulk of the nature conservation applications are more or less equally scattered between small and medium farms as well as smallholdings.

The fact that the largest portion of land use change developments are occurring on small farms and smallholdings is a clear indication of the results of fragmentation of agriculturally zoned land. The reason for this fragmentation process can be ascribed to previous inheritance practices where family lands were subdivided among the children as well as high land and farming related costs, resulting in farmers selling the uneconomical portions of farm land to developers or establishing some sort of hospitality development (Elsenburg Landbou-ontwikkelings Instituut vir Winterreëngebied 1990; Gebeyehu 1995). The DoA is considering the affects that these land use changes has on the sustainability of agricultural and are implementing policies to prevent and mitigate those impacts (Pollard & du Toit 2005). It was expected that most of these hospitality related developments would be developed on small farms as it is the most appropriate size to serve as a country retreat with additional benefits such as natural biodiversity and aesthetics (Kallas et al. 2007; Pope & Goodwin 1984). The typical popularity of development on these small farms can also be ascribed to high land and development cost, causing people to rather buy smaller farms for recreation, farming or development purposes (Elsenburg Landbou-ontwikkelings Instituut vir Winterreëngebied 1990). It is however surprising that most of the resort related applications apply for a change of land use on medium-sized farms, contrary to the expectation (Elsenburg Landbou-ontwikkelings Instituut vir Winterreëngebied 1990; Kallas et al. 2007). It was anticipated that the majority of residential related developments would be situated on smallholdings, as a result of the appropriate size and cost of these properties for most residential developments (Wiid & Le Roux 1999).

In conclusion, all the land use change developments within the study region over the specified period are more or less equally divided between agriculture, hospitality and development, of which almost three quarters occur on small farms and smallholdings due to the peculiar property size structure and costs (farming, development, property) (Gebeyehu 1995). It is therefore essential to find harmony between these three sectors by exploring the advantages that the hospitality industry holds for the farmer, without jeopordising the sustainability of agriculture (Holmes 2006; Visser & Van Huyssteen 1997).

3.7 Permanent and temporary job creation per development function

Sustainable jobs have a positive effect on the development of rural communities in the Western Cape by enhancing economic growth, providing social security and reducing crime (Vink 2003). Commentators often claim that the numbers of jobs 'promised' in applications for land use conversion, are inflated to grease the decision-making process towards a favourable decision – especially where decisions are locally politically facilitated, leading to a potential oversight of the environmental features (De Villiers & Manuel 2006). It is consequently important to examine the number of permanent and temporary jobs projected in these applications. Such analysis is furthermore significant to the upliftment of rural communities by identifying appropriate development types that would provide the most jobs in order to enhance social security and economic growth. The relationship between the temporary and permanent jobs will similarly stimulate more permanent jobs, because of the more sustainable positive effects through business and biodiversity related projects being mainstreamed in land use change developments (Meurk 2007).

The two types of jobs measured in this section are permanent and temporary jobs. Permanent jobs refer to job opportunities where the employee is employed on a permanent basis. Temporary jobs refer to instances where the employee only holds the job for a fixed period or until a contract or development phase (like construction) expires. The following subsections evaluate in tandem the relationship between the projected permanent and temporary jobs and type of development function.

3.7.1 Projected permanent jobs and development function

The Western Cape is currently struggling under high unemployment rates as a result of inmigration, poor education, failure of governance, financial mismanagement and shortage of sustainable job creation opportunities (Abdalla 2007; Western Cape Provincial Treasury 2006). It is therefore important that municipalities and the government seek means to address unemployment areas, by identifying and creating growth strategies and development opportunities to encourage broad based employment growth (Western Cape Provincial Treasury 2006). The number classes of permanent jobs projected and the development functions responsible for these jobs appear in Table 3.7. All the applications together listed a total of 6078 projected permanent jobs to be created, of which most were created within the 11-50 class, with the 101-200 and 1-10 classes being a short head behind.

Table 3.7 Relationship between development function and number of projected permanent jobs

(Row %)	**Permanent jobs projected (Number)**							
Development function	**>200**	**101-200**	**51-100**	**11-50**	**1-10**	**0**	**Row total (n)**	**Total (%)**
Bulk services	0.0	2.8	2.8	36.6	31.0	26.8	**30**	**7.2**
Commercial	0.0	0.0	16.7	33.3	50.0	0.0	**6**	**1.4**
Residential construction	5.3	1.5	5.5	18.2	43.8	25.7	**76**	**18.3**
Resort	2.0	7.1	5.1	10.1	75.7	0.0	**12**	**2.9**
Communication	0.0	20.0	20.0	20.0	20.0	20.0	**5**	**1.2**
Hospitality	0.0	0.8	2.0	15.1	65.2	16.9	**126**	**30.3**
Agricultural construction	0.0	0.7	1.6	14.1	71.9	11.7	**120**	**28.8**
Agricultural cultivation	8.3	25.0	41.7	16.7	8.3	0.0	**16**	**3.9**
Nature conservation	0.0	3.6	7.2	7.4	78.8	3.0	**25**	**6.0**
Column total (n)	**5**	**11**	**19**	**68**	**254**	**59**	**416**	
Total (%)	**1.2**	**2.6**	**4.6**	**16.3**	**61.1**	**14.2**		**100.0**
Total (n)	**722**	**1382**	**1119**	**1499**	**1356**	**0**	**6078**	

It is clear that most of these developments promise to generate limited numbers of permanent jobs with only about one quarter creating more than 10 jobs per project and 14% no jobs at all. Firstly this raises the question if the elaborate application procedure is really always economically relevant and secondly why the types of development being proposed in this province are so relatively insignificant.

By function agricultural construction, and hospitality and resorts dominate in job creation, but projects are all relatively small. Agricultural cultivation projects are significantly larger job creators to confirm the Agriculture Sector Brief (2005/2006) conclusions – as are some of the urban-like function projects. O'Neil & Charters (2000) emphasise the importance of the agricultural sector and viticulture in particular as rural employers and a key role in regional development. Of course the positive spill-over effects benefit the whole region and not just the industries involved (Tassiopoulus et al. 2004). The latter observation is to be expected, because non-agricultural developments are driven by public authorities and commercial enterprises with access to public and more substantial capital sources (Rosegrant et al. 2005). It is nevertheless understandable that most development functions in these rural dominant settings do not require an extensive (new/additional) labor force. Rees & Wackernagel (1996) supports this conclusion by stating that most developments require a limited number of workers and that developers mostly strive to use a minimum work force to reduce construction costs, which can refer to the situation in the Western Cape. It was hardly surprising that residential construction and resort related developments produced slightly more job opportunities as such development types often

use job creation to bolster the positive effects in proposals to obtain authorisation from the relevant authorities (DEAT 1999).

3.7.2 Projected temporary jobs and development function

Temporary jobs play an essential role in the sustainable economic growth and poverty prevention in South Africa by providing employment in times of permanent job shedding. Temporary jobs serve a wide range of occupations, provide vital income to the jobless, and prevent complete poverty (Abdalla 2007). It is therefore important that the extent of temporary job creation per application type is measured in order for authorities to encourage development initiatives that promote most job creation (Western Cape Provincial Treasury 2006).

Comparison between Tables 3.7 and 3.8, contrary to expectations, show considerable differences in the numbers of permanent and temporary jobs projected per development function. More than double the number of temporary jobs in total and in the class 11-50 is projected, while least of the jobs are projected in the larger than 200 class. A similar number of applications promised no temporary jobs. Agriculture and hospitality related projects offer most job opportunities, with a surprising upsurge in the number of conservation related temporary jobs. Urban related functions, with the exception of residential construction (as confirmed by the DEAT (1999), seems to all offer more opportunities of smaller extent.

Table 3.8 Relationship between development function and number of projected temporary jobs

(Row %)	**Temporary jobs projected (Number)**							
Development function	**> 200**	**101-200**	**51-100**	**11-50**	**1-10**	**0**	**Row total (n)**	**Total (%)**
Bulk services	0.0	3.0	20.9	35.8	25.4	14.9	**30**	**7.2**
Commercial	0.0	0.0	0.0	16.7	83.3	0.0	**6**	**1.4**
Residential construction	5.7	2.9	14.8	49.4	12.4	14.8	**76**	**18.3**
Resort	5.5	2.2	7.7	28.6	45.0	11.0	**12**	**2.9**
Communication	0.0	0.0	40.0	40.0	20.0	0.0	**5**	**1.2**
Hospitality	4.3	2.2	10.4	24.9	38.5	19.7	**126**	**30.3**
Agricultural construction	0.0	0.8	2.2	57.0	25.1	14.9	**120**	**28.8**
Agricultural cultivation	0.0	0.0	0.0	44.4	55.6	0.0	**16**	**3.9**
Nature conservation	0.0	15.8	3.2	30.2	42.9	7.9	**25**	**6.0**
Column total (n)	**11**	**13**	**35**	**171**	**125**	**61**	**416**	
Total (%)	**2.6**	**3.1**	**8.4**	**41.2**	**30.0**	**14.7**		**100.0**
Total (n)	**1660**	**2643**	**3208**	**4898**	**1520**	**0**	**13929**	

Another comparison is also that with both permanent and temporary job opportunities the 11-50 (medium-sized) class is responsible for the most jobs, while the other classes seem to differ. This includes the 51-100 (larger) class being responsible for creating the second most jobs and the least jobs being accounted for by the 1-10 (small) class.

It was expected that a dominant portion (more than three quarters) of the commercial applications would produce few projected job opportunities as a workforce of about ten workers is sufficient for the average scale of development, including mostly business offices, which can be associated with the situation in the Western Cape (Green et al. 2005). It was also expected that almost half of the resort, hospitality and nature conservation applications would create few projected jobs as these development types are renowned for offering contract vacancies with in-house training provided. The relatively low number of vacancies protects the company from being obliged to keep workers that did not develop the necessary skills during the training, placing a long-term financial burden on the company (Bridgman 2009; Reed 2009). It was anticipated that communication applications would provide variable-sized projected temporary jobs because of the difference in scale of these development types – for instance the establishment of an underground communication network from Stellenbosch to George, which would require an extensive temporary workforce compared to the construction of cell masts, limited temporary workforce. The more or less equal distribution of temporary jobs creating between 1-200 jobs can be ascribed to the upgrading of South Africa's infrastructure during 2000-2003, which produced various numbers of temporary jobs during the construction phase (De Klerk et al. 2004).

The results illustrate that agriculture is the main contributor of projected temporary jobs in the smaller categories below 100 and confirm claim to its importance. Hospitality, resort and residential related developments are the main contributors of temporary job creation in the larger categories (above 100) as a result of the sudden increase in these development types between 2000-2004 (Rosegrant et al. 2005). In conclusion, this illustrates the importance of temporary job creation which will support economic growth and sustainability of a whole region (Tassiopoulus et al. 2004) and that development should not be prevented by over regulation.

3.7.3 Relationship between projected permanent and temporary jobs

This section compares the total number of projected permanent jobs against the total number of temporary jobs created per development function. This comparison provides important information on the total number of projected jobs created per development function, illustrating which development

function is the most sustainable in terms of job provision. This assessment is important as it illustrates the role that agricultural land use changes are playing in terms of job creation, given the importance of agriculture regarding job creation, social development and economic growth (Huston 1993). Figure 3.2 illustrates that agricultural construction is responsible for providing the most projected job opportunities of which almost double the amount is temporary in relation to permanent opportunities.

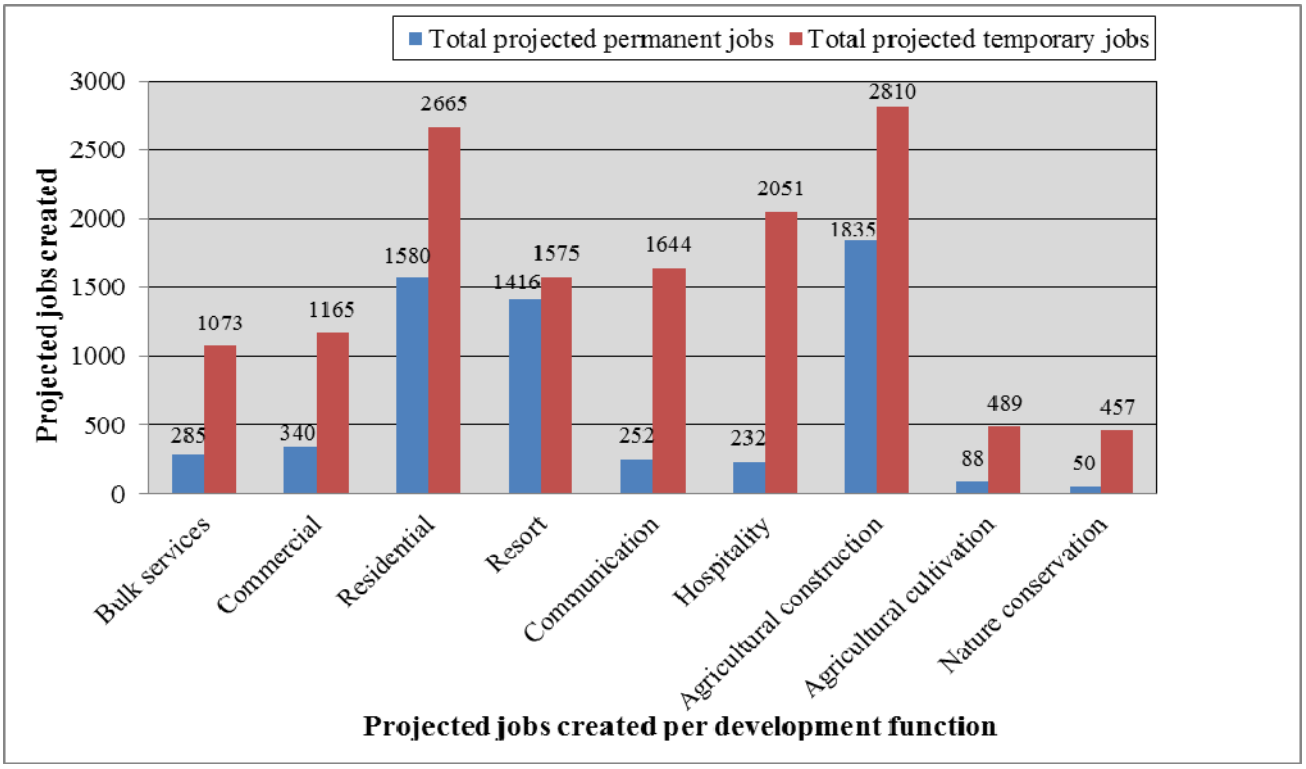


Figure 3.2 Comparison between projected permanent and construction jobs per development function

The reason for this is probably because viticulture is the most dominant agricultural industry in the study area, providing a large number of casual jobs during the annual harvesting of grapes and other fruit. During the rest of the year only about half of the workers are required to treat the vines (Agriculture Sector Brief 2005/2006; O'Neil & Charters 2000). Resort and residential construction are also responsible for providing large numbers of permanent job opportunities, with the former having equal numbers of permanent and temporary jobs. This is expected because the resort industry has two peak seasons (during June and December) when the industry often takes additional staff on board on a temporary basis (Reed 2009). The reason for the relative large number of projected temporary jobs in relation to projected permanent jobs in residential construction can be ascribed to the construction

phase of a development, which usually requires more workers, than after completion (Rosegrant et al. 2005).

