CONSERVATION INCENTIVES FOR PRIVATE COMMERCIAL FARMERS IN THE THICKET BIOME, EASTERN CAPE, SOUTH AFRICA

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This study sought opportunities to mitigate the pressures of land transformation and alien invader plants on commercial farm land in the thicket biome in the lower reaches of the Fish Kowie Corridor. It had two aims. Firstly, to determine the role incentives could play in mitigating these pressures. Secondly, to determine the characteristics of an incentive programme that would most effectively achieve this. In order to do this, an understanding of landowner activities, needs, opinions and barriers to behaviour; the nature of the pressures on thicket and the nature of the required behaviour to reduce these pressures; and current and past institutional arrangements needed to be achieved. This was done predominantly through a current literature review and personal interviews with landowners and key informants. These findings were used to make recommendations for an effective incentive programme.

Landowners showed a preference towards tangible incentives, in particular management assistance, financial compensation and law enforcement. They indicated an aversion to an incentive programme implemented by a government agency, particularly district and provincial government. Rather, landowners showed a propensity towards a non-government organisation (NGO) or a farmers group implementing an incentive programme.

It was recommended that the two major pressures, namely land transformation and alien invader plants, required different interventions by different agencies in order to be mitigated. The pressure of land transformation required a stewardship model response, with the primary drive being a non-contractual environmental extension service to landowners. The extension service should focus on promoting pro-conservation practises, raising awareness and disseminating information. It should also build a relationship of trust between landowners and the implementing agency.

The pressure of alien invader plants would be most effectively addressed through the Working for Water programme. Tangible incentives must be provided to the landowner to induce the costly exercise of alien invader plant control. In particular, the high cost of labour must be addressed. The regulatory incentive of applying laws requiring landowners to control alien invader plants on their land should also be enforced.

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AIP	alien invader plant
CARA	Conservation of Agricultural Resources Act
CSIR	Council for Scientific and Industrial Research
CV	Contingent valuation
CVM	Contingent valuation method
DEAET	Department of Economic Affairs, Environment and Tourism (Eastern Cape Province)
DEAT	Department of Environmental Affairs and Tourism (National department)
DLA	Department of Land Affairs
DWAF	Department of Water Affairs and Forestry
GEF	Global Environmental Facility
GIS	Geographic Information System
IC	Incentive-compatible
IDP	Integrated Development Plan
NDA	National Department of Agriculture
NGO	Non-government organisation
NOAA	National Oceanic and Atmospheric Association
PMU	Project Management Unit (Baviaanskloof Mega-reserve)
SANBI	South African National Biodiversity Institute
STEP	Subtropical Thicket Ecosystem Programme
TPB	Theory of Planned Behaviour
USA	United States of America
WBI	Wine and Biodiversity Initiative
WfW	Working for Water
WTA	Willingness to accept
WTP	Willingness to pay
WWF	World Wildlife Fund

CHAPTER ONE

SETTING THE SCENE: THE THICKET BIOME AND CONSERVATION INCENTIVES

1.1 THE THICKET BIOME

Covering an area of close to 42 000 km^2 in the Eastern and Western Cape provinces, the subtropical thicket biome is a major centre of diversity and endemism for plants, reptiles and invertebrates (Kerley *et al.*1999; Cowling *et al.* 2005; Victor and Dold 2003). Solid thicket in its pristine condition exists as an impenetrable, evergreen, closed shrubland or low forest, consisting of leathery-leaved or succulent trees, shrubs and vines (Vlok *et al.* 2003; Cowling *et al.* 2005). Thicket presents not only unique structural and functional characteristics, but also has a high number of endemic plants. Endemics are specifically represented among succulents (Euphorbiaceae, Crassulaceae, Aizoiaceae and Asphodelaceae) and geophytes (Hyacinthaceae, Amaryllidaceae) (Vlok and Euston-Brown 2002). Mosaic thicket exists where thicket clumps occur in a matrix of non-thicket vegetation (Vlok *et al.* 2003). Subtropical thicket forms mosaics with six of its neighbouring biomes, namely Fynbos, Forest, Grassland, Nama-karoo, Savanna and Succulent Karoo. The inclusion of these mosaic forms in the biome has greatly increased its extent relative to previous delimitations (Vlok *et al.* 2003).

The thicket biome has undergone some of the most marked degradation of any biome in South Africa (Cowling *et al.* 2003). Once severely degraded, most thicket communities, but especially Arid Thicket, do not restore spontaneously (Midgley and Cowling 1993; Stuart-Hill and Aucamp 1993; Kerley *et al.* 1995; Fabricius *et al.* 2002; Fabricius *et al.* 2003; Lechmere-Oertel *et al.* 2005c). Within the STEP planning domain (see Box 1), agriculture, urbanisation and alien plans have transformed some 16% of the vegetation (Lloyd *et al.* 2002). Another 8% is highly threatened by these land use pressures (Cowling *et al.* 2003). A further 12% has been severely degraded by over-grazing (Lloyd *et al.* 2002; Cowling *et al.* 2003; Lombard *et al.* 2003).