The lowest number of projected jobs is created by nature conservation related developments, which can be ascribed to the nature of these developments which are not labour intensive. This result was anticipated as the larger number of temporary jobs during establishment for tasks such as the erection of fences, construction of roads and construction or conversion of accommodation units is well known. Once these are completed, developments such as a nature reserve only require a couple of permanent staff for maintenance, hospitality and maybe a game ranger or two depending on the size of the reserve (Kallas et al. 2007). It is significant that residential, resort and agricultural construction are the sectors where 50%-60% of all jobs are temporary, while the others hover between 80%-90% − a sure sign that the former are economic mainstays. Such developments must be encouraged rather than discouraged by over regulation.

3.8 Development coverage

Land use change is irreversible when the ecological attributes necessary for the environmental functioning and food production are destroyed (Lyson & Olson 1999). There is also a significant relation between biodiversity and agriculture, as ecosystems need to be healthy in turn for agriculture to be sustainable; it is therefore not a situation of saving the one or the other but conserving both in order to secure food security (Libby 1997). It is thus important to identify which development types are responsible for converting land in order to place mitigation and preventative measures as well as guidelines to preserve the natural and agricultural landscapes because of its contribution to the economic, social and environmental well-being of a region (Lyson & Olson 1999). This section analyses the proportion of property developed per development function to establish each impact. Managing this impact is imperative for the Western Cape in order to maintain a sustainable land use balance between agriculture (construction and cultivation), development and nature conservation. Development coverage does not account for the area (hectarage) of the property involved, but gives an estimate of the proportion of the property converted by each development type. This helps to estimate the potential impact that a development might have on operational aspects of agricultural activities on a farm (Lyson & Olson 1999).

The following interpretations refer to the percentage in relation to the whole property that will potentially be developed for the specific development function. It is important to note that some

properties are larger than others, and will therefore have a smaller percentage of the property developed in relation to a smaller property. A large portion of agricultural land in the Western Cape is developed for non-agricultural uses, which sometimes results in agriculture becoming the secondary use (Reed 2009). The main goal of this assessment is thus to establish whether agricultural properties are gradually being converted for uses outside of agriculture, by referring to the percentage of agriculturally zoned properties being converted to different development functions as depicted in Table 3.9. It lists proportion categories (ranging from 0 = no new coverage, to 100%= total property) covered by proposed activity or structure. The table shows that nearly sixty percent of applications relate to developments that cover less than a quarter of the property – presumably involving most of the larger properties. Where larger proportions are involved – and about 20% cover between 25% and 100% - we are probably dealing with the contingent of smaller properties. It is certainly the case (nearly one fifth) with the full coverage figure. The table depicts that most of the applications propose to develop between 2% and 25% of the property contributing to more than a third of all the applications. Least of the applications do not convert any of the property (no footprint), contributing to about 1% of the applications. These are mostly applications were existing infrastructure are utilised, such as vacant labourer cottages that are converted for guest accommodation.

Table 3.9 Relationship between development function and proportion of property developed

(Row %)	**Proportion of property developed (%)**								
Development function	**100**	**76-99**	**51-75**	**26-50**	**2-25**	**≤ 1**	**0**	**Row total (n)**	**Total (%)**
Bulk services	26.7	0.6	12.1	8.5	43.6	8.5	0.0	**30**	**7.2**
Commercial	25.0	50.0	25.0	0.0	0.0	0.0	0.0	**6**	**1.4**
Residential	47.7	5.2	5.2	11.6	25.1	5.2	0.0	**76**	**18.3**
Resort	25.5	38.3	14.9	10.7	5.3	5.3	0.0	**12**	**2.9**
Communication	0.0	40.0	20.0	20.0	20.0	0.0	0.0	**5**	**1.2**
Hospitality	4.7	0.9	2.3	4.7	48.2	36.9	2.3	**126**	**30.3**
Agricultural construction	2.6	0.7	2.6	4.4	44.4	45.3	0.0	**120**	**28.8**
Agricultural cultivation	41.7	50.0	8.3	0.0	0.0	0.0	0.0	**16**	**3.9**
Nature conservation	3.0	0.0	3.0	7.6	47.0	28.8	10.6	**25**	**6.0**
Column total (n)	**72**	**36**	**25**	**30**	**145**	**103**	**5**	**416**	
Total (%)	**17.3**	**8.7**	**6.0**	**7.2**	**34.8**	**24.8**	**1.2**		**100.0**

It is interesting to note that almost half of all the bulk service related applications intend to convert the lesser part of the proposed property. Contrarily, half of the few commercial land use change applications proposed to convert almost all or the majority of the proposed property. It is also noteworthy that about half of all the residential applications intend to convert all the land on the

proposed property, while about one quarter proposes to convert a small portion only. More than two thirds of all the resort applications intend to convert more than three quarters or all of the proposed property – a heavy footprint indeed. Communication applications share this trend, while the majority of the hospitality and nature conservation applications propose to convert relatively small portions of the affected property. Similarly, agricultural construction applications tend to convert small fractions of the proposed property, whereas agricultural cultivation applications tend to convert almost all of the affected property

It was anticipated that most of the bulk service, hospitality and nature conservation related developments would convert small portions of the property, as these developments have a small footprint compared to the overall size of the property, such as a waste water treatment plant, guesthouse and accommodation units on a nature reserve (Kallas et al. 2007). In most cases a larger than necessary property would be bought to accommodate future expansion (Reed 2009). It was also expected that the commercial, resort and agricultural cultivation development functions would intend to convert most of the proposed property as these development types are commercially orientated and benefit the most by utilising the greatest possible portion from the property. For instance, the more commercial buildings and resort units land owners can erect on properties, the larger profits will be. The same applies to farmers cultivating most of their property to plant crops (Maybery et al. 2005; Reed 2009). It was also projected that residential developments would consume mostly the whole property as these development types also gain the largest profit by erecting the largest possible amount of residential units on the proposed property (Maybery et al. 2005). It was rather surprising that most of the communication applications intend to convert the majority of the proposed properties as this development type usually contains a small footprint such as underground communication cable or cell masts (Elsenburg Landbou-ontwikkelings Instituut vir Winterreëngebied 1990). Most of the agricultural construction applications converted between 1-25% of the property, which was predictable as these development types' utilises a limited amount of space, such as a wine cellar and a shed, which consumes a limited amount of space on most properties (Holmes 2006).

3.9 Extent and nature of land use conversion

Land use conversion is mostly driven by population and economic growth, which, among other results, causes the expansion of urban areas through different residential, infrastructure, commercial and service related development types (Bockstael 1996). These developments often cause fragmentation of

agricultural land and sensitive biodiversity areas, which in turn affect human well-being (Knickel 2007). It is therefore important that the negative impacts associated with these interlinked processes are assessed and that steps are taken to prevent further negative effects. A lack of sustainability planning, allows the loss of prime agricultural and pristine biodiversity areas to urbanisation, mining and other activities. Most of the impacts on agricultural land and biodiversity could have been prevented if the development footprint had been taken into account before actually allowing conversion of agricultural land (Yield 1997). The nature of affected land use types and footprint of proposed developments must inform decisions on anticipated development in areas already degraded (e.g. covered by alien vegetation) versus areas of the most vulnerable and important indigenous vegetation and high potential agricultural land. The formulation of guidelines to prevent and mitigate the impacts that development has on valuable agricultural land by addressing issues such as water consumption, conversion of fertile land, socio-economic issues and environmental impact planning (DEADP 2005c) then becomes possible.

This section analyses the areal footprint that new potential developments will have on the existing land uses of the affected portions of land. Table 3.10 shows that more than one quarter of the land use change applications are potentially developed on land with existing agricultural land uses (wheat and lucerne farming, stone fruit farming and viticulture), but that almost half affect vacant land with various levels of agricultural potential. Of those, the medium and high potential soils are the most significant for agricultural production.

Table 3.10 Areal footprint of new land use types by affected land use type

(Row %)	**Area footprint of proposed development (ha)**						
Existing land use of affected portion	**>50**	**>10-50**	**>1-10**	**≤1**	**0**	**Row total (n)**	**Total (%)**
Alien vegetation	0.0	4.7	27.9	67.4	0.0	**29**	**7.0**
Wheat and lucerne farming	0.0	8.3	50.0	41.7	0.0	**21**	**5.1**
Stone fruit farming	4.4	26.7	37.8	26.7	4.4	**30**	**7.2**
Viticulture	1.8	10.9	15.5	70.0	1.8	**65**	**15.6**
Virgin high potential agricultural soil	0.0	1.8	10.6	87.6	0.0	**57**	**13.7**
Virgin medium potential agricultural soil	4.9	1.9	25.2	68.0	0.0	**53**	**12.7**
Virgin low potential agricultural soil	2.8	12.3	35.2	49.7	0.0	**83**	**20.0**
Grazing land	0.0	9.9	36.6	53.5	0.0	**40**	**9.6**
Indigenous vegetation	7.5	3.0	35.8	53.7	0.0	**38**	**9.1**
Column total (n)	**9**	**28**	**102**	**273**	**4**	**416**	
Total (%)	**2.2**	**6.7**	**24.5**	**65.6**	**1.0**		**100.0**

The larger developments with footprints above 10ha affect mostly stone fruit farming and the prominent 1-10ha footprint uses impact across the board – i.e. all types of agricultural uses, grazing land and vegetation types. Unfortunately developments seem to avoid alien vegetation stands, with only small footprints wandering to that category. The smallest footprints have a similar impact range across most existing land use types.

It could be expected that more than half of the change of land use applications on alien vegetation, viticulture, grazing land and indigenous vegetation land use would be smaller. This is mainly based on the expansion or development of/on the existing land use such as clearing of an additional hectare of alien vegetation or indigenous vegetation or grazing land to plant an additional hectare of vineyards, which are all expensive improvements on a farm and are therefore done on a small scale at a time (Geach & Peart 1998). The DoA (2003) confirms the enormous costs associated with the clearing of alien vegetation and rehabilitation of degraded and overgrazed agricultural soil, which are run by programmes facilitated by BWI and LandCare Areawide Planning, forcing these programmes to rather focus on smaller financially manageable portions. This assumption is also further confirmed by Holmes (2005), stating that most of the developments on existing agricultural land are of a relatively small scale as most of these developments are tourism related, which include mostly conversion of existing infrastructure or construction of one or two accommodation units or wine tasting facilities. It can be unanticipated that most of the land use change applications on land practicing wheat and lucerne farming as well as land practicing stone fruit farming, will be developed. This can be ascribed to the tendency of farmers to establish a resort with accommodation related facilities on their farms to produce additional income (De Villiers & Hill 2007; Reed 2009). This tendency can also be ascribed to the fact that these farming types are less profitable than viticulture in the study region, hence the need to develop diverse income sources (Visser & Van Huyssteen 1997).

It is encouraging that the largest portion (half) of all developments on vacant low potential agricultural soils had a footprint of equal and smaller than one hectare – perhaps because it is awkwardly located land? It was rather expected that most of this land would be utilised for development purposes, according to Herman (2005), who states that ideally impacts associated with developments are irreversible and must be allowed only on low-potential agricultural land and in insignificant biodiversity areas. A balanced relationship between development and agriculture is essential to prevent development taking place on fertile agricultural land. This can be anticipated through the implementation of better planning methods and policies (Dower 1973; Speirs 2003). Sustainable

agriculture can be achieved through continuous interaction and consultation between farmers and developers to decide on the best location for a specific development that will not hinder the future of agriculture and the environment (Jenkins & Prin 1998).

3.10 Agricultural soil potential

Agriculture is one of the pillars of the Western Cape economy, by producing approximately 60% of national agricultural exports and also playing a major role towards food security and job creation (Agriculture Sector Brief 2005/2006). This is all thanks to the limited amount of high-potential soils in the Western Cape to support a variety of agricultural industries of which viticulture is the most dominant. Soil potential is the capacity of the soil to grow crops which is dependent on factors such as soil colour, texture, depth, structure, rainfall, position and inclination (DoA 2007). The protection of the medium and high quality soils is thus essential for the sustainability of agriculture in the Western Cape (Campanhola, Kitamura & Rodrigues 2003). This section assesses the land use change applications (both DEADP and DoA applications) related to the different soil potential types which they occupy within the study region, as depicted in Figure 3.3.

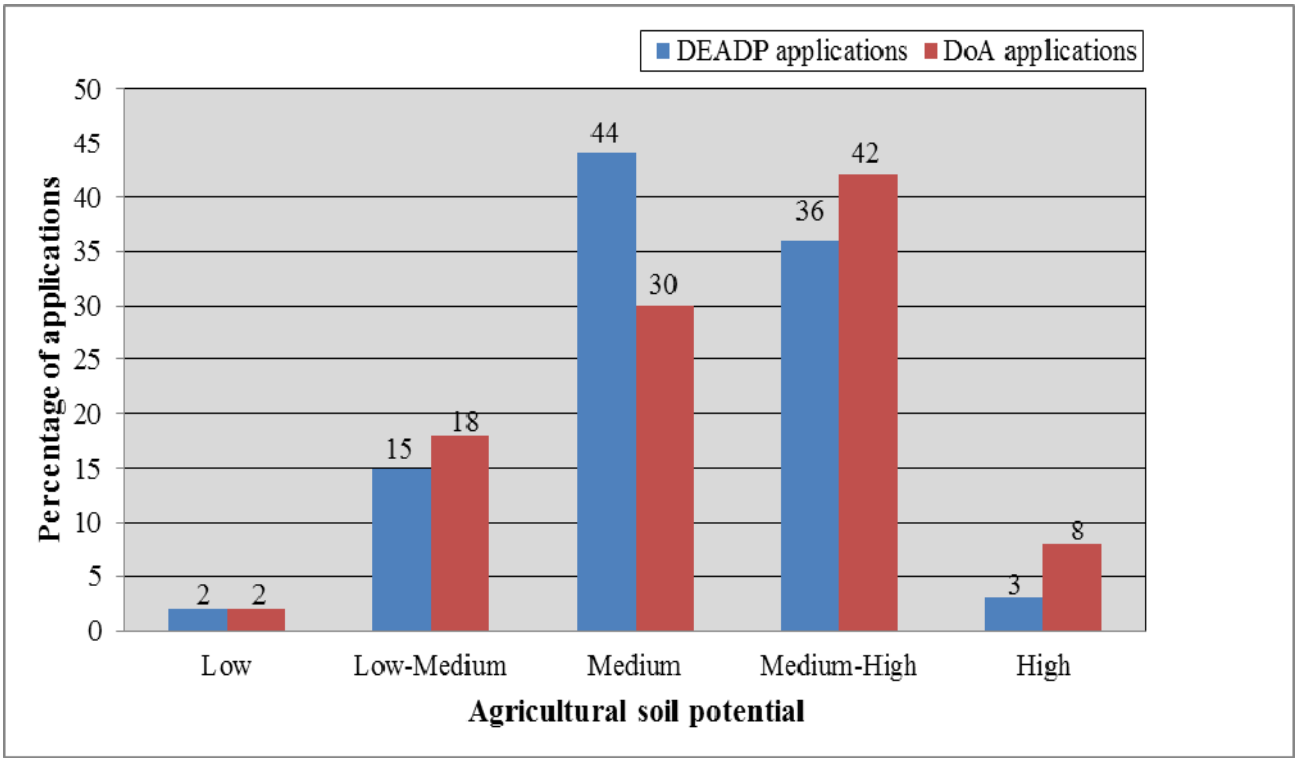


Figure 3.3 Percentage of applications situated on land with different agricultural soil potential

This is significant in order to prioritise the utilisation of the most appropriate land use type for the most suitable usage, for instance by ideally reserving land with high and medium agricultural potential for agricultural cultivation and land with low agricultural potential for non-agricultural developments. The figure shows that about three quarters of both application types are geared to develop mostly medium and medium-high potential soil groups. Apparently, high and low potential soils are avoided or are simply absent from affected areas. The fact remains that valuable soils are earmarked for development. This variation is probably due to the type of development intended.