Box 1: STEP: Subtropical Thicket Ecosystem Programme

Extending from the eastern Western Cape through to KwaZulu-Natal, subtropical thicket is found predominantly in the Eastern Cape (Low & Rebelo 1996). This biome covers an area of close to 42 000 km^2 in the Eastern and Western Cape provinces, most markedly in river valleys (Vlok *et al.* 2003). In the field of conservation planning, “STEP” (Subtropical Thicket Ecosystem Programme) has become

synonymous with the subtropical thicket biome. The STEP planning domain covers an area of 116 574.82 km^2 (Lloyd *et al.* 2002), and is centred on the thicket biome, although it includes mosaics made up of thicket and its neighbouring biomes, such as fynbos and grassland. The planning domain stretches from the Duiwenhoks River in the east and the Great Kei River in the west and is bounded by the Indian Ocean in the south and the northern limits of the thicket biome in the north (Cowling *et al.* 2003). The planning phase of the STEP project was funded by the Global Environment Facility (GEF), and was initiated in 2000 over four years (Cowling et al. 2003). It aimed to assess subtropical thicket biodiversity, and develop a strategy for conserving thicket within the domain (Cowling *et al.* 2003). This resulted in the mapping of priority corridors within the domain, essentially corridors of existing habitat that are able to achieve conservation targets for process and pattern, while considering implementation opportunities and constraints (Cowling *et al.* 2003). The ethos of STEP is "keeping people on the land", and therefore in agricultural regions STEP seeks to ensure that the goals of agricultural production, water management and nature conservation are met simultaneously (Knight *et al.* 2003; Knight and Cowling 2003). STEP now continues as an implementation programme, facilitated by the South African National Biodiversity Institute (SANBI 2006).

According to Lombard *et al*. (2003), only 7.3% of the STEP planning domain is under formal protection (formal protection requires that state, provincial or local authority owns and manages the land). Furthermore, this existing protected areas system is not representative of the region's biodiversity patterns or the processes that maintain these patterns (Cowling *et al.* 2003). Attempts to conserve intact thicket have traditionally been in the form of the proclamation of discrete parcels of land managed by statutory conservation organizations (Lombard *et al*. 2003). The majority of land within the STEP planning domain is under private tenure (Cowling *et al.* 2003). Given the cost of purchasing land and the opportunity costs of setting aside land strictly for conservation, innovative ways need to be found to conserve more of this important biome, without necessarily proclaiming formal state-operated protected areas (Pressey and Logan 1997; Knight and Cowling 2003).

Internationally, the last decade of conservation planning and implementation has seen a shift from conserving a discrete site to demarcating and managing a range of land parcels at a larger ecosystem or landscape level, involving multiple landowners in conservation initiatives (Brunckhorst 2000; Margules and Pressey 2000; Thomas and Middleton 2003). South Africa has made considerable progress in this regard,

with the focus of conservation planning shifting from formal reserves and species specific conservation to preventing habitat loss both within and beyond the borders of formal reserves (Cowling *et al.* 2003; Driver *et al.* 2003; Young and Fowkes 2003; Rouget *et al*. 2006); see Box 1. In response to a growing need for alternative conservation strategies, incentive programmes are being developed and implemented as a mechanism for multi-stakeholder conservation initiatives (van Kooten and Schmitz 1992; Clark and Downes 1999; Anon. 2003; Boody *et al.* 2005).

1.2. INCENTIVES

"…in a world increasingly influenced by market economies and where the state continues to withdraw support for conservation efforts, incentives-based conservation is likely to continue increasing in importance." Langholz et al. 2000 pp 1736

1.2.1 Incentive Theory

A common term in the fields of economics (Sloman 1997), management (Hellriegel *et al.* 2001) and the behavioural sciences (Skinner 1974; McKenzie-Mohr 2000; Clayton and Brook 2005), the role of incentives is to positively motivate behaviour. In the field of environmental management, incentives can be best described as "an inducement on the part of an external agency (government, NGO or other), meant to both allow or motivate the local population, be it collectively or on an individual basis, to adopt new techniques and methods aimed at improving natural resource management" (Laman *et al.* 1996; Hellin and Schrader 2003). Incentives can range in scale from policy issues to instruments used at the local or project level, and can be either financial and tangible or non-financial and less tangible, such as social, cultural or moral factors (Giger 1999). Incentive types can be further divided into various categories, such as management assistance, market creation and recognition incentives. This categorisation will be discussed in section 1.2.2 below.

In securing conservation action among private actors, the use of incentives is becoming an increasingly popular tool, and has been recognised in the fields of environmental management (Young *et al.* 1996; Bowers 1999), environmental economics (McNeely 1988; Emerton 2000) and environmental law (Doremus 2003; Clark and Downes 1999). The range of useful incentives types is broad, with these taking the form of purely financial incentives (Blignal 1998; Clarke and Downes 1999), to non-financial incentives which are tangible (Fusaro 2005) to intangible incentives based on moral factors (Giger 1999). Australia, the European Union, the UK and the United States all support a variety of incentive programmes for biodiversity conservation (Terry and Case 1994; Young *et al.* 1996; Vickerman 1998;

Fish 2003; van Gossum 2005). Similar support for the use of incentives is found in the developing world (Ashley 1996; Langholz *et al.* 2000; May *et al.* 2002; Fabricius *et al*. 2004; Prazan *et al.* 2005) and from international bodies (IUCN 1998; Emerton 2000; WWF 2005). Institutionally, the use of incentives is widespread, with government agencies at the national, regional and local level implementing incentive schemes (Terry and Case 1994; Young *et al.* 1996; Clough 2000), as well as conservation agencies incorporating this tool into their conservation strategies, such as CapeNature in South Africa (CapeNature 2006) and NGOs (Defenders of Wildlife 2002; Brocket and Gottfried 2002). Within South Africa, the government has recognised a need to incorporate conservation incentives into their suite of conservation tools (DEAT 1997; DEAET 2003b).

1.2.2 Types of Incentives

Incentive classification systems vary widely in the literature. Firstly, distinction must be made between incentives, disincentives and perverse incentives. In conservation, incentives encourage pro-nature conservation practises. Disincentives discourage a specific action or behaviour – a disincentive to conserve would therefore penalise an individual for engaging in pro-conservation practises. However, disincentives can also be used to benefit conservation by penalising negative behaviour. To avoid confusion, a disincentive for the benefit of conservation is termed a regulatory incentive. A perverse incentive is one that encourages (deliberately or accidentally) unsuitable behaviour (Myers and Kent 2001). Market failure is often the cause of a perverse incentive, and a significant proportion of biodiversity loss can be attributed to this (Myers and Kent 2001; Emerton 2000; Doremus 2003).

Within the realm of positive incentives, numerous types of incentives have been identified. These include education and awareness incentives (Vickerman 1998; Curtis and De Lacy 1996; Botha 2001); recognition incentives (Young *et al.* 1996; Vorhies 2000; Vickerman 1998; Botha 2001; Shafer 2004); fiscal incentives (McNeely 1988; Clarke and Downes 1999); property or rights-based or price based incentives (Botha 2001); management assistance incentives (Doremus 2003); market based incentives (Vickerman 1998; Doremus 2003) and administrative streamlining (Doremus 2003).

Below is a brief review of those six incentive types that are relevant to this study, as well as some other aspects of incentives. These types are:

- Education and awareness incentives

- Recognition incentives
- Fiscal incentives
- Management assistance incentives
- Market based incentives
- Law enforcement (Table 1.1)

This sub-set was identified after interviews with key informants and a brief pilot study (Chapter Three).

Table 1.1 Incentive types investigated in this study

Incentive type	Description	References
Education and awareness incentives	Effective communication and education on the importance of biological diversity	McNeely 1988; Young *et al.* 1996; Vickerman 1998; Curtis and De Lacy 1998; Botha 2001; Defenders of Wildlife 2002; Bekele and Drake 2003
Recognition incentives	Public recognition to an individual or entity who incorporates ecologically sound principles into their land management	Young *et al.* 1996; Vorhies 2000; Vickerman 1998; Botha 2001; Defenders of Wildlife 2002; Shafer 2004
Fiscal incentives	Financial compensation	McNeely 1988; Blignal 1998; Boyd *et al.*1999; Clarke and Downes 1999; Defenders of Wildlife 2002; VCMC/DSE 2003
Management assistance incentives	Physical assistance or information and advice on land management	Botha 2001; Anon. 2003; Doremus 2003
Market based incentives	Creation of a market for ecologically sound land management, or the products accruing from ecologically sound land management	Vickerman 1998; Defenders of Wildlife 2002; Doremus 2003; VCMC/DSE 2003
Law enforcement	Law enforcement to assist landowners in their land management	Langholtz *et al.* 2000

1.2.2.1 Education and Awareness Incentives

Education incentives are said to underpin all other incentives (Botha 2001). They are based on effective communication and education on the importance of biological diversity (Bekele and Drake 2003). With an ideal target audience, education incentives can stand alone, but in reality these incentives must be supported by one or more of the other incentive types to be effective (Vickerman 1998; Curtis and De Lacy 1998). Ideally, no conservation incentive programme should be without education incentives.

Education incentives can take the form of distributed booklets, public talks, personal visits or newsletters. In a sense, education incentives can be seen as marketing biodiversity. An educational incentive is successful on its own when the target individual is driven by a desire to conserve nature. The importance of this type of incentive is recognised in much of the literature on incentive types (McNeely 1988; Young *et al.* 1996; Vickerman 1998; Vorhies 2000; Bekele and Drake 2003; Doremus 2003; VCMC/DSE 2003). The state of Missouri, for example, offers education to landowners through the Landowner Assistance Program, which encourages the use of wildlife friendly practises (Defenders of Wildlife 2002). Education is often coupled with other incentive types, such as technical assistance or recognition (Defenders of Wildlife 2002).

1.2.2.2 Recognition Incentives

Recognition incentives, whereby an organisation or individual are formally acknowledged for their contribution to nature conservation can be considered as a step beyond education incentives. While recognition incentives are also dependent on communication and education, they go further to provide public recognition to an individual or entity that incorporates ecologically sound principles into their land management regime. This recognition may take the form of a green award system or public media recognition of the individual's efforts (Young *et al.* 1996; Vorhies 2000; Vickerman 1998; Shafer 2004). Recognition incentives are based on the understanding that people who seek a positive self-image through achievements tend to view situations as tests of self-esteem (Crocker *et al.* 2002; Clayton and Brook 2005). A person who bases their self-esteem on environmentalism may view decisions as opportunities to demonstrate their environmental responsibility, and therefore behave in an environmentally conscious manner (Brook *et al.* 2005). As

with education incentives, recognition incentives are targeted at, and therefore effective with a certain set of individuals, but cannot be expected to motivate the entire population (Vickerman 1998). The Colorado Division of Wildlife, for example, runs a “Landowner of the Year” programme, which recognises landowners who have made outstanding improvements to wildlife habitat and/or have provided public access to Colorado’s wildlife on their private agricultural or forested lands (Defenders of Wildlife 2002).