This figure illustrates that half of all the DoA applications (i.e involving virgin soil conversion), resulting in the conversion of undeveloped land for agricultural use, are on soil with a medium-high and high agricultural potential. It is surprising that the largest proportion of DEADP developments is potentially developed on land with a medium and medium to high soil potential. This was expected as the largest portion of the study regions consist of those soils, especially in the dominant viticulture regions and therefore these areas would mostly be developed for viticulture, but also some stone fruit farming as well as wheat and lucerne farming. The reason for the small percentage of high potential land being developed, can be ascribed to the relative small percentage of high potential land in the Western Cape, while the cause for the similar small development of low potential soils can be ascribed to the location of these soils being situated mostly in the mountainous areas (DoA 2007; Kleynhans & Opperman 2005). Campanhola, Kitamura & Rodrigues (2003) and The World Bank (2004) stresses the importance of implementing preventative measures to preclude development (such as DEADP applications) on high potential soils and to earmark these soils for intensive agriculture.

The next chapter will focus on the conversion of undeveloped land applications by analysing the impacts associated with the transformation of undeveloped land to an agriculture related use. It will also measure the amount of agricultural land potentially lost through change of land use applications as opposed to the amount of agricultural land potentially gained through transformation of undeveloped land.

CHAPTER 4: LAND USE CONVERSION OF UNDEVELOPED LAND

The most important large-scale cause of habitat loss worldwide is the expansion and intensification of agriculture in natural environments (Harris 1984). These land use conversions result in the loss of indigenous biodiversity by reducing the size of the remaining habitat patches, causing habitat fragmentation, and increasing the distances between habitat patches; all of which increase the rate of habitat loss (Dobson, McLellan & Wilcove 1986). Consequently, it is important that land use conversions are compatible with natural resource conservation and at the same time preserve agricultural land to improve livelihoods and reduce poverty (Ellis-Jones 1999). This chapter analyses the potential impacts associated with the transformation of undeveloped land to an agriculture related use such as crop cultivation, according to applications approved within the study period by comparison of the DoA and DEADP databases. These potential transformations entail mostly the conversion of indigenous vegetation, which has a serious impact on biodiversity in the Western Cape, especially in the intensively cultivated areas of the Western Cape (Cowling 1999). The importance of scrutinising the conversion of undeveloped land cannot be understated when one considers the threatened status of biodiversity, since 66% of Fynbos ecosystems is located in the Western Cape (De Villiers 2007b; Driver 2004).

The first main section of the chapter deals with the undeveloped land conversions subject to the EIA process followed by an analysis of undeveloped land conversions that did not undergo an EIA process – the data for empirical analyses extracted from the relevant official applications submitted. The last main section measures the potential extent of agricultural land lost through undeveloped land conversions. This chapter is concluded by an assessment on the extent of agricultural land potentially converted for development purposes (non-agricultural) as well as land gained through previously undeveloped land being transformed to agricultural land.

4.1 Undeveloped land conversions subjected to the EIA process

The conversion of undeveloped land is a major ongoing contributor to habitat loss in the Western Cape (Cowling 1999). For this reason it is important that these land use conversions are examined to illustrate the land uses mostly responsible for converting undeveloped land. The 118 CARA applications approved by DoA for conversion of undeveloped land that underwent EIAs were analysed to ascertain the nature and extent of undeveloped land conversions that underwent the EIA

process. In the sections below the following eight variables are examined: year of authorisation, new land use type, municipal region, property ownership, proportion of property converted, footprint of development, existing land use and proposed land use in order to examine the degree of undeveloped land conversions.

4.1.1 Temporal trend in applications

The year of authorisation for each new land use type is important as it gives an indication of when the most land conversion occurred. Table 4.1 and Figure 4.1 show that the largest contingent of applications was received in 2003, with the other years yielding a fairly steady contribution.

Table 4.1 Year of authorisation for each type of new agricultural land use

(Row %)	**Year of Authorisation**										
New Land Use	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Row total (n)**	**Total (%)**
Wine grapes	1.7	9.1	9.1	9.1	4.5	34.9	16.4	9.1	6.1	**48**	**40.3**
Table grapes	5.6	5.6	5.6	11.1	5.6	38.7	11.1	5.6	11.1	**18**	**15.6**
Orchards	6.3	12.5	6.3	12.5	6.3	31.0	12.5	6.3	6.3	**16**	**13.3**
Barley and Lucerne	0.0	18.0	9.2	18.0	9.2	18.0	9.2	9.2	9.2	**11**	**9.2**
Indigenous Vegetation	6.7	6.7	13.3	6.7	6.7	33.2	6.7	6.7	13.3	**15**	**12.7**
Vegetables	10.0	10.0	10.0	10.0	10.0	20.0	10.0	10.0	10.0	**10**	**8.9**
Column total (n)	**6**	**10**	**10**	**12**	**8**	**37**	**15**	**9**	**11**	**118**	
Total (%)	**5.1**	**8.5**	**8.5**	**10.5**	**6.7**	**31.2**	**13**	**7.6**	**8.9**		**100.0**

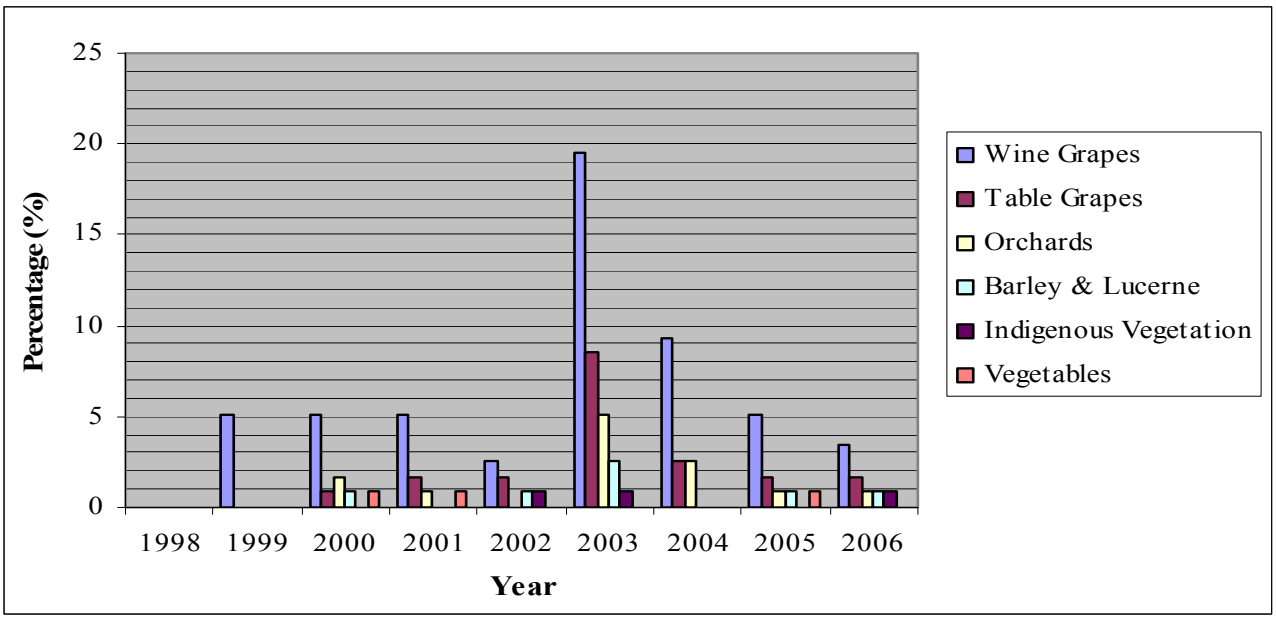


Figure 4.1 Percentage and type of new land use converted per year

The cause of this dominant spike in 2003 can be speculated due to a couple of temporal reasons, including agricultural costs and relative low prices for exports due to the weak Rand, forcing farmers to convert undeveloped land into production (viticulture, orchards, vegetables) in order to cover the expenses. It can also be assumed that farmers became more aware and comfortable with the EIA process, following its promulgation in 1998 and farmers applying more comfortably. An increase in undeveloped land applications until 2003 was expected for a number of different reasons ranging from the farmers being uninformed about the ECA regulations promulgation in 1997, to the amendment of the ECA regulations in 1998 and 2002 resulting in increased uncertainty regarding the legislated EIA requirements, with the increasing agricultural costs forcing the farmers to subsequently cultivate more land in order to cover their costs. The decrease in undeveloped land applications from 2003 to 2006 might be due to the land potentially cultivated in 2003 being sufficient for a few years of subsequent agricultural expansion. It's also expected that farmers continued to or started to cultivate illegally as they became frustrated with the time frames and costs associated with the ECA EIA process.

More than half of the potential land conversion went to viticulture with wine grapes contributing most and table grapes also contributing a significant number of the applications. This was rather expected as viticulture is the most dominant agricultural land use in the study area and one would therefore expect that most of the expansions of agricultural land use would be viticulture related. Another possible reason is the location of these undeveloped lands, situated in the high-lying rocky areas, which is more suitable for viticulture than for other agriculture. Most of these areas were historically not accessible, but due to new technology and farming methods they can now be accessed and farmed. The table also shows that least of the undeveloped land was potentially converted for vegetable farming adding almost a tenth of the applications, with just over a tenth remaining indigenous vegetation. The reason for this is probably because there is not much undeveloped land available in the low lying, sandy flat areas which is mostly suitable for vegetable farming, with most of these areas historically utilsed for vegetable farming with gravity irrigation. One of the possible reasons for some of the undeveloped land earmarked to remain indigenous vegetation might be because of the new practice where herbs such as buchu or fynbos such as proteas are planted between natural vegetation causing the land use to remain normally the same.

The relationship between the percentages and type of agricultural land use changes, authorised per year is significant as it shows the most dominant land uses responsible for undeveloped land use conversions, assisting conservation agencies and governing bodies to implement strategies in harmony with the dominant land use types to preserve significant indigenous vegetation. Such management strategies is the LandCare Areawide Planning program as well as the BWI, which specifically targets the viticulture industry to be more biodiversity friendly, because of its impact on biodiversity in the Western Cape (Biodiversity and Wine Initiative 2008; Sandwith et al. 2005).

4.1.2 Year of authorisation and location

The relation between year of authorisation and location is important to identify the municipal areas where the conversion of undeveloped land occurred over time, and to identify which areas was the host to most of the conversions over time. This will illustrate which municipal area's agricultural sectors are expanding, which can be a predictor of future growth in that area. As expected and illustrated in Table 4.2 most of the conversion of undeveloped land applications were authorised in the Breede Valley and the Breede River Winelands municipal regions, contributing to more than half of all the undeveloped land conversion applications.

Table 4.2 Temporal trend in undeveloped land conversion by municipal subregion

(Row %)	**Year of Authorisation**										
Municipal Subregion	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Row total (n)**	**Total (%)**
Stellenbosch	5.6	11.1	11.1	11.1	11.1	22.2	11.1	11.1	5.6	**18**	**15.3**
Drakenstein	3.8	7.6	10.0	10.4	7.6	14.2	14.2	3.8	28.4	**24**	**20.3**
Breede Valley	3.8	2.7	7.6	5.2	2.7	37.1	20.5	17.7	2.7	**33**	**28.0**
Witzenberg	7.7	7.7	7.7	7.7	15.4	23.0	15.4	7.7	7.7	**13**	**11.0**
Breede River Winelands	3.0	5.0	3.0	5.7	20.7	31.0	16.0	10.0	5.6	**30**	**25.4**
Column total (n)	**6**	**10**	**10**	**12**	**8**	**37**	**15**	**9**	**11**	**118**	
Total (%)	**5.1**	**8.5**	**8.5**	**10.5**	**6.7**	**31.2**	**13.0**	**7.6**	**8.9**		**100.0**

Note: The CoCT: TA and CoCT: OA were left out in the table as they did not have any undeveloped land conversions.

It was also expected that the least of the applications would emanate from the Witzenberg municipal region because of its less competitive/developed agricultural industry in relation to the other regions, which can possibly be linked to water shortage. What is however surprising is the small difference in applications between the Witzenberg and Stellenbosch region, which is renowned for its dominant viticulture industry. This reasonably low number of applications in the Stellenbosch municipal

region can likely be ascribed to the saturated viticulture market, resulting in most of the undeveloped land consisting of good quality soils already being converted for viticulture, and hence fewer land conversions.

In retrospect, Table 3.5 and Table 4.2 illustrate the causal relationship between the ratio of undeveloped land conversions and potential change of land use applications, from the different municipal regions in the study area. Both tables show that Drakenstein and Breede River Winelands are some of the dominant regions, contributing conjointly to almost half of all the applications, while the CoCT: Oostenberg administration and CoCT: Tygerberg administration contribute the lowest (none, in fact). There is also some correlation between the year of authorisation between the land use change and conversion of undeveloped land applications, according to Table 3.2 and Table 4.2, illustrating that least of the applications were authorised during 1998. The low percentage of applications authorised during 1998 was probably because the NEMA EIA regulations were fairly new for developers and farmers since its promulgation within that year, causing hesitance in the beginning. This irresoluteness seemed to dissolve in the years to follow as the numbers increased significantly, especially in the change of land use applications, as portrayed in Table 4.2. One of the reasons for this is because the Breede Valley and Breede River Wineland municipal regions are less intensively developed, with more vacant, undeveloped land available than the more urbanised areas such as Stellenbosch and Drakenstein and also because these municipal regions are spatially much larger comprising collectively almost half of the study area (see Table 3.5).

The noteworthy spike in undeveloped land conversion applications in 2003 was rather unexpected since it was assumed to occur during 2006. In that year the NEMA regulations replaced the ECA regulations (on 3 July), making the cultivation of any undeveloped land greater than 3ha a listed activity. It was thus expected that farmers would take the last opportunity to cultivate (for future use) all the remaining undeveloped patches disturbed within the preceding ten years to avoid going through an EIA process. Therefore the decline in the number of land conversions from 2003 to 2006 illustrating that the temporal fluctuations are not influenced by legislative influences but rather by economic conditions and demand for certain products. This trend can be confirmed by the tendency among farmers to convert their land to viticulture, especially during the last decade, during which time this type of farming became more profitable and competitive than other land use types (Matthews 2003). The specific year of conversion during the last decade can presumably be ascribed

to the financial situation of each individual landowner and which year the conversion of land would have benefited the owner most.

4.1.3 Property ownership and percentage of property developed

The relationship between the type of property owner and the proportion of property converted is an important relation as it illustrates which type of property ownership is responsible for the most conversions, and towards what type of development the undeveloped land is due to be converted. It is important to note that these results are highly correlated with the land use change applications discussed in Section 3.3, where the individual owners are also responsible for the largest percentage of land use changes (see Table 4.3). The reason is mostly because most of the agricultural zoned land is under the ownership of farmers, who are in most cases individual owners.