A South African example of using recognition as an incentive is the Baviaanskloof Mega-reserve Proud Partners Programme. The Proud Partners Programme has been developed by the Baviaanskloof Mega-reserve Project Management Unit (PMU), supported by the Wilderness Foundation. This programme seeks to expand the conservation estate of the Baviaanskloof and surrounds through partnerships with private landowners. While this is usually associated with formal contractual arrangements, the PMU recognised a need to develop a partnership programme that could include private landowners as well as business initiatives and even commercial farms that allows for a wide spectrum of participation from stakeholders. Stakeholders that become part of the Partner Programme receive a signboard that they can display at the entrance to their property or business, as well as a certificate. Partners are then able to associate themselves with the Baviaanskloof Mega-reserve when marketing their accommodation or products. In return, Partners commit to sharing the vision and principles of the Mega-reserve, open communication and constructive engagement within the governance structures of the Mega-reserve, promotion of the Mega-reserve as a catalyst for positive change for the environment and for people, adherence to legislation when making decisions regarding the development and management of activities on their properties or within their businesses, developing a positive working relationship with the Eastern Cape Parks, the Department of Economic Affairs and Tourism and the Project Management Unit of the Baviaanskloof Mega-reserve (Baviaanskloof Mega-reserve Project Management Unit 2005).

1.2.2.3 Management Assistance Incentives

Management assistance may be in the form of physical assistance such as labour or equipment, or information and advice on land management (Botha 2001; Doremus 2003). This form of incentive, while not directly financial, can fairly easily be translated into cost saved by the landowner (Doremus 2003). Some pressures on biodiversity, such as the spread of invasive species, can only be addressed through

costly, technically demanding, continuous management inputs (Wilcove and Chen 1998). In these cases, a management assistance incentive is suitable. The Conservation Stewardship Pilot Programme in South Africa's Western Cape relies largely on management assistance incentives to attract landowners to the land stewardship programme. In this programme, the degree of management assistance increases as the level of commitment on the part of the landowner increases (Anon. 2003).

1.2.2.4 Market Based Incentives

A major driving force behind environmental degradation is market failure - the inability of the market to capture the full cost of transforming and over-exploiting natural resources and to reward sound land management (Field 2001). The creation of a market for ecologically sound land management, or the goods and services accruing from such management, could help to rectify this imbalance (Doremus 2003).

Market correction may require consumer education where critical information is lacking, such as a product certification programme, "green branding" or "eco-labeling" (Vickerman 1998; Clark and Downes 1999; Doremus 2003; Sammon and Thompson 2003). In order for eco-labeling to be effective, some form of reputable external organisation or third party must be brought in to certify the product (VCMC/DSE 2003).

In other instances, it is necessary to develop an entire market for biodiversity. Ecotourism, for instance, has developed around the protection of biodiversity (Milton *et al.* 2003). While ecotourism can sometimes be in conflict with the biodiversity it is claiming to protect, this can be controlled by external monitoring and evaluation of the impacts of biodiversity management for ecotourism (Langholz and Krug 2004). The trading of carbon credits is a market spanning the globe that has allowed for the protection of biomes that are able to sequest significant amounts of carbon (Fusaro 2005; Williams *et al.* 2005).

In the Free State province of South Africa, the department of Nature Conservation has undertaken the marketing of fishing for Yellow Fish (*Barbus* spp, a popular indigenous game fish) in rivers running through private land. With the subsequent demand for the recreational sport, landowners now have an incentive to preserve the

habitat of the Yellow Fish, and in doing so are maintaining and improving the health of the entire river ecosystem on their land (P. de Villiers pers comm. 2003).

"Green" hunting has been designed as an alternative product to traditional trophy hunting. This not only protects animals previously under constant threat from over hunting, but also plays a role in scientific monitoring. Originally developed as a substitute for elephant hunting in South Africa's Lowveld, green hunting provides the same recreational package as traditional trophy hunting, with the exception that animals are shot with an anaesthetic dart rather than a lethal bullet (Anon. 2000). The anaesthetised animal is fitted with a satellite collar to assist scientific studies on their movements, and the hunter receives a bronze or fibre glass replica of the trophy.

1.2.2.5 Fiscal Incentives

Both direct and indirect fiscal incentives result in some form of financial compensation to recipients. It must be acknowledged that most landowners manage their land primarily and even solely for profit, and this provides great potential for fiscal incentives to be a powerful motivating tool (Lovejoy *et al.* 1986; Gunatilake and Abeygunawardena 1993; Vitousek *et al.* 1997). Direct financial incentives can take the form of subsidies or payments (Blignal 1998; Clarke and Downes 1999). A US based NGO, The Delta Waterfowl Foundation, offers direct cash payments to farmers to protect duck nesting areas on their farms (Delta Waterfowl Foundation 2000). Indirect financial incentives can be offered through tax laws with land, cash and land rights donations all being tax deductible (McNeely 1988; Boyd *et al.*1999; Clarke and Downes 1999). Tax rebates for pro-biodiversity land management can also be an effective tool (VCMC/DSE 2003). In Brazil, local municipalities receive financial rewards from national government according to the size of conserved land relative to the total size of the municipality, as well as the condition of the conserved land. This incentive is passed on to private landowners within participating municipalities, who receive tax breaks on rural land tax for conserving land (May *et al.* 2002). A perceived danger with financial incentives is that landowners may be reluctant to accept financial assistance for fear of "strings attached". It can also prove to be one of the more costly incentive types (Vickerman 1998).

Conservation easements are another form of fiscal incentives. Conservation easements transfer property rights from a landowner to a private conservation organisation or government agency. In a formal agreement, the landowners consent

to relinquish the right to certain specified development rights, in exchange for cash or tax benefits (Boyd *et al.* 1999). Easements do not transfer the property itself, but merely give the easement purchaser the right to enforce prohibitions against future development on the land (Boyd *et al.* 1999; Doremus 2003). In the United States, the Conservation Reserve Program and the Wetlands Reserve Program remove highly erodible lands, riparian areas and wetlands from agricultural production through the purchase of easements from farmers (Clark and Downes 1999).

1.2.2.6 Law Enforcement

Langholz *et al.* (2000) found law enforcement to be an effective incentive with private landowners in Costa Rica. This incentive type aims to enforce legal requirements on those impinging on the legal rights of the landowners involved in an incentive scheme. In the case of Langholz *et al.* (2000), landowners who signed up for the incentive scheme were assured that illegal squatters would be removed from their land. Apart from this, there have been few examples of law enforcement offered as an incentive for private landowners. It has been pointed out that using law enforcement as an incentive mechanism may raise inherent political and social justice issues, (Langholz *et al.* 2000; Langholz and Krug 2004). However, this tool does offer a potentially powerful incentive. For example, offering farmers protection from stock theft, a major concern for South African farmers (Nel and Davies 1999; ABSA 2003; Beinart 2003), might have a significant impact on farmer's decision-making. In the case of alien invader plant control (discussed below), enforcing alien invader plant control on neighbouring land might encourage landowners to control alien invader plants on their own land.

1.2.3 Defining Incentives Further

1.2.3.1 Contractual vs. Non-Contractual Agreements

It is important to differentiate between contractual and non-contractual incentive programmes since different incentive types suit different types of agreements. For instance, education and recognition incentives, if applied on their own, are not designed for contractual agreements, as the landowner is not receiving a tangible benefit. However, incentives that provide a more tangible product, such as management assistance or financial incentives, function better as part of a contractual agreement (Young *et al.* 1996; Botha 2001). The negative aspect of contractual agreements is the substantial funding requirements of such agreements (Young *et al.*1996), and the significant transaction costs in time and institutional resources required for the contracts to be put in place (S. Winter 2005 pers comm.).

1.2.3.2 Inherent vs. External Incentives

Distinction must be made between incentives inherent in a system, and incentives that are offered externally. For example, the formation of a conservancy produces an inherent incentive in the nature of decreased management costs to individual landowners due to economies of scale. An external incentive is one that would be explicitly offered by an implementing agency, such as improved property-rights with the formation of a conservancy, or tax breaks for a conservancy. Literature on conservation incentives almost always pertains to external incentives, as does this study.

1.2.4 Designing an Incentive Programme

In developing an effective conservation incentive programme, a number of crucial factors are stressed. Arguably the most important factor is that the incentives are place specific. This refers to:

- The ecosystem in question, its vulnerabilities and resilience (Hoffman and Todd 2000; Vorhies 2000; Bekele and Drake 2003; Doremus 2003)
- The pressures on the natural environment, and root causes of these pressures (McNeely 1988; Young *et al.* 1996; Bowers 1999; Hoffman and Todd 2000).
- The target stakeholders – their barriers to conservation actions, as well as the specific needs and concerns of the individuals that are being targeted by the incentive programme. This may be affected by historical factors, the economic environment and individual personalities (Bergsma 2000; May *et al*. 2002; Bekele and Drake 2003; Doremus 2003; Langholz *et al.* 2000).

These factors, therefore, must be investigated before designing suitable incentives.

On a more academic level, the effectiveness of purely financial incentives over a combination of financial, non-financial and “intangible” incentives has received some interest in the literature. The use of purely financial incentives for conservation has received some criticism for creating dependency, although this discourse has centred on incentive programmes for impoverished rural communities (Bunch 1982; Hellin and Schrader 2003). Other major criticisms of direct incentives to rural communities claim that these incentives are not sustainable, do not contribute to farmer empowerment and undermine participatory decision-making, farmer experimentation and empowerment of marginal groups (Hinchcliffe *et al.* 1995; Steiner 1996; Hellin

and Schrader 2003). This discourse leads to the support of indirect incentives that create an enabling environment, such as secure access to land, markets, agricultural inputs, access to professional extension services and education (Almekinders 2002).