Table 4.3 Type of property owner and proportion of property converted

(Row %)	**% of Property Developed**							
Property Ownership	**100**	**76-99**	**51-75**	**26-50**	**2-25**	**≤ 1**	**Row total (n)**	**Total (%)**
Individual owner	2.4	6.3	8.4	27.0	49.6	6.3	**70**	**59.2**
Family ownership	5.6	16.7	16.7	5.6	33.3	22.1	**18**	**15.3**
Commercial estate	8.3	16.6	33.3	8.3	25.2	8.3	**12**	**10.2**
Private company	10.0	10.0	30.0	20.0	20.0	10.0	**10**	**8.5**
Public land	37.5	0.0	12.5	25.0	12.5	12.5	**8**	**6.8**
Column total (n)	**7**	**10**	**18**	**21**	**56**	**6**	**118**	
Total (%)	**5.9**	**8.5**	**15.3**	**17.8**	**47.5**	**5.1**		**100.0**

Other private ownership types make up one-third of the land use change developments, while very few undeveloped land conversions originate on public land. It was expected that individual ownership would be the dominant type of ownership as most of the conversions of undeveloped land are mainly for agricultural purposes, such as the extension of existing crop land. It was also anticipated that estates, companies and public land would be the least dominant type of ownership, contributing conjointly to about one quarter of all the applications. The reason is mainly because of these latter ownership types are not agriculturally orientated, with most of the undeveloped land being situated on farms. Non-agricultural developments such as a resort or residential construction on agricultural land, is mostly driven by estate, company or public ownership.

Table 4.3 also shows that almost half of the conversion of undeveloped land applications converted less than 25% of the proposed property. The reason for this could be high or low soil suitability, or that most of the land on the farm had already been cultivated, leaving only small portions for further cultivation. It seems logical that very few properties were fully converted. This is mainly because municipalities buy or expropriate certain sized properties for specific infrastructure related development and mostly utilises as much as possible of the property. Low cost housing developments are a case in point. Often low cost housing developments are established in order to address urgent social needs (and for political reasons) but in the process high potential agricultural land or environmentally sensitive land may be impacted on. An example is the De Nova low cost housing project in Rawsonville, where vineyards on medium potential soil were replaced by housing units, along the Smalblaar River, causing serious potential pollution and flooding threats.

Individual owners were not only responsible for the largest number of conversions, but theirs involved small proportions of the properties. Estates, companies and public land related developments tended to develop more than 50% of the properties. The fact that undeveloped land with low agricultural potential is often sold by the individual owner, and which is then subdivided by companies into residential erven and sold individually (Clarke 1999) explains the high coverage factor. In cases of public land ownership, the main goal is not to generate a profit but rather to optimise the social benefit from the land in order to fit as many as possible housing units in the proposed area to ease the housing backlog. In most cases of individual ownership where the farmer is the property owner, most of the land will be used for agricultural purposes as agriculture is the primary activity, whereas companies and public ownership types utilise the land for non-agricultural developments (residential, resorts, service delivery).

4.1.4 New land use and footprint size of converted land

The association between the land uses responsible for converting the most undeveloped land in terms of area and the footprint size of the converted land is significant as it gives an indication of general conversion tendencies. This is crucial for the conservation of biodiversity on undeveloped land, seeing that the conversion of undeveloped land through agriculture is one of the main contributors to biodiversity degradation in the Western Cape (Cowling 1999). The results shown in Table 4.4 help to identify possible mitigation and/or conservation measure priorities.

Table 4.4 New land use and the footprint size of converted land

(Row %)	**Footprint of Proposed Development (ha)**						
New Land use	**1-10**	**11-20**	**21-30**	**31-50**	**51-130**	**Row total (n)**	**Total (%)**
Wine Grapes	33.3	27.1	14.6	12.5	12.5	**48**	**40.3**
Table Grapes	38.9	22.2	11.1	16.7	11.1	**18**	**15.6**
Orchards	31.3	25.0	18.8	18.8	6.1	**16**	**13.3**
Indigenous Vegetation	45.5	27.2	9.1	9.1	9.1	**11**	**9.2**
Barley and Lucerne	13.3	13.3	26.7	40.0	6.7	**15**	**12.7**
Vegetables	20.0	20.0	10.0	40.0	10.0	**10**	**8.9**
Column total (n)	**40**	**27**	**17**	**19**	**15**	**118**	
Total (%)	**33.5**	**22.9**	**14.5**	**16.3**	**12.8**		**100.0**

It was expected that viticulture would be responsible for converting the greatest proportion of agricultural land and indeed it contributed more than half of all the applications with wine grapes the largest followed by table grapes. This was expected as viticulture is the most dominant land use in the study region. As expected barley and lucerne as the least dominant land use, contributing to about a tenth of all the applications. The reason for this can be because of the conditions in the study region being more favorable towards viticulture, hence the dominance thereof. According to the DoA database a total of 2239ha of undeveloped land were converted for the above-mentioned new land uses. This is a positive trend in the sense that farmers are expanding, their operations thereby stimulating agricultural production, economic growth, food security and job creation in the study area. On the other hand this also means that 2239ha of potentially biodiverse land was converted – clearly emphasising the importance of creating harmony between agriculture and biodiversity in the form of programmes such as BWI (Biodiversity and Wine Initiative 2008).

Most of the conversion of undeveloped land developments involved less than 20ha of land, of which almost a third was smaller than 10 hectares. This reflects that smaller conversions is the most likely size for agricultural expansion in the study area. Nevertheless still one third of the conversion of undeveloped land footprints was larger than 30ha and >10% larger than 50ha. Similar patterns apply to orchard farming – dominant in some peripheral areas and generally utilising areas of approximately 10-20 hectares in the Western Cape (Samways & Witt 2004). It is notable that barley and lucerne occupy larger areas − expected of this extensive farming type. It is disconcerting that most of the planned indigenous vegetation have smaller footprints, emphasising the importance of

harmony between agriculture and conservation of indigenous vegetation (Giliomee 2006; Gough & Grace 1998).

4.1.5 Existing land use and the footprint of converted land

The fact that two of the world's 25 biodiversity hotspots are represented in the Western Cape and the study area, namely the Cape Floristic Kingdom (CFK) and the Succulent Karoo, makes it important that the sensitivity of the area and the total extent of proposed developments are considered before land is newly cultivated (Myers et al. 2000). This makes the relation between existing land use before cultivation and the proposed conversion by the development an important one. Table 4.5 reveals that more than half of the conversions affected land smaller than 20 hectares, of which a third was actually smaller than 10 hectares. Just about 10% fall in each of the three larger footprint classes.

Table 4.5 Relationship between existing land cover and the footprint of conversion

(Row %)	**Footprint of proposed development (ha)**						
Existing land cover (before cultivation)	**1-10**	**11-20**	**21-30**	**31-50**	**51-130**	**Row total (n)**	**Total (%)**
Previously cultivated	36.8	20.0	7.6	14.4	21.2	10	**8.5**
Grazing	45.4	27.3	9.1	9.1	9.1	18.2	**11.0**
Indigenous vegetation	36.4	25.0	14.8	13.6	10.2	88	**74.6**
Alien vegetation	14.2	14.2	28.7	14.2	28.7	7	**5.9**
Column total (n)	**40**	**27**	**17**	**19**	**15**	**118**	
Total %	**33.5**	**22.9**	**14.5**	**16.3**	**12.8**		**100.0**

The figures reveal that three quarters of the existing landcover to be converted consisted of indigenous vegetation – hardly surprising given the nature of the database. Large portions of farms consist of undeveloped indigenous vegetation, which had not been converted because the topography or soil potential was not suitable for agricultural purposes. Also, assigned authorities such as CapeNature and DoA may not previously have cultivation in certain areas because of the sensitivity of the habitat or threatened conservation status of the vegetation. Only about 5% of the existing landcover consisted of alien vegetation. This may partly be as a result of programmes such as "Working for Water" aiming to sustainably eradicate invading alien vegetation. This programme in particular was prioritised and driven by DWAF because of the negative impacts that alien vegetation has on agriculture and biodiversity as it consumes about 7% of available runoff, intensifies flooding

and fires, destroys river habitat, causes erosion, reduces ability to farm and can cause mass extinction of indigenous plants and animals (DWAF 2005).

It was also expected that the footprint of developments where the land cover consisted of previously cultivated land would be more or less equally divided between the different conversion classes as the size of footprint depends mainly on the type of agriculture to be established. Existing land uses, such as grazing (comprising 11% of the existing land uses) may be a threat to biodiversity through overgrazing in some areas (Körner, Liberman & Spehn 2006). Grazing impacts the cover, structure and diversity of plant communities, thereby affecting the functioning of ecosystems (Crawley & Pacala 1992; Gough & Grace 1998). So its removal may not be entirely harmful. It can be concluded from the above that agriculture is one of the main contributors to the loss of indigenous vegetation, with urbanisation and alien plant invasions also being large contributors (Giliomee 2006).

The following section will focus on the conversion of undeveloped land applications that were not received by DEADP and the possible implications thereof.

4.2 Undeveloped land conversions that did not go through the EIA process

De Villiers & Manuel (2006) explain that while the application flow process between DoA and DEADP, as depicted in Figure 2.1, provides for some degree of environmental oversight, it is sometimes flawed. This section analyses empirical evidence of the process and the possible implications associated therewith.

A total of 170 conversions of undeveloped land applications were received by DoA. Of these, 52 applications (31%) were not received by DEADP and therefore the impacts associated with those 52 applications were not assessed in terms of ECA. In other words from a total of 170 applications only, 118 (69%) were received by DEADP for comment. The main reason for these applications not reaching DEADP is because some land owners do not abide by the law and therefore commence illegally, without obtaining environmental authorisation through the EIA process. Table 4.6 investigates the footprint of these 52 undeveloped land conversions while the full impacts associated with the 118 applications that obtained environmental authorisation are examined in the next section. According to the DoA database the 52 applications (potential developments) applied for cultivation of undeveloped land around Worcester, Ceres, Robertson, Wellington, Stellenbosch and Montagu.

Table 4.6 Applications for conversion of undeveloped land not received by DEADP

Town	Data	Number	% of Applications	Area (ha)	% of Area converted
Worcester	Potential footprint (ha)			**724**	**46**
	Number of applications	**14**	**27**		
Ceres	Potential footprint (ha)			**403**	**25**
	Number of applications	**6**	**11**		
Robertson	Potential footprint (ha)			**242**	**15**
	Number of applications	**14**	**27**		
Wellington	Potential footprint (ha)			**126**	**8**
	Number of applications	**11**	**21**		
Stellenbosch	Potential footprint (ha)			**74**	**5**
	Number of applications	**5**	**10**		
Montagu	Potential footprint (ha)			**20**	**1**
	Number of applications	**2**	**4**		
Total of Footprint of all Developments (ha)				**1589**	
Total Applications not received by DEADP		**52**			
Total %			**100**		**100**

Van der Merwe et al. (2004) confirms that Worcester, Robertson and Montagu are areas with high natural resource value, implying that these 52 conversions of undeveloped land developments potentially had negative impacts on the natural resources in these areas. Van der Merwe et al. (2004) determined the natural resource value by considering variables such as availability of developable land and water, agricultural potential, tourism attractions (natural and cultural) and environmental sensitivity. The table illustrates that the largest share of these 52 applications applying for conversion of undeveloped land were from Worcester and Robertson. The largest area of land (724ha) was also affected in the Worcester area, contributing to almost half of the total footprint of land potentially cleared by these undeveloped land conversions. Montagu is responsible for the smaller share of applications and contributes a mere 20ha.

Worcester and Ceres are responsible for converting more than the average area (265ha) of undeveloped land. The reason for these applications not going through EIA process can possibly be ascribed to farmers not being familiar with the ECA regulations and the procedure of sending an application to DEADP for comment. Some farmers are also reluctant to abide by the environmental law process as stipulated under ECA and NEMA, and would rather take the risks and commence illegally. One of the improvements in NEMA is its law enforcement measures, which allow for the issuing of fines up to R 5 million and/or up to 5 years imprisonment if found guilty of an offence

(Glazewski 2005). Clearing of such large areas of natural habitat can easily degrade the region's high natural resource value, change the sense of place and thereby jeopardise the future development and sustainability of the region.

This section revealed the large amount (1589 ha) of undeveloped land, mostly indigenous vegetation, potentially converted for agricultural purposes and so identified a potential threat for biodiversity in the study area. The next section will focus on the total extent of agricultural land converted for development purposes and the total extent of undeveloped land converted for agricultural purposes during the study period, in order to measure the extent of agricultural land gained (through conversion of undeveloped land) against the extent of agricultural land lost (through conversion of agricultural land for development purposes).

4.3 Total agricultural land lost to developments

Agriculture plays an important role in food security, while at the same time being the main cause of natural habitat destruction (Elrich, Hobbs & Saunders 1993). The conundrum we are therefore faced with is how to improve agricultural production while at the same time limiting further loss of biodiversity. The preservation of high potential, yet ecologically stable, agricultural land is thus becoming crucial (Ares, Bertiller & Del Valle 2001). It is therefore important to measure the total amount of agricultural land potentially lost through DEADP applications (change of agricultural land use) against the amount of new agricultural land gained through DoA applications (conversion of undeveloped land) in order to estimate the impacts of these land use changes. The next section focuses on the total extent of agricultural zoned land converted for development purposes (DEADP applications), followed first by an analysis of the total extent of undeveloped land converted for agricultural purposes (DoA applications), and then an analysis on the status of natural habitat as a reflection of the integrity of indigenous vegetation. The chapter is concluded by comparing the DEADP applications (amount of agricultural land potentially lost to change of agricultural land use developments) against the DoA applications (amount of agricultural land potentially gained by conversion of undeveloped land).

4.3.1 Agricultural land converted for development purposes

Table 4.7 details the amount of hectares (agricultural land) potentially lost to different types of land use change. This explains the reason for 255 applications and not 416 as the initial total of all the

Table 4.7 Agricultural land converted for development

(Row %)	**Footprint of development (ha)**								
Development function	**0-1**	**2-10**	**11-30**	**30-85**	**85-220**	**220-540**	**Row total (n)**	**Total (%)**	**Total (ha)**
Bulk services	40.0	3.3	6.7	13.3	30.0	6.7	**30**	**11.8**	**201**
Commercial	33.3	50.0	16.7	0.0	0.0	0.0	**6**	**2.4**	**132**
Residential	7.9	44.7	5.3	13.2	26.3	2.6	**76**	**29.8**	**1355**
Resort	25.1	33.3	16.7	8.3	8.3	8.3	**12**	**4.7**	**382**
Communication	0.0	40.0	20.0	20.0	20.0	0.0	**5**	**2.0**	**111**
Hospitality	43.7	33.3	4.8	9.5	6.3	2.4	**126**	**49.3**	**674**
Column total (n)	**103**	**71**	**49**	**26**	**4**	**2**	**255**		**2855**
Total (%)	**40.4**	**27.8**	**19.2**	**8.3**	**3.5**	**0.8**		**100.0**	

Note: agricultural construction, agricultural cultivation and nature conservation development functions were excluded from this table, since it is not regarded as a loss of agricultural zoned land.

agricultural land use change applications, according to DEADP's database. The table facilitates an examination of the number of developments in relation to the hectares of agricultural land lost so as to determine which land use types are responsible for the most agricultural land lost. The largest percentage of applications are hospitality related, contributing to almost half of all the applications. This was expected as it is a popular conversion type undertaken by farmers to generate some additional income by utilising existing infrastructure and unused land. It was expected that these developments would consume a small percentage of land as it usually entails the use of existing infrastructure. It is evident that very few of the applications consisted of commercial and communication related developments, contributing jointly to less than 5% of the applications. The result seems logical as these developments are developed less often and seldom requires upgrades or extensions. Nevertheless, these developments consume the least land as they mostly require small portions of land, such as in the case of cell mast and communication structures.

Residential related developments are responsible for converting the most agricultural zoned land (almost half of all the land area converted) from only a third of all the applications. This indicates that residential related developments yield a smaller number of applications in relation to hospitality related applications, but leave a larger development footprint. Normally residential related developments would consume the most land, primarily because of the demand in these developments

as a result of housing backlogs and the relatively large portions of land required (Platinga et al. 2002; Weerahewa et al. 2008).