From an implementer's perspective, Vickerman (1998) claims that financial incentives can prove to be one of the more costly incentive types. However, the review on financial incentives is not unilateral, as other commentators support the use of fiscal incentives. Ferraro and Kiss (2002) maintains that the potential obstacles with implementing a direct payment system are equally valid for indirect schemes, if not more so. They argue that direct payments are generally more cost efficient and less institutionally complex.

Langholz (2000) found that non-financial incentives proved to be more effective than financial incentives in developing Private Wildlife Refuges in Costa Rica. However, this difference was shown to be only marginal. In a review of conservation policy in Costa Rica, Brocket and Gottfried (2002) acknowledged the importance of a cultural value system that can act as an incentive to encourage land stewardship. Bergsma (2000) recognises the importance of intangible incentives for farmers in both the developing and developed world. Van Kooten and Schmitz (1992) acknowledge the importance of intangible incentives through moral suasion; however, they emphasize the need for financial incentives to effectively motivate landowner behaviour. In national reviews of possible conservation incentives (for example Australia, Young *et al.* 1996; New Zealand, Clough 2000; USA NGO, Vickerman 1998; USA NGO, Defenders of Wildlife 2002), the use of a wide array of incentive types is acknowledged and emphasized.

Research into the behaviour of farmers suggests that both economic and non-economic factors influence farmers' decisions to incorporate conservation-related practises onto their farms (Beedell and Rehman 1999; Traoré *et al.* 2000; Illukpitiya 2004; Plieninger *et al.* 2004). Government policy macro-economics play a critical role in influencing land use decisions (Sanders and Cahill 1999), yet farming practises are also strongly influenced by cultural and social factors (Curtis and Lockwood 1998; Community Solutions 2000; Briggs 2001). This suggests that incentive programmes may need to take into account financial as well as non-financial and intangible factors.

This research attempts to contribute to the debate surrounding the most effective suite of incentives, by determining whether landowners respond better to the concept of financial incentives, or prefer non-financial incentives. Similar research was conducted by Winter (2003), in attempting to determine the type of incentive that landowners preferred in the highly fragmented renosterveld lowlands of the Western Cape, South Africa.

This study is therefore conducted at two levels. At an academic level, it assesses the acceptability of different incentive types to landowners. It particularly evaluates their preference for financial incentives only, versus their preference for a suite of financial and non-financial incentives. At a management level, it seeks to identify the suite of incentives and design of incentive programme that will be most effective to motivate conservation behaviour within the lower reaches of the Fish Kowie Corridor, and to develop a set of guidelines for the application of an incentive programme.

1.3 AIMS

This study was undertaken to answer two key questions:

1. What role can incentives play in mitigating the pressures of land transformation and alien invader plants on the thicket biome on private land?
2. What are the characteristics of an incentive programme that would most effectively achieve this?

As the major private land use within the study area is commercial farming (see Chapter Two), this study dealt specifically with private, commercial farmers. Two major pressures are focused on, namely land transformation and degradation agricultural practises (cropping and overgrazing), and the spread of alien invasive plants. These pressures are further explained in Chapter Two.

Land transformation is a major pressure on thicket (Lloyd *et al.* 2002; DEAET 2003b; DEAET 2004), particularly as thicket appears to be unable to regenerate once severely degraded (Midgley and Cowling 1993; Stuart-Hill and Aucamp 1993; Kerley *et al.* 1995; Fabricius *et al.* 2002; Fabricius *et al.* 2003; Lechmere-Oertel *et al.* 2005c). With the high cost of purchasing land, as well as the opportunity cost of setting aside land strictly for conservation, innovative alternatives to formal protected areas need to be found to mitigate the pressure of land transformation and degradation on thicket (Knight and Cowling 2003). Suitable incentives present an effective tool for addressing pressures on the natural environment on privately owned

land (van Kooten and Schmitz 1992; Clark and Downes 1999; Anon. 2003; Boody *et al*. 2005; Langholz *et al.* 2000).

Alien invasive plants (AIPs) pose a global problem of significant proportion (Ewel *et al.* 1999; Millennium Ecosystem Assessment 2005a; 2005b). Within South Africa, AIPs are thought to be the single biggest threat to plant and animal biodiversity (Versveld *et al.* 1998; Le Maitre *et al.* 2004; Macdonald 2004; van Wilgen *et al. 2*004; DWAF 2005). The thicket biome, made more vulnerable by the disturbance of natural vegetation, is infested by a number of AIP species (Lloyd *et al.* 2002; Cowling *et al.* 2003). Human actions and activities play critical roles in facilitating the invasion of AIPs. Effective solutions to this pressure will only be found with an understanding of the inappropriate actions and behaviours, and where and how to intervene to change them (Le Maitre *et al.* 2004). There is a glaring gap in the literature on the use of incentives to encourage the clearing of alien invasive plants.

1.4 OBJECTIVES

The following objectives were identified to achieve the aims of the study. These objectives provided the framework for the research:

- Determine the major pressures and the root causes of these pressures acting on biodiversity in the thicket biome
- Identify the strategies to counter these pressures
- Determine the land use practises within the study area
- Determine landowner activities, opinions, needs and barriers to pro-conservation behavior.
- Identify suitable incentive types to mitigate against the pressures
- Develop recommendations for suitable incentive programmes to offer the suitable incentives to landowners
- Determine whether there is a significant relationship between farmer or farm characteristics and farmer receptiveness to incentives and different incentive types.

1.5 STRUCTURE OF THESIS

The following chapter (Chapter Two) provides a descriptive overview of the study area, with a specific focus on the thicket biome, as well as documenting the landowner and land unit characteristics within the study area, based on data obtained during the interview stage. Chapter Three details the methods used in this study.

Chapters Four and Five present the main body of data and relevant discussion. Chapter Four focuses on the use of incentives to secure land for conservation, identifying barriers to securing land and preferred incentives identified by landowners. Chapter Five focuses on the use of incentives to induce the control of alien invasive plants on private land, once again identifying landowner barriers to clearing alien invader plants, and identifying effective incentives to encourage invasive alien plant clearing on private land. Chapter Six presents the final discussion on the use of incentives to mitigate pressures on thicket within the lower reaches of the Fish Kowie Corridor, providing guidelines for the development and implementation of an incentive programme.

CHAPTER TWO
STUDY AREA

2.1 INTRODUCTION

This chapter describes the socio-demographic, agricultural and ecological characteristics of the Eastern Cape Province, the thicket biome, and more specifically the study area. It outlines some of the major pressures on thicket and demonstrates the importance of the protection of the biome. The chapter assesses the extent of privately owned commercial agricultural land in the province and in the thicket biome, illustrating the considerable influence that private landowners can have on contributing to the conservation of the thicket biome. Finally, it outlines the characteristics of landowners and land units within the study area, based largely on data obtained from landowner interviews.

2.2 DELINEATION OF THE STUDY AREA

The study area falls within the Makana and Ndlambe local municipalities in the Eastern Cape Province. Covering a total of 301 952 ha, it falls across the lower reaches of the STEP Fish Kowie Corridor identified as an area of high importance for conservation intervention (Cowling *et al.* 2003). The study area is bounded in the south by the Indian Ocean, the Great Fish River in the east and north, and the R343 road in the west (Fig 2.2). The Great Fish River was used as a boundary as it marks the transition from predominantly private land to communal land within this part of the Eastern Cape (Nel and Davies 1999) (see section 2.5.2 for further explanation).