Almost 40% of the developments utilise agricultural land smaller than 1ha of which most are used for hospitality and bulk service upgrades. Hospitality related developments that mostly consist of the conversion of sheds into wine tasting facilities or the conversion of existing buildings on the farm into guesthouse units, which mostly cover less than 1 hectare. The same applies to bulk service related developments that mostly require an upgrade of the existing services and require less than a hectare of land. The low percentage of larger developments can result from the high costs and/or the more stringent EIA process. These developments are mostly residential estates, examples of which are the Glen Rosa and Boschenmeer estate in Paarl, the Riverside development in Worcester and the De Doorns as well as the N2 Gateway low cost housing projects.

It is crucial that proper planning is undertaken to demarcate medium and high-potential agriculture areas that must be earmarked for agriculture and the areas with low agricultural potential that could be utilised for non-agricultural uses, in order to prevent the loss of good agricultural land to non-agricultural developments (Dale & Haeuber 2001).

4.3.2 Undeveloped land converted to agricultural land use

The problem in the Western Cape is that most of the limited fertile land potentially supporting natural habitat is already cultivated for agriculture (Donald 2006). The reason for this is mainly because agricultural land is converted for non-agricultural uses, which creates small remnants of agricultural land leading to the conversion of undeveloped land (natural habitat) for agricultural purposes. It is therefore important to assess the conversion of undeveloped land for agricultural purposes to identify the potential impact on natural vegetation as the conversion of natural habitat is seen as the most serious cause of biodiversity loss (Igegnoli 2002; Noss 1991).

Table 4.8 lists the existing land uses and the potential footprint of the undeveloped land converted for agricultural use. It is clear that most of the existing land cover consisted of indigenous vegetation, contributing to almost three quarters of all the applications, resulting in most of the land cover converted being indigenous vegetation (totaling to 1707ha).

Table 4.8 Relation between new land gained for agriculture and indigenous vegetation lost

(Row %)	**Footprint of undeveloped land converted (ha)**								
Existing land cover (before cultivation)	**0-1**	**2-10**	**11-30**	**30-85**	**85-220**	**220-540**	**Row total (n)**	**Total (%)**	**Total (ha)**
Previously cultivated	40.0	20.0	10.0	10.0	20.0	10.0	10	**8.5**	**253**
Grazing	30.7	23.1	15.4	15.4	7.7	7.7	13	**11.0**	**330**
Indigenous vegetation	36.4	25.0	14.8	13.6	9.1	1.1	88	**74.6**	**1707**
Alien vegetation	14.2	14.2	28.7	14.2	28.7	0.0	7	**5.9**	**299**
Column total (n)	**40**	**27**	**17**	**18**	**13**	**3**	**118**		**2589**
Total %	**33.5**	**22.9**	**14.5**	**15.4**	**11.2**	**2.5**		**100.0**	

Since most of the undeveloped land is still in a natural (undisturbed) state it would therefore consist mostly of indigenous vegetation. On the other hand, few (less than 5%) of the applications converted alien vegetation, affecting only 299ha. While it is regrettable that indigenous vegetation is cleared for these agricultural applications at all, one would suggest that land owners/farmers rather focus on the disturbed patches (previously cultivated, grazing land and alien vegetation) before converting indigenous vegetation. The conversion of indigenous vegetation should rather be seen as the last resort for converting undeveloped land. This accentuates the importance of implementing conservation measures through programmes such as LandCare Areawide Planning and BWI, as many of these potentially converted areas (undeveloped areas) consist of natural vegetation which plays an extremely important role in the sustainability of biodiversity and agricultural resources (Ellis-Jones 1999).

More than a third of the undeveloped land conversion had a small footprint (<1ha), while almost no applications had a footprint above 220ha. It is evident that the largest portion of land conversions consists of a previously cultivated, grazing and indigenous vegetation land cover. This is however not favourable for indigenous vegetation as it results in isolated islands of indigenous vegetation to form, hindering natural processes such as pollination (Sands 1995). On the other hand it is satisfying to deduce that the largest portion of landcover consisting of alien vegetation, affected large areas. This can be ascribed to programmes such as Working for Water, ensuring that larger areas of alien vegetation are cleared in order to conserve our water sources (DWAF 2005). Collins & Qualset (1999) state that the conversion of natural vegetation to agricultural land is agriculture's greatest negative effect on biodiversity. It is thus imperative that land owners conserve ecosystems (agro-

ecosystems) on their properties to reduce the risk of land degradation and to promote food production and security with minimum impact on the environment (Brookfield et al. 2002).

4.3.3 The status of natural habitat as a reflection of the integrity of indigenous vegetation

This section explores the status of natural habitat in the study region as well as the distribution of developments resulting in an agricultural land use change (DEADP applications) and conversion of undeveloped land conversions (DoA applications). This is very important as the natural habitat and biodiversity in the study region depends greatly on the survival of indigenous vegetation, specifically because of its important role in supporting ecological processes, natural systems and biodiversity. Indigenous vegetation is also important as a source for biological resources and ecosystem services (including water, pollinators, food, pharmaceutical and other resources), and is also worth maintaining for ethical and aesthetic reasons (Sands 1995).

The fact that two of the world's 25 biodiversity hotspots are represented in the Western Cape, namely the Cape Floristic Kingdom (CFK) and the Succulent Karoo, highlights the importance of assessing the status of natural habitat (reflecting the condition of indigenous vegetation) in the study area (Myers et al. 2000).

Figure 4.2 illustrates that more than three quarters of all the DEADP and DoA applications (developments involving a land use change) are potentially developed on land cover with no natural habitat, while less than a tenth are situated on land cover consisting of natural habitat. From a biodiversity point of view it is satisfying to see that most of the developments are potentially constructed on degraded land cover, with no surviving natural habitat. In both cases in the region of 10% will potentially result in the conversion of land covered with natural habitat. These relatively low percentages of land conversion on natural habitat is gratifying from a biodiversity point of view. This exemplifies that biodiversity is taken into account in the decision making process and that degraded areas are prioritised for DEADP and DoA applications. Consequently, it is still important that farmers conserve the remaining natural biodiversity on their farms as land productivity is strongly influenced by factors such as the quality of the atmosphere, productive capacity of the soil, water and biodiversity (Campanhola, Kitamura & Rodrigues 2003).

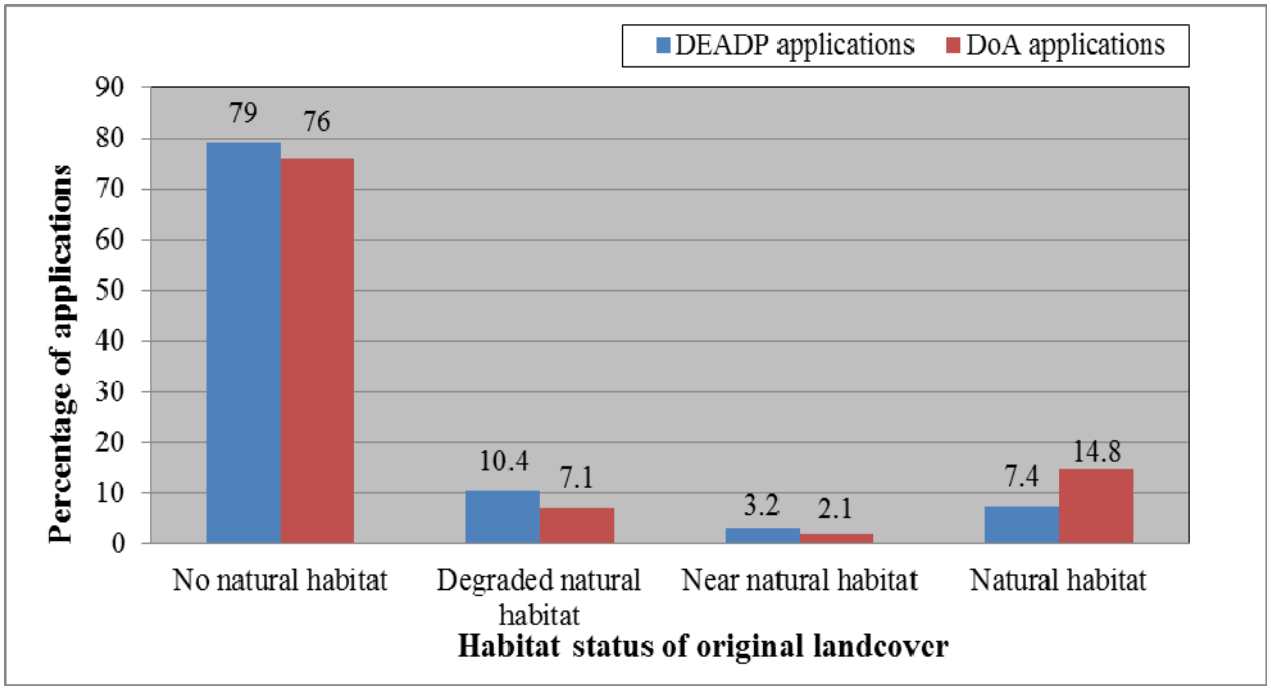


Figure 4.2 Location of applications in relation to natural habitat status of land

4.3.4 Agricultural land lost versus agricultural land gained from undeveloped land conversions

Food production is the most important economic activity for humankind. It is also the main cause of biodiversity loss worldwide through the conversion of natural habitat to agricultural use, habitat invasion, and use of chemical fertilisers and pesticides (Daily 1999). The challenge is how to maintain food production without compromising biodiversity. Whereas 2855ha (see Table 4.7) of agricultural land were potentially lost through land use change developments, another 2589ha (see Table 4.8) of new agricultural land were potentially added through the conversion of undeveloped land. This means that the potential amount of agriculturally zoned land lost is more or less equivalent to the amount of new agricultural land gained. The most crucial fact is that these conversions have either an impact on biodiversity or agricultural productivity, confirming the importance of programmes such as LandCare Areawide Planning which promotes the sustainability of biodiversity and growth in the agricultural sector (DoA 2008:6). It is an all-important challenge to prevent this conversion of natural habitats through producing higher yields on smaller portions of land, by using supplements such as fertiliser (Fresco et al. 1994). Concomitantly, there is a need to produce a long-term land conservation programme to identify optimum land use areas (Potter et al. 1991).

The main goal of this chapter was to determine the nature and extent of undeveloped land conversion in the study region by examining the transformation of undeveloped land for agricultural use applications through correlation between the DEADP database and the DoA database. The chapter compared the total amount of agricultural land potentially lost (through change of agricultural land use applications) against the amount of agricultural land potentially gained (through the conversion of undeveloped land for agricultural purposes), which revealed these to be almost in balance. The next chapter concludes this study by analysing each objective in terms of its achievements, and ends by making a number of recommendations and proposing ideas for future research.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

This study investigated the phenomenon of agricultural and undeveloped land transformation in the Boland region of the Western Cape through regulated development activities applied for according to the legislation administered by DEADP and DoA. The aim of the study was to firstly compile two databases; the one comprising of variables obtained from EIAs for agricultural land use change developments (DEADP applications) and the other of variables obtained from applications for the transformation of undeveloped land according to the DoA definition (DoA applications). These databases provided information to establish the extent, nature, rationale and geographical characteristics of agricultural land transformed to non-agricultural land uses, as well as undeveloped land transformed for agricultural land uses. The study provides some background on the land use problems in the study region and necessity for continuous land use change monitoring and analysis. It provides valuable justification for the implementation of IEM throughEIAs in order to manage agricultural land use change. The study also examines the intended role, function and efficacy of land use related legislation applicable to agricultural land use by revisiting the development of environmental law in SA, law processes associated with land use change, legally required flow of applications between DoA and DEADP as well as the range of management programmes active in protecting agricultural land in the province. In order to reach the desired aims, the study addressed five objectives, each of which is revisited in this chapter to determine the degree to which they have been achieved. This chapter formulates general conclusions and recommendations, assesses the limitations of the study and suggests avenues for future research.

5.1 Importance of agricultural land, land use dilemmas and legislation pertaining to land use control in the Western Cape

The first objective was addressed in the first two chapters by examining the importance of agricultural land, land use dilemmas in the Western Cape as well as environmental law in South Africa more broadly and its applicability to land use change control. The relevant literature including acts applicable to agricultural land use changes were discussed and implications associated with changes in legislation applicable to agricultural land use changes were pointed out. The main conclusions were that:

- The main factors causing development pressure on agricultural land in the Western Cape are the increase in human population through in-migration, instability of exchange rates, prevailing

farming systems and practices, the continual need for infrastructural development and natural veld disturbances by different land use types – conclusions supported by Ouadba et al. (2008).

- Most of the regulatory acts are clear and concise in terms of their legal requirements and that the authorities involved in the process are actively and constantly adjusting, amending or replacing the acts or parts of it towards developing functional, efficient and user friendly legislation that addresses the changing needs of the environment, development, developers and land owners.
- The awareness of possible negative effects from development on agriculture has lead to the amendment and replacement of legislation. Of general management relevance the National Environmental Management Act (Act 107 of 1998) has replaced the Environment Conservation Act (Act 73 of 1989) and relevant to agriculture the Sustainable Utilisation of Agricultural Resources Bill is currently in the process of replacing the Conservation of Agricultural Resources Act (Act 43 of 1983).

These measures confirm the important role that legislation plays in agricultural land transformation with regard to conservation, management and planning.

5.2 Strategies to prevent the loss of agricultural land

Chapter 2 also addressed the second objective by examining ancillary management strategies and programmes aimed at preventing the loss of productive agricultural land in the province. These include the LandCare Areawide Planning, Western Cape Provincial Spatial Development Framework and the Biodiversity and Wine Initiative in the Western Cape. The enquiry revealed that:

- The overarching goal of these management strategies is to conserve agricultural land in the Western Cape and to ensure sustainable agriculture in the future.
- The existence of these management strategies and guidelines confirms the existence of real problems related to the conversion of agricultural and undeveloped land. Especially the loss of indigenous vegetation is a serious problem and serious challenge for agriculture and biodiversity, for which these preventative measures are applied with measured success.

The conclusion is that these management programmes and guidelines play an important role in the planning, conservation and sustainability of agricultural resources in the province.

5.3 Nature and extent of agricultural land use change: Applications on the DEADP database

This objective was addressed in Chapter 3 by relating different variables – development function, regional location, year of authorisation, applicant type, property ownership, size classes of affected property, jobs created (permanent and temporary), proportion of property developed, existing land use of affected portion and area footprint of development. These variables were used to establish the nature, extent and rationale of these agricultural land use changes. Some salient findings were that:

- The largest portion of applications applied for hospitality and agricultural related developments by jointly contributing more than half of all the applications.
- About one third of the agricultural land use change applications originated in the developmentally vibrant Stellenbosch region, while the more peripheral Boland and Breede River East are the next regions in line.
- The lowest annual number of land use change applications were authorised in 1998, while the largest number were authorised in 2006 – attesting to an escalating trend in application submission and hence development momentum. The number of applications spiked in 2002, declined and then rose again to peak in 2006 – possibly in response to the legislative framework undergoing significant change over the period.
- The majority of properties involved in agricultural land use changes were owned by individual owners, followed by private companies and families (almost 90% privately owned). This illustrates that land development remains privately driven and active despite the rigours that legislation and regulation has enforced upon land owners.
- Residential and hospitality related developments are responsible for almost half of all the land use change applications, while agriculturally related changes (mostly agri-construction) account for a further one quarter of all the applications. As can be expected bulk service provisions are largely applied for from the public sector charged with service provision. In all other instances the private entrepreneur (individuals, companies and family owned) brought the overwhelming majority (generally >80%) of applications. A striking feature is the dominance of individual owners, especially with resort, hospitality, conservation and agricultural conversion related developments.
- The three largest and outlying municipal regions (Breede River Winelands, Breede Valley and Witzenberg) collectively cover nearly 70% of the total municipal area, but generate only about 35% of all the land use change applications – about the same as Stellenbosch alone. These

figures show that the agriculturally intensive regions, closer to the metropole, such as Stellenbosch and Drakenstein, generate most agricultural land use change developments.

- The majority of applications related to small farms with a size range between 10-100ha and very few related to properties larger than 500ha. Applications from small farms were for bulk services, communication, hospitality and agricultural conversion related developments, contributing each to about half of the applications in their respective fields. Applications on large farms tended to be for resort related developments.
- A total of 6078 permanent jobs were projected to be created by various land use change developments types. More than half of the developments promised to create less than 10 jobs, while the most jobs (1499) were created within the size category 11-50. Only a few of the developments promised to create more than 200 jobs adding to 722 jobs in total, while more than a tenth of the projects aimed at no job creation. Agriculture and communication related developments are responsible for producing the most permanent jobs.
- A total of 13929 temporary jobs were projected to be created by various land use change development types. The largest portion of projects aimed to create between 11-50 jobs and produced a projected total of 4898. Similarly, few developments created more than 200 temporary jobs, but small prospective employers (the 1-10 category) still contributed 1520 jobs. Residential, resort and hospitality related developments provided most of the temporary jobs, while more than a tenth of the developments did not create any jobs.
- Projects generally convert small proportions of the affected property to be developed, while only about a tenth of the developments convert more than 25% of the property. It must also be noted that a small fraction of the developments does not actually convert any of the land. In conclusion it can be surmised that the profit-making related developments (seeking to optimise the utilisation of the land) such as commercial, residential, resort and agricultural cultivation types are responsible for the largest conversions.
- The largest contingent of existing land uses due for conversion are vacant, low potential agricultural soil while viticulture follows in close second place. Very little alien vegetation and wheat and lucerne farm crops are slated for conversion. Stone fruit farming on the contrary are often impacted by the largest development footprints, albeit somewhat offset by the occupation of vacant low potential agricultural land.

- More than half of all the developments have a footprint of less than a hectare while less than 5% of the applications have a footprint that exceeds 50ha. Some proposed developments have no footprint at all.
- A large majority of the DEADP applications are developed on land with a medium or medium-high agricultural potential, with much smaller proportions developed on land with either a low or high agricultural soil potential.

What one can conclude from these selected findings is that these agricultural land use change developments may play a potentially important role in the future development of the Western Cape, especially in terms of: economic development; the future and sustainability of agriculture; variable and uneven development within the municipal regions and subsequently the province; uneven job creation; as well as challenges for soil and biodiversity conservation. It is therefore crucial that all the impacts associated with these developments are carefully considered before decisions are taken in order to ensure sustainable development within the province.

5.4 Nature and extent of undeveloped land conversion: Analysis of the DoA database

The fourth objective was pursued in Chapter 4 where the conversion of existing undeveloped land was scrutinised, using the following variables: year of authorisation, new land use type, municipal subregion, property ownership, percentage of property developed, and footprint of proposed development. The role of DoA in land conversion control, the conversion of undeveloped land that went through the EIA process as well as the conversions of undeveloped land applications not subject to the EIA process came under scrutiny and yielded the following conclusions:

- It was found that the main role of the DoA and DEADP in land conversion control is to steer development away from highly biodiverse areas and from land with significant agricultural potential and to protect such areas for either conservation or for agricultural production – congruent to the promotion of sustainable development.
- Viticulture (both wine and table grapes) is responsible for the largest conversion of undeveloped land, while preparation for vegetable farming is responsible for the least conversion. The reason for this can be found in the highly developed, vibrantly expanding and dominant viticulture industry in the study region, especially in the Stellenbosch, Drakenstein and Breede Valley municipal regions. Other farm types like fruit and vegetable cultivation are relatively minor to farming in the study region.

- The temporal trends in conversion applications are characterised by fluctuations starting low in 1998, peaking in 2003 and declining towards 2006 once more. The fluctuations can be ascribed to a number of reasons ranging from the prevailing economic climate, demand for certain agricultural products, the financial situation of land owners, and land owners getting familiar with the EIA process. Early reluctance to apply, contrasting with land owners becoming more comfortable with the EIA process later on, provides a feasible explanation.
- More than half of undeveloped land slated for conversion was owned by individual owners (mostly farmers), while very few were owned by the state in the form of public land. Estates, companies and public land were the least dominant types of ownership, contributing jointly to about one quarter of all the applications. The latter types of ownerships were less likely to have agricultural production functions, with most of the undeveloped land being situated on farms. Non-agricultural development applications such as resorts or residential constructions on agricultural land were most likely derived from commercial ownership types such as estates, companies or public land.
- Almost half of the undeveloped land applications wanted to convert between less than 25% of the proposed property. Land conversions of whole properties were largely limited to service delivery developments, mainly because public authorities like municipalities buy or expropriate particular-sized properties for specific infrastructure related development and mostly utilise as much as possible of the property. Low cost housing is a case in point.
- The majority of undeveloped land conversions tend to transform areas smaller than 20ha of land per project and more so transform less than 10 hectares. Footprints above 50 hectares are rare, mainly because of the dominant, intensive viticulture industry that expands by small increments on smaller portions of land. Orchard farming converted similar small areas of undeveloped land, which was surprising as this type of agriculture in the Western Cape generally utilises larger areas. This trend is echoed by barley and lucerne farming expansion.
- It is unfortunate that also most of the applications for conversion to indigenous vegetation involve smaller footprints, emphasizing the importance of harmony between agricultural production and the conservation of indigenous vegetation. About three quarters of the undeveloped land applications involved the conversion of specifically indigenous vegetation in order to expand crop production. Very few alien vegetation stands were so to be converted, perhaps because so much of it had already been eradicated through programmes such as Working for Water.

- Of the 170 DoA applications, 52 did not follow an EIA process and therefore could be considered as illegal acts in terms of the legally prescribed environmental screening procedures. The largest share of these applications commenced in the Worcester and Robertson region. The largest area of land (724ha) was cleared in the Worcester area, contributing to almost half of the total footprint of this land conversion group. The Worcester and Ceres subareas were the only that converted more than the average area (265ha) of undeveloped land, while Montagu was responsible for the smallest share in this category (only 20ha). The commencement of these potentially 'illegal' conversions can be mainly ascribed to the reluctance of land owners to fully abide by the environmental law process as stipulated under ECA and NEMA.

These findings reveal that agriculture is responsible for converting the greatest portion of undeveloped land, especially through viticulture, because of its dominance in the study region. It also seems to expose the possibility that large portions of undeveloped land, of which most are indigenous vegetation stands, are being cleared without assessment in terms of the EIA process, especially in the Worcester and Robertson areas. This reiterates the important management role that authorities have to play in these undeveloped land conversions, to ensure sustainability of agriculture in balance with biodiversity – especially since most of the biodiversity hotspots in the Western Cape are located on farms (Wynberg 2002).

5.5 Agricultural land conversion: Potential loss vs. potential gain

The fifth objective was to measure the extent of agricultural land lost to developments through change of land use as opposed to the extent of agricultural land gained through conversions of undeveloped land. The research found that:

- DEADP authorised 416 change of agricultural land use applications during the study period. Of these applications, 255 resulted in the conversion of agricultural land, excluding agricultural construction, cultivation and nature conservation applications. These applications implied a potential loss of 2855ha of agricultural land. Of these applications hospitality related developments represented almost half the number, but residential related developments were responsible for converting the most land (1355ha). Applications for commercial and communication related developments converting the least land, adding a mere 243ha jointly.

- DoA authorised 170 conversion of undeveloped land applications during the study period, of which 118 applications went through an EIA process, which resulted in the potential gain of 2589ha of agricultural land. About three quarters of these applications resulted in the conversion of indigenous vegetation, adding 1707ha, while applications for the conversion of previously cultivated land and alien vegetation contributed 552ha jointly. The remaining 52 applications not subjected to an EIA process potentially converted 1589ha of undeveloped land. The land use coverage converted by these applications is however uncertain as this research did not investigate the development path of these applications fully. Whether the 1589ha is a potential gain or loss of agricultural land thus remains uncertain.

These findings show a virtual balance between agricultural land potentially lost (2855ha) and potentially gained (2589ha). Perhaps the most significant finding is, however, that 1707ha of indigenous vegetation was lost during the 8-year period due to these land use conversion processes, confirming the importance of proper planning and conservation of agricultural and biodiverse areas.

5.6 Avenues for future research

The research cannot provide all answers for or solve the development challenges embedded in the conversion of agricultural land generally or in the Western Cape. Among others, some limitations to the study are embedded in the nature of the data obtainable and hence it behoves to suggest various avenues for future research. A number of topics that can be fruitfully explored emerged, namely to:

- Determine the important role of agriculture in the economic growth, job creation and food security of the Western Cape (Bennett 1994). It's important that future research identifies, analyses and monitors the efficacy of existing methods or programmes as the possible mechanisms through which to ensure sustainable agricultural development in the rural landscapes of the Western Cape.
- Examine the role that agriculture plays in food security, the economic implications of importing food rather than utilising the land for agricultural purposes, and the impact of these external factors on the balance between production and conservation.
- Research, measure and quantify the economic value of agricultural land in terms of job creation, food security and the value of the yields generated from the land against the economic value of the land if it is utilised for other developmental purposes.

- Establish the value of agritourism as a supplementary income for agriculture by evaluating the complimentarity and competition between agriculture and tourism, its utilisation of land, and the impacts its conduct may have on natural resources. Tourism could be a panacea to biodiversity conservation by attaching monetary value to its non-invasive utilisation as tourism product.
- Study the land use intensification through regulated development activities in the other three regions (West coast (region B2), Overberg (region B1) and Garden Route (region A1)) of the Western Cape to determine the stability of the results obtained from this region and to allow DEADP to interpret and measure the findings at a provincial scale.
- Investigate the law enforcement and regulation mechanisms and their efficacy, by focusing on illegal land conversions, such as the change of undeveloped land applications that did not follow the prescribed screening routes for comment and assessment of the possible implications. Applications of geographical information technology like remote sensing and GIS to aid detection may be highly productive.
- Measure the successes of cooperative governance by evaluating the interaction and information flows between different spheres of the government and assessing alternative mechanisms to improve, for instance, the miscommunication between DoA and DEADP in terms of agricultural land use applications.

Most of the issues in agricultural land use change detection and monitoring arise because of poor planning. The most important drivers of inappropriate land use change in the Western Cape are mostly the clearing of land for socio-economic uses such as urban settlements (Giliomee 1994). Other forms of unsuitable land use change in the Western Cape are inappropriate road construction, forestry planting, and inappropriately located rural and informal settlements all contributing to land degradation (Garland, Hoffman & Todd 1999). These inappropriate agricultural land uses, as well as the construction of recreational activities and the expansion of urban settlements (including associated infrastructure), put additional pressure on the remaining agricultural land as it leaves less land for farming. The Western Cape experiences high levels of urbanisation because of its favorable location and enviable environmental quality, putting pressure on natural resources and undeveloped rural areas. It's therefore important to ensure a suitable balance between economic development and the conservation of agricultural land and biodiversity in these rural areas (DEADP 2005b). It's also essential that future research focuses on better planning in terms of alternative land uses for

development in order to conserve and reserve the remaining prospective agricultural soils for agriculture.

REFERENCES

Abdalla YI 2007. Causes of food insecurity in Southern Africa: An assessment. Masters thesis. Stellenbosch: University of Stellenbosch, Department of Agricultural Economics.

Abrahams F 2005. A review of provincial land use planning in the Western Cape. Research paper for the requirements of the LLM degree in the Faculty of Law. Bellville: University of the Western Cape.

Agriculture Sector Brief 2005/2006. Optimising the productivity and sustainability through LandCare Areawide Planning. Online available: www.wesgro.org.za. [Accessed 12 July 2008].

Altieri MA 1999. The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems and Environment* 74: 19-31.

Ambatsha R Bharadwaj G & Shah P 1991. *Participatory impact monitoring of a soil and water conservation programme* by farmers. Report No.13 of the Sustainable Agriculture Programme. Wageningen: Elsevier.

Andrews A 1998. *A user guide to the National Environmental Management Act.* Pretoria: Government Printer.

Ares J, Bertiller M & Del Valle H 2001. Functional and structural indicators of intensification, resilience and resistance in agroecosystems in Southern Argentina based on remotely-sensed data. *Landscape Ecology* 16: 221-234.

Barnard D 1999. *Environmental law for all: A practical guide for the business community, the planning professions, environmentalists and lawyers*. Pretoria: Impact Books .

Barret GW 1992. *Landscape ecology: Designing sustainable agricultural landscapes in integrating sustainable agriculture, ecology and environmental policy*. New York: Harworth Press.

Bennett AF 1994. Key issues in sustainable agricultural development. In Maddock N & Wilson FA (eds) *Project design for agricultural development*, 12-21. Sydney: Avebury.

Bennett AF 2003. *Linkages in the landscape: The role of corridors and connectivity in wildlife conservation*. Cambridge: International Union for the Conservation of Nature and Natural Resources.

Bergstrom JC, Goetz SJ & Shortle JS 2005. *Land use problems and conflicts: Causes, consequences and solutions.* New York: Routledge.

Biodiversity and Wine Initiative 2007. A pioneering partnership between the South African wine industry and the conservation sector. Online available: www.bwi.co.za. [Accessed 7 June 2008].

Biodiversity and Wine Initiative 2008. Biodiversity and Wine Initiative brochure. Online available: www.bwi.co.za. [Accessed 5 December 2008].

Bizimana C, Ferrer SRD & Niewoudt WL 2004. Farm size, land fragmentation and economic efficiency in southern Rwanda. *Agrekon* 43: 244-262.

Bockstael ME 1996. Modelling economics and ecology: The importance of a spatial perspective. *American Journal of Agricultural Economics* 78: 1168-1180.

Bo-jie F & Li-ding C 1999. Integrating landscape ecological principles and land evaluation for sustainable land use. *Journal of Environmental Sciences* 11: 136-140.

Bowers J & Hopkinson P 1994. The treatment of landscape in project appraisal: Consumption and sustainability approaches. *Project Appraisal* 9: 108-110.

Bridgman C 2009. Biodiversity and the South African wine sector a successful blend? Masters thesis. Stellenbosch: University of Stellenbosch, Department of Geography and Environmental Studies.

Brandt J & Vejre H 2004. Multifunctional landscapes-motives, concepts and perspectives. Southampton: Wit press.

Brookfield H, Padoch C, Parsons H & Stocking M 2002. Cultivating biodiversity: Understanding, analyzing and using agricultural diversity. London: ITDG Publishing.

Brouwer F & McCarl BA 2006. *Agriculture and climate beyond 2015.* Utrecht: Springer Publishing.

Campanhola C, Kitamura PC & Rodrigues GS 2003. An environmental impact assessment system for agricultural R&D. *Environmental Impact Assessment Review* 23: 219-244.

CAPE Info Sheet 2001. Business sector information updates from South Africa's Western Cape: Western Cape Agriculture. Wesgro's sector research section. Online available: www.wesgro.org.za. [Accessed 22 November 2008].

Cape Times 2001. Country golf estate planned for valley near Wellington. 20 August: 3.

Cape Times 2006. Luxury estates eating agricultural land – Dowry. 6 April: 3.

Carter C 2004. Golf estates under the spotlight. *This Day* 22 June: 5.

Chadwick A, Glasson J & Therivel R 1994. *Introduction to environmental impact assessement.* London: UCL Press.

Clarke J 1999. Marketing structures of farm tourism. *Journal of Sustainable Tourism* 7: 26-47.

Coetsee J 2006. Land reform must allow best use of farms. *Business Report* 15 March: 2.

Coggins GC & Smith DL 1976. The emerging law of wildlife: A narrative bibliography. *Environmental Law* 6: 583-588.

Collins WW & Qualset CO 1999. *Biodiversity in agroecosystems*. New York: CRC Press.

Convention on Biodiversity 2001. *Handbook of the Convention on Biological Diversity.* London: Earthscan Publications.

Council for the Environment 1989. *Integrated environmental management in South Africa*. Pretoria: Joan Lötter.

Cowling RM 1999. *Framework for a conservation plan for the Cape Floristic Region, South Africa.* IPC Report 9902 prepared for WWF-South Africa. Stellenbosch: World Wildlife Fund Press.

Cowling RM, Rouget M, Richardson DM & Lombard A 2003. Current patterns of habitat transformation and future threats to biodiversity in terrestrial ecosystems of the Cape Floristic Region, South Africa. *Biological Conservation* 112, 1.

Cox D 2005. Review of the agricultural application procedure in KwaZulu-Natal. *South African Sugar Journal* 89 (4): 16-17.

Cramer VA & Hobbs RJ 2007. *Old fields: Dynamics and restoration of abandoned farmland*. Washington: Island Press.

Crawley MJ & Pacala SW 1992. Herbivores and plant diversity. *American Naturalist* 140: 243-260.

Dalal-Clayton B & Sadler B 2005. *Strategic environmental assessment: A sourcebook and reference guide to international experience.* London: Earthscan Publications.

Dale VH & Haeuber RA (eds) 2001. *Applying ecological principles to land management*. New York: Springer-Verlag.

Dalgliesh C, Steytler N & Breetzke B 2004. *Western Cape state of the environment overview report*. Cape Town: Steffen, Robertson and Kirsten (South Africa) (Pty) Ltd.

Daily GC 1999. Developing a scientific basis for managing earth's life support systems. Report No. 3: 14. Online available: http://www.consecol.org/vol3/iss2/art 14. [Accessed 21 June 2008].

Den Hartigh W 2006. An EIA can contribute to efficient agriculture. *Farmer's Weekly* 18 August 2006: 32-33.

Dennis Moss Partnership 2004. *Hoogekraal Sustainable Development Initiative Report.* Consultative Draft report No. 3. Stellenbosch: Dennis Moss Partnership.

De Klerk M, Drimie S, Aliber M, Mini S, Reuben M, Randela R, Modiselle S, Roberts B, Vogel C, De Swardt C & Kirsten J 2004. *Food security in South Africa: Key Policy Issues for the Medium Term.*

Pretoria: Human Science Research Council, Integrated Rural and Regional Development, position Paper.

Department of Agriculture (DoA) 1996. *Report on the role of agriculture in the South African economy*. Pretoria: National Department of Agriculture. Pretoria: Government Printer.

Department of Agriculture (DoA) 2003. *LandCare Areawide Planning: Community led, linked to IDP process, integrated diverse patterns, natural resource planning and spatial planning.* Cape Town: Government Printer.

Department of Agriculture (DoA) 2007. Soil potential. Cape Town: Government Printer. Available online: http://www.nda.agric.za/publications [Accessed 07 January 2009].

Department of Agriculture (DoA) 2008. *Policy for the national LandCare Areawide Planning programme in South Africa*. Pretoria: Government Printer.

Department of Environmental Affairs and Development Planning (DEADP) 2005a. *State of the environment report (SOER).* Cape Town: Government Printer.

Department of Environmental Affairs and Development Planning (DEADP) 2005b. *Western Cape provincial spatial development framework (WCPSDF)*. Cape Town: Government Printer.

Department of Environmental Affairs and Development Planning (DEADP) 2005c. *Rapid review of golf course and polo field developments.* Cape Town: Government Printer.

Department of Environmental Affairs and Development Planning (DEADP) 2005d. *South Africa's national biodiversity strategy and action plan*: *Country study*. Cape Town: Government Printer.

Department of Environmental Affairs and Development Planning (DEADP) , National Department of Agriculture, Provincial Department of Agriculture, Department of Water Affairs and Forestry and CapeNature 2005e. *Agreement of co-operation concerning the streamlining of the application and review process for the cultivation of new agricultural fields.*

Department of Environmental Affairs and Development Planning (DEADP) 2008. *Agreement of co-operation for the processing of applications to cultivate new agricultural fields ("Agri-MOU").* Department of Environmental Affairs and Development Planning. Cape Town: Government Printer.

Department of Environmental Affairs and Tourism (DEAT) 1997. *White paper on environmental management policy*. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 1998. *EIA regulations: Implementation of sections 21, 22 and 26 of the Environment Conservation Act*: *Guideline document*. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 1999. *State of the environment report South* Africa-*an overview*. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 2000. *Strategic Environmental Assessment in South Africa.* Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 2004a. *Overview of integrated environmental management.* Integrated Environmental Management, Information Series 0. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 2004b. *Review of environmental impact assessment*. Integrated Environmental Management, Information Series 13. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 2004c. *Strategic environmental assessment*. Integrated Environmental Management, Information Series 10. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT) 2006. *South Africa environment outlook. A report on the state of the environment*. Pretoria: DEAT.

Department of Tourism, Environment and Conservation (DTEC) and Department of Agriculture and Land Reform (DALR) 2009. *Integrated permit project, terms of reference*. Northern Cape Department of Tourism, Environment and Conservation and the Department of Agriculture and Land Reform. Pretoria: Government Printer.

Department of Water Affairs and Forestry (DWAF) 2005. Working for Water Program. Available online: http://www.dwaf.gov.za/wfw/problem.asp April 2005 [Accessed 9 November 2009].

De Villiers C 2007a. *Biodiversity guidelines for the Western Cape*. Botanical Society of South Africa. Cape Town: P.E.R Publishers.

De Villiers C 2007b. *Threatened biodiversity, the NEMA EIA regulations and cultivation of virgin land: More of the sorry same?* Botanical Society of South Africa. Cape Town: P.E.R publishers.

De Villiers C & Hill RC 2007. *Evaluating activity-based EIA as a tool for sustainable agriculture in a global biodiversity 'hotspot' – Lessons from the Cape Floristic Region.* Cape Town: Botanical Society of South Africa.

De Villiers C & Manuel J 2006. *The NEMA EIA regulations, agriculture and biodiversity: New challenges, new opportunities*. Cape Town: Botanical Society of South Africa.

Die Burger 1990. Paarlse stadsraad teen ontwikkeling van oord. 13 November: 15.

Dobson AP, McLellan CH & Wilcove DS 1986. *Habitat fragmentation in the temperate zone, in conservation biology: The science of scarcity and diversity.* Cape Town: Sunderland Press.

Donald AJ 2006. Landscape function analysis and ecological management of an agricultural landscape. Masters thesis. Stellenbosch: University of Stellenbosch, Department of Geography and Environmental Studies.

Dower M 1973. Recreation, tourism and the farmer. *Journal of Agricultural Economics* 24: 465-477.

Driver A 2004. National spatial biodiversity assessment 2004: Priorities for biodiversity conservation in South Africa. *Strelitzia* 17. South African National Biodiversity Institute. Pretoria.

Drozd DJ & Johnson BB 2004. Dynamics of rural land market experiencing farmland conversions to acreages: the case of Saunders County, Nebraska. *Land Economics* 80(2):294-311.

Duffy PJB 1992. EIA as a catalyst to sustainable development in Mozambique. *Impact Assessement Bulletin* 10 (3), 67-72.

Duvenhage H 2006. Landbou kan nie só gemelk word nie. *Rapport* 10 September: 2.

Ellis-Jones J 1999. Poverty, land care and sustainable livelihoods in hillside and mountain regions. *Mountain Research and Development* 19: 179-190.

Elrich PR, Hobbs RJ & Saunders DA 1993. Reconstruction of fragmented ecosystems: Problems and possibilities. In Saunders DA, Hobbs RJ & Elrich PR (eds) *Nature conservation 3: The reconstruction of fragmented ecosystems*, 305-313. Chichester: John Wiley and Sons.

Elsenburg Landbou-ontwikkelings Instituut vir Winterreëngebied 1990. *Boland streeksontwikkelingsdokument.* Elsenburg: Department of Agriculture, Western Cape.

Essop P 2005. Guidelines for golf estates set to tee off. *Cape Argus* 26 October: 15.

Essop P 2006. Dowry under fire on land 'U turn'. *Cape Argus* 19 October: 15.

Ferraro PJ & Simpson RD 2004. Protecting forests and biodiversity: Are investments in eco-friendly production activities the best way to protect endangered species and enhance rural livelihoods? 19-23. Paper presented at the International Conference on Rural Livelihoods, Forests and Biodiversity. Available from: www.cifor.cgiar.org/publications/corporate/cd-roms/bonnproc/pdfs/papers/t4_final_ferraro.pdf [Accessed 21 June 2010].

Fey MV & Mills AJ 2003. Declining soil quality in South Africa: Effects of land use on soil organic matter and surface crusting. *South African Journal of Science* 99: 429-436.

Fraser GCG & Mabusela LL 2003. Sustainability of traditional agriculture in the Southern African savannas of Botswana. *South African Geographical Journal* 85: 11-17.

Fresco LO, Stroosnijder L, Bouma J & Van Kuelen H 1994. *The future of the land: Mobilising and integrating knowledge for land use options*. Chichester: John Wiley and Sons.

Fuggle RF & Rabie MA 1983. *Environmental concerns in South Africa*. Kenwyn: Juta and Company.

Fuggle RF & Rabie MA 1992. *Environmental management in South Africa*. Kenwyn: Juta and Company.

Fuggle RF & Rabie MA 2000. *Environmental management in South Africa*. Kenwyn: Juta and Company.

Garland G, Hoffman T & Todd S 1999. Soil degradation: A national review of land degradation in South Africa, first draft South African National Biodiversity Institute (SANBI). Available online: http://www.nbi.ac.za [Accessed 6 November 2008].

Geach B & Peart R 1998. Land, resource use, biodiversity and desertification in South Africa. An overview and analisys of post-1994 policies, programmes, institutions and financial mechanisms. Paper presented at the 12th Global Biodiversity Forum, Dakar, Senegal. Available online: www.gbf.ch./Session_Administration/upload/Geach.pdf. [Accessed 16 February 2010].

Gebeyehu Y 1995. Population pressure, agricultural land fragmentation and land use: A case study of Dale and Shashemene Weredas, Southern Ethiopia. Proceedings of the Fourth Annual Conference on the Ethiopian Economy, Addis Ababa.

Gemmill B & Varela AM 2004. Policy brief: Modern agriculture and biodiversity: uneasy neighbours. Nairobi: Environment Liaison Centre International.

Giliomee JH 1994. Agriculture. In Fuggle RF and Rabie MA (eds) *Environmental management in South Africa,* 25-40. Kenwyn: Juta & Company.

Giliomee JH 2006. Conserving and increasing biodiversity in the large-scale, intensive farming systems of the Western Cape, South Africa. *South African Journal of Science* 102: 375-378.

Giliomee JH & Glavovic PD 1992. Pesticides. In Fuggle RF & Rabie MA (eds) *Environmental management in South Africa*, 20: 301-322. Kenwyn: Juta and Company.

Glaeser EL & Kahn ME 2003. *Sprawl and urban growth.* Report No. 9733. Cambridge, National Bureau of Economic Research. Cambridge: Cambridge University Press.

Glasson J, Therivel R & Chadwick A 1999. *Introduction to environmental impact assessment: Principles and procedures, process, practice and prospects*. London: UCL Press.

Glazewski J 2000. *Environmental law in South Africa*. Cape Town: Butterworth.

Glazewski J 2005. *Environmental law in South Africa*. Second edition. Cape Town: Butterworth.

Goerning P, Norberg-Hodge H & Page J 1993. *From the ground up*. London: Zed Books.

Gough L & Grace JB 1998. Herbivore effects on plant species diversity at varying productivity levels. *Naturalist* 79: 1586-1594.

Green GP, Deller SC, Marcouiller DW 2005. *Amenities and rural development*. Northampton: Edward Elgar.

Greenland DJ, Gregory PJ & Nye PH 1998. *Land resources: On the edge of the Malthusian precipice*. Wallingford: CAB International.

Harris LD 1984. *The fragmented forest: Island biogeography theory and the preservation of biotic diversity*. Chicago: University of Chicago Press.

Heap B & Kent J 2000. *Towards sustainable consumption: A European perspective*. London: Royal Society Printers.

Hendy S 1998. Rural holding or hobby farm? *The Valuer & Land Economist* 1998: 144-149.

Herman D 2005. Tough conditions for new golf estates in Western Cape. *Cape Times* 30 May: 6.

Hinderink J & Titus MJ 2002. Small town and regional development: Major findings and policy implications from comparative research. *Urban Studies* 39: 379-391.

Holmes J 2006. Impulses towards a multi-functional transition in rural Australia: Gaps in the research agenda. *Journal of Rural Studies* 22:142-160.

Holmes PM 2005. Results of a Lucerne old field restoration experiment at the fynbos-Karoo interface. *South African Journal of Botany* 71, 326-338.

Hood T 2005. Anyone for Golf? : Tom Hood on Property. *SA Country Life*, February 2005:104.

Howarth W & Rodgers CP 1993. *Agriculture conservation and land use: Law and policy issues for rural areas*. Cardiff: University of Wales Press.

Huntley BJ 1989. *Biotic diversity in Southern Africa: Concepts and conservation.* Cape Town: Oxford University Press.

Huntley BJ & Petersen C 2005. *Mainstreaming biodiversity in production landscapes*. Washington: Global Environment Facility.

Huston M 1993. Biological diversity, soils and economics. *Science* 202: 1076-1080.

Igegnoli V 2002. *Landscape ecology: A widening foundation*. Berlin: Springer-Verlag.

International Institute for Environment and Development 1998. Policies that work in South Africa. Golden Gate workshop report. London: Zed Books.

Jenkins J & Prin E 1998. Rural landholder attitudes: The case of public recreational access to private lands. In Butler R, Hall CM & Jenkins J (eds.) *Tourism and recreation in rural areas*, 179-196. Chichester: John Wiley and Sons.

Jones KM & Pattayanak SK 2006. Ecosystem valuation: Linking biodiversity conservation to human welfare. *Biodiversity and Conservation* 22, 3:15-29.

Jordaan W 2001. Toerisme in landbou nagevors. *Die Burger* 29 March: 4.

Kallas Z, Gomes-Limon JA & Arriaza M 2007. Are citizens willing to pay for agricultural multifunctionality? *Agricultural Economics* 36(3):405-419.

Kent J & Myers N 2000. Food and hunger in sub-Sahara Africa. *The Environmentalist* 10 October: 2.

Kidd M 1997. *Environmental law: A South African guide*. Kenwyn: Juta & Company.

Kirkby J, O'Keefe P & Timberlake L 1995. *The Earthscan reader in sustainable development*. London: Earthscan Publications.

Kleynhans TE & Opperman JM 2005. Determination of priorities of buyers regarding value contributing characteristics of farm land in the Stellenbosch district, South Africa. *Agrekon* 44: 38-43.

Knickel K 2007. Integrated assessment of the land system: The future of land use. *Land Use Policy* 24: 517-520.

Körner C, Liberman M & Spehn EM 2006. *Land use change and mountain biodiversity*. New York: CRC Press.

Kotze I 2008. *Cape Winelands make conservation history-conservation exceeds the total vineyard footprint*. Stellenbosch: World Wildlife Fund Press.

Kuyvenhoven A & Van Pelt MF 1994. Sustainability-orientated appraisal for agricultural projects. In Maddock N & Wilson FA (eds) *Project design for agricultural development*, 85-97. Sydney: Avebury.

Lambin EF, Lepers E & Geist HJ 2003. Dynamics of land use and land cover change in tropical regions. *Annual Review of Environment and Resources* 28: 205-241.

Lampkin N 1990. *Organic farming*. Tonbridge: Farming Press.

Lewandowski I, Hardtlein M & Kaltschmitt M 1999. Sustainable crop production: Definition and methodological approach for assessing and implementing sustainability. *Crop Science* 39: 184-193.

Libby LW 1997. *In pursuit of the commons: Toward a farmland protection strategy for the Midwest.* Centre for Agriculture in the Environment. New York: Oxford University Press.

Lockeretz W 1988. Editor's introduction to special issue: Sustaining agriculture near cities. *Landscape and Urban Planning* 16: 291-292.

Lyson TA & Olson RK 1999. *Under the blade: The conversion of agricultural landscapes*. Boulder: Westview Press.

MacLennan B 2004. Bidders sought for urgent study on impact of golf estates. *Cape Times* 5 August: 4.

Madeley J 2002. *Food for all*. New York: Oxford University Press.

Mannion AM 2002. *Dynamic world: Land cover and land use change*. New York: Oxford University Press.

Matthews S 2003. Phase 1 of the Wine and Conservation Project complete. A report to Conservation International, from the Botanical Society's Cape Conservation Unit in conjunction with the Percy Fitzpatrick Institute and the Western Cape's Chief Directorate of Agriculture, Elsenburg. Available online: www.botanicalsociety.org.za.

Maybery D, Crase L & Gullifer C 2005. Categorising farming values as economic, conservation and lifestyle. *Journal of Economic Psycology* 26: 59-72.

McKercher B 1993. The unrecognized threat to tourism: Can tourism survive sustainability? *Tourism Management* 14 (2): 131-136.

Meurk C 2007. Urban space – making links between people, land and nature or planning and design of restoration at small to large/catchment scales. Paper delivered at an urban catchment connections workshop, Kaipatiki [online]. Available from: www.landcareresearch.co.nz/research/built/liudd/restoration.asp [Accessed June 30 2010].

Morris M & Yeld J 2004. Moratorium on golf estates mooted. *Cape Argus* 15 December: 4.

Myers N, Mitermeller RA, Mitermeller CG, Da Fonseca GAB & Kent J 2000. *Biodiversity hotspots for conservation priorities*. Washington DC: Centre for Applied Biodiversity Science.

Neher D 1992. Ecological sustainability in agricultural systems: Definition and measurement. *Sustainable Agriculture* 2: 51-61.

Noss RF 1991. Landscape connectivity: Different functions at different scales. In Hudson WE. *Landscape linkages and biodiversity*, 27-39. Washington DC: Island Press.

O'Neill M & Charters S 2000. Service quality at the cellar door: Implications for Western Australia's developing wine tourism industry. *Managing Service Quality* 10(2): 112-122.

Organisation for Economic Cooperation and Development 2006. *Review of agricultural policies in South Africa*. Cape Town: OECD Publishing.

Ortolano L & Shephard A 1995. Environmental impact assessment: Challenges and opportunities. *Impact Assessment* 3 (1): 3-30.

Ouadba JM, Pare S, Sandewall M & Soderberg U 2008. Land use analysis from spatial and field data capture in South Burkina Faso, West Africa. *Agriculture, Ecosystem and Environment* 127: 277-285.

Paarl Post 2001. Another golfing estate proposed. 30 August.

Pascual U & Perrings C 2007. The economics of biodiversity loss in agricultural landscapes. *Agriculture, Ecosystem & Environment* 121: 256-268. Available from: www.sciencedirect.com.ezproxy.uct.ac.za.

Paterson RW & Boyle KJ 2002. Out of sight, out of mind? Using GIS to incorporate visibility in hedonic property value models. *Land Economics* 78(3): 417-425.

Payraudeau S & Van der Werf HMG 2005. Environmental impact assessment for a farming region: A review of methods. *Agriculture, Ecosystems and Environment* 107 (1): 2-19.

Peart R & Wilson J 1998. Environmental policy-making in the new South Africa, *South African Journal of Environmental Law and Policy* 5: 237-267.

Phillips C & Randolph J 2000. The relationship of ecosystem management to the National Environmental Policy Act and it's goals. *Environmental Management* 26 (1): 1-12.

Platinga AJ, Lubowski RN & Stavins RN 2002. The effects of potential land developments on agricultural land prices. *Journal of Urban Economics* 52:561-581.

Pollard S & du Toit D 2005. *Harmonising policy and practice: Governance integrated development planning and capacity development for natural resource management*. Discussion document, Association for Water and Rural Development (AWARD). Cape Town: Government Printer.

Polyakov M & Zhang D 2008. Population growth and land use dynamics along the urban-rural gradient. *Journal of Agricultural and Applied Economics* 40 (2): 649-666.

Pope CA & Goodwin HL 1984. Impact of consumptive demand on rural land values. *American Journal of Agricultural Economics* 66(5): 750-754.

Potter C, Burnham P, Edwards A, Gasson R & Green B 1991. *The division of land: Conservation in a period of farming contraction.* London: Routledge.

Powell A 2007. Huge developments for Boland. *Cape Times* 15 November: 12.

Rabie MA 1999. The New Zealand parliamentary commissioner for the environment: A comparative perspective. *Acta Juridica* 97: 61-70.

Randolph J 2004. *Environmental land use planning and management*. Washington DC: Island Press.

Randolph J & Ortlano L 1976. Effect of the National Environmental Policy Act on corps of engineers planning for the Carmel River. *Environmental Affairs* 5 (2): 213-253.

Redford K 2005. Achieving sustainable landscapes. A calculus for trade-offs between conservation and human use. In: *Mainstreaming biodiversity in production landscapes, Working Paper 20.* Washington DC: The Global Environment Facility.

Reed LL 2009. A reinterpretation of the value attributes of agricultural land for the valuation of farms bought for lifestyle purposes. Doctoral dissertation. Stellenbosch: University of Stellenbosch, Department of Philsophy.

Rees W & Wackernagel M 1996. *Our ecological footprint.* Philadelphia: New Society Publishers.

Roberson JD 1997. Tradition or stagnation? In defence of non-economic highest and best use. *The Appraisal Journal* 65(2):113-120.

Roberts J 2004. *Environmental policy.* New York: Routledge.

Romeril M 1989. Tourism and the environment - accord or discord? *Tourism Management* 10 (3): 204-208.

Rookwood P 1995. Landscape planning for biodiversity. *Landscape and Urban Planning* 31: 379-385.

Rosegrant WM, Cline SA, Li W, Sulser BT & Santos VAR 2005. *Looking Ahead: Long Term Prospects for Africa's Agricultural Development and Food Security*. 2020 Discussion Paper. Online. Available from: www.ifpri.org/2020AfricaConference/pubs.asp.

Rossouw N & Wiseman K 2004. Learning from the implementation of environmental public policy instruments after the first ten years of democracy in South Africa. *Impact Assessment and Project Appraisal* 22 (2): 131-140.

Ryskowski L & Jankowiak J 2002. Development of agriculture and it's impact on landscape functions. In Ryskowski L (ed) *Landscape ecology in agroecosystems management*, 118-134. New York: CRC Press.

Sadler B 1996. *Environmental assessment in a changing world: Evaluating practice to improve performance*. International study of the effectiveness of environmental assessment, Final Report. Toronto: Association for Impact Assessment Press.

Samways MJ & Witt ABR 2004. Influence of agricultural land transformation and pest management practices on the arthropod diversity of a biodiversity hotspot, the Cape Floristic Region, South Africa. *African Entomology* 12: 89-95.

Sands P 1995. *Conservation of biological diversity*. Manchester: Manchester University Press.

Sandwith T, Maze K, Barnett M, Frazee S & Cadman M 2005. Mainstreaming biodiversity through South Africa's bioregional conservation programmes: Top-down and bottom-up. In: *Mainstreaming in Production Landscapes, Working Paper 20.* Washington DC: The Global Environment Facility.

Sandwith T, Barnett M, Parker A & Wisani F 2006. *Fynbos Fynmense*: *People Making Biodiversity Work*. SANBI Biodiversity Series 4. Pretoria: South African National Biodiversity Institute.

Saturday Weekend Argus 2004a. When impact of golf estates under scrutiny. 14 August: 13.

Saturday Weekend Argus 2004b. When going green means yet another 18 holes in the Western Cape. 14 August: 13.

Schumann M 2007. News from the Conservation Unit: Branch out. *Veld and Flora* 93 (2): 130-131.

Smith CH 1981. *Smith's story of the Mennonites*. New York: CRC Press.

Smith CS & McDonald GT 1998. Assessing the sustainability of agriculture at the planning stage. *Journal of Environmental Management* 52 (1): 15-37.

South Africa 1970. *Subdivision of Agricultural Lands Act, Act 70 of 1970.* Pretoria: Government Printer.

South Africa 1983. *Conservation of Agricultural Resources Act, Act 43 of 1983.* Pretoria: Government Printer.

South Africa 1985. *Land Use Planning Ordinance, Ordinance 15 of 1985.* Pretoria: Government Printer.

South Africa 1989. *Environment Conservation Act, Act No. 73 of 1989.* Pretoria: Government Printer.

South Africa 1998a. *Agricultural Policy of South Africa*. Pretoria: Government Printer.

South Africa 1998b. *National Environmental Management Act, Act No. 107 of 1998.* Pretoria: Government Printer.

South Africa 2004a. *National Environmental Biodiversity Act, 2004.* Pretoria: Government Printer.

South Africa 2004b. *Sustainable Utilisation of Agricultural Resources Bill*. Pretoria: Government Printer.

South Africa 2006. *Environmental Impact Assessment Regulations, 2006.* Government Gazette No. 28753, 21 April 2006. Government Printer, Pretoria.

South Africa 2010. *Environmental Impact Assessment Regulations, 2010.* Government Gazette No. 33306, 18 June 2010. Government Printer, Pretoria.

South African Wine Industry and Information (SAWIS) 2008. South African wine industry statistics No. 32. Paarl. Available from: www.sawis.co.za.

Sowman M, Fuggle R & Preston G 1995. A review of the evolution of environmental evaluation procedures in South Africa. *Environmental Impact Assessment Reviews* 15: 45-67. New York: Elsevier.

Speirs LJ 2003. Agritourism: Market segmentation profile of potential and practicing agritourists. Masters thesis. Stellenbosch: University of Stellenbosch, Department of Geography and Environmental Studies.

Steenkamp W 2006. Furore over golf estates. *Saturday Star* 28 January: 5.

Tassiopoulos D, Nuntsu N & Haydam N 2004. Wine tourists in South Africa: A demographic and pshycographic study. *Journal of Wine Research* 15(1): 51-63.

Tenure Reform 1998. *A reflection of field practice and a consultation on the new tenure legislation*. Bellville: School of Government, University of the Western Cape.

Thamm M 2006. Boesak's golf estate gets the nod. *Mail and Guardian* 24 August: 7.

The Herald 2005. Province draws line in sand on golf estates. 15 December: 6.

The Presidency 2003. *Towards a ten year review: Synthesis report on implementation of government programmes* (Discussion document, Policy Co-ordination and Advisory Services (PCAS), The Presidency, Republic of South Africa). Cape Town: Government Printer.

The World Bank (2004). Responsible growth for the new millennium: Integrating society, ecology and the economy. Washington DC: The World Bank.

Thrupp LA 1998. *Agricultural biodiversity and food security: Predicaments, policies and practices*. Washington DC: World Resources Institute.

Treweek J 1996. Ecology and environmental impact assessment. *Journal of Applied Ecology* 33 (2): 191-199.

TSG (2004). *The Manufacturing Sector in Southern Africa*. Southern African Development Community, Economic Impact Assessment Study. Report prepared for USAID Regional Centre for Southern Africa (RCSA).

United Nations Convention on Biological Diversity. Rio de Janeiro, June 1992. Available from: www.cbd.int.

United Nations 2001. *The economics of conservation agriculture*. Rome, Food and Agriculture Organisation of the United Nations. New York: Oxford University Press.

United Nations 2002. *Report of the World Summit on Sustainable Development*. London: Earthscan Publications Ltd.

United Nations Development Programme 1999. *Human development report*. New York: Oxford University Press.

United Nations Economic Commission for Europe 1991. *Policies and systems of environmental impact assessment*. Environment Series 4. Geneva: United Nations Economic Commission for Europe.

United States Department of Agriculture 1999. *Food security assessment: Why countries are at risk*. Washington DC: Government Printer.

Urban-Econ 2005. *Economic impact report for LagoonBay Lifestyle Estate*. Report for preliminary Impact Assessment. Pretoria: Urban-Econ.

Van der Linde M 2006. *Compendium of South African environmental legislation.* Pretoria: Pretoria University Law Press.

Van der Merwe IJ, Davids AJ, Ferreira S, Swart GP & Zietsman HL 2004. *Growth potential of towns in the Western Cape*. Stellenbosch: Centre for Geographical Analysis, University of Stellenbosch.

Van der Merwe SWJ 2006. Local and sub-regional socio-economic and environmental impact of large-scale resort development. Masters thesis. Stellenbosch: University of Stellenbosch, Department of Geography and Environmental Studies.

Van der Westhuizen T 1998. Wes-Kaap besluit nou self oor verdeling van grond. *Die Burger* 8 May: 5.

Vink N 2003. *Why is agriculture important to the Western Cape Province?* Stellenbosch: University of Stellenbosch, Department of Agricultural Economics & Faculty of Agricultural and Forestry Sciences.

Visser G & Van Huyssteen K 1997. Guesthouses - new option for tourists in the Western Cape winelands. *Acta Academia* 29(2): 106-137.

Weale A 1992. *The new politics of pollution.* Manchester: Manchester University Press.

Weerahewa J, Meike KD, Vyn RJ & Haq Z 2008. *The determinates of farmland values in Canada*. Canadian Agricultural Trade Policy Research Network, Report No: 2008-03, Canada.

Werner R 1993. Ecologically and economically efficient and sustainable use of agricultural landscapes. *Landscape and Urban Planning* 27: 237-248.

Western Cape Provincial Treasury 2006. *Western Cape provincial economic review and outlook*. Pretoria: Business Print Centre.

Wiesner D 1995. *The environmental impact process, what it is and how to do one.* Bridgeport: Prism Press.

Wiid AJ & Le Roux CM 1999. *Streeksontwikkelingsplan Beaufort-Wes Voorligtingswyk.* Elsenburg: Western Cape Department of Agriculture.

Wikipedia 2008. Western Cape Municipalities [online]. Available from: http://comms.wikipedia.org [Accessed 30 April 2009].

Wynberg R 2002. A decade of biodiversity conservation and use in South Africa: Tracking progress from the Rio Earth Summit to the Johannesberg World Summit on Sustainable Development. *South African Journal of Science* 98: 233-243.

Yield J 1997. *Caring for the earth, South Africa: A guide to sustainable living.* Cape Town: CMYK Press.