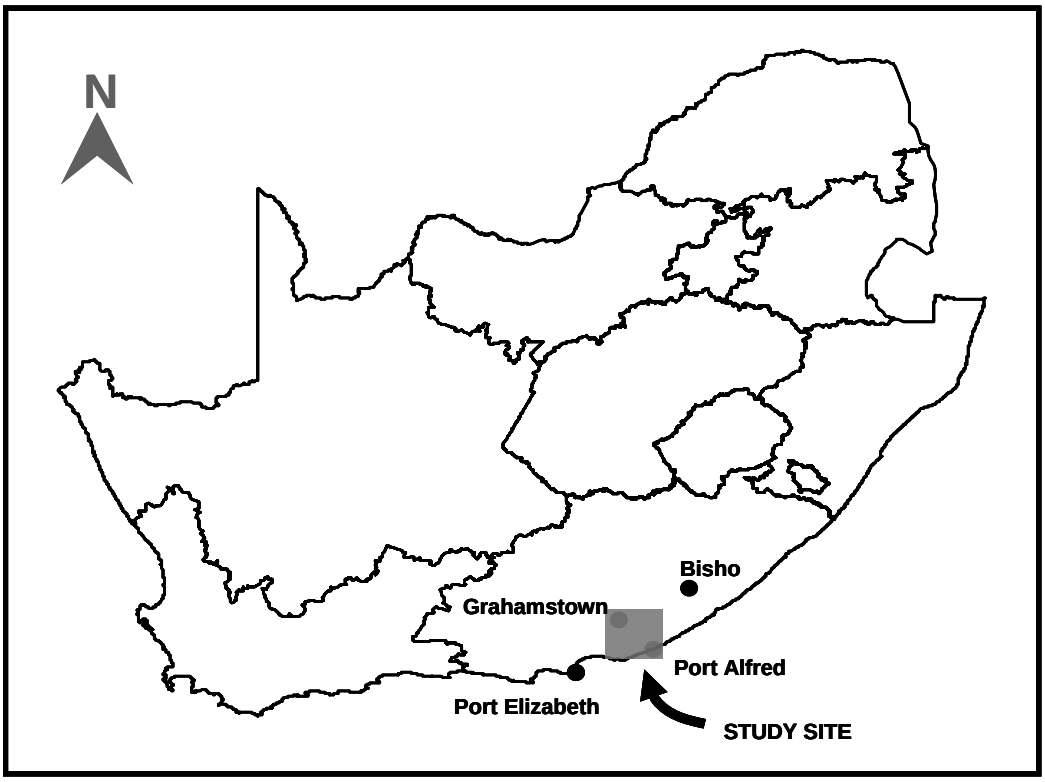


Figure 2.1 Study area location within South Africa

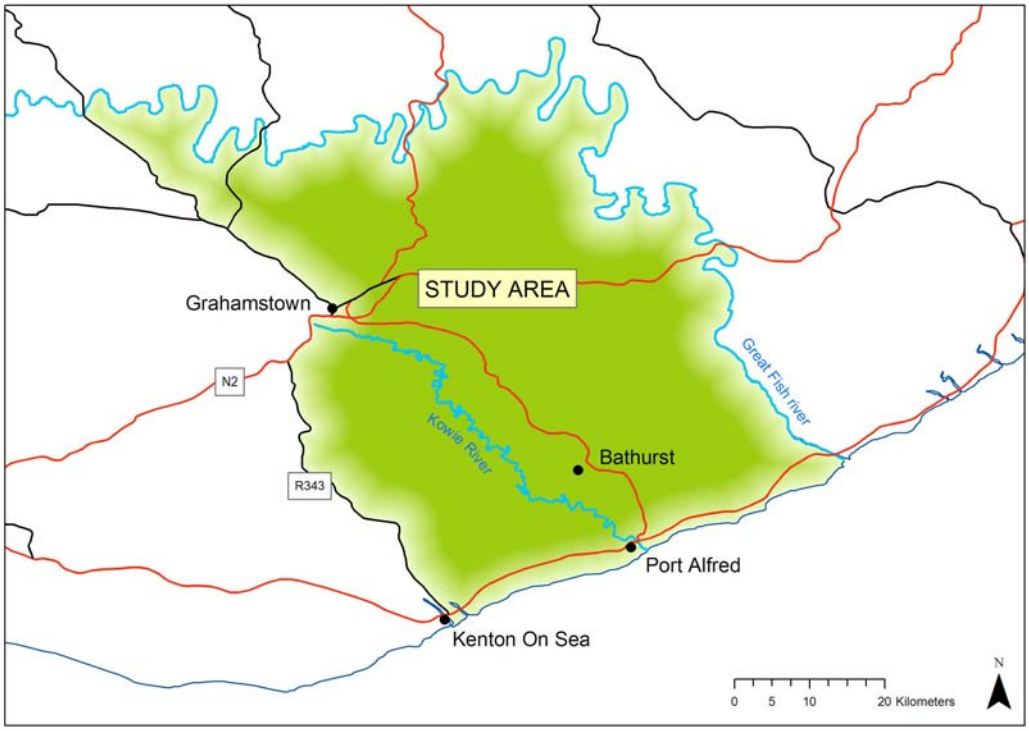


Figure 2.2 Study area

2.3 EASTERN CAPE PROVINCE

2.3.1 Socio-economic factors

The Eastern Cape, the second largest province in South Africa, lies on the south eastern seaboard, flanked by four of the nation's other provinces. Covering an area of 169 580 km^2, it makes up 13.9% of the South Africa's total area (Statistics South Africa 2003). The Eastern Cape had a population of 6.4 million in 2001, representing 14% of the total South African population (Statistics South Africa 2003). In terms of average monthly household expenditure, the Eastern Cape is the poorest of the nine provinces (Statistics South Africa 2003). The three prominent languages are IsiXhosa, Afrikaans and English, with English being the spoken language of business. Incorporating two of the country's previous homelands or Bantustans, the population is made up of 88% African; 7% Coloured; 5% White and 0.3% Indian/Asian (Statistics South Africa 2003).

Land tenure in the Eastern Cape falls into three categories: state ownership, private ownership and communal land. Private land ownership makes up the majority of the land – 66.5% in total. Communal land makes up 29.5% and the remaining 4% is under state ownership (CSIR 2000). The government is currently implementing a land reform programme, based on which government is to enable the transformation of 30% of white owned land to black ownership by 2014 (DLA 2005).

2.3.2 Land use

Agriculture in the Eastern Cape

Commercial agriculture in the Eastern Cape, as in the rest of the country, has enjoyed generations of state support as well as access to extensive tracts of lands, infrastructure and services (Nel and Davies 1999). This has resulted in agricultural areas dominated by large, extensive farms, often several hundred to thousand hectares in extent, with very low population densities and a reasonable degree of agricultural productivity (Nel and Davies 1999). Agriculture in the province is based predominantly on the rearing of livestock, with limited cultivation being practised in areas that are better watered or with access to irrigation (Nel and Davies 1999).

The agricultural industry in the Eastern Cape has suffered from recurring drought (Nel and Davies 1999), rural depopulation and a decline in the commercial value of animal products, such as wool and mohair. This has resulted in a diminished agricultural purchasing power, and has affected employment and the region's economy, which is heavily reliant on agriculture (Nel and Hill 1997; Statistics South

Africa 2003; Eastern Cape Business Information Service 2001). Furthermore, the last ten years has seen a significant withdrawal of state support of commercial farmers, with subsidies and agricultural extension services being severely diminished (ABSA 2003). One of the responses to this has been a conversion from traditional agriculture to game farming (ABSA 2003).

Game hunting has been practised on farms in the Eastern Cape for generations (Turpie 2003). A variety of game species occur naturally in thicket, and the recreational hunting of indigenous species such as kudu, bushbuck and springbuck have all been popular pursuits on private stock and crop farms (ABSA 2003; Turpie 2003). More recently, however, the increased demand for game products and ecotourism facilities, added to diminishing support for agricultural enterprises and increasing stock theft (ABSA 2003), have led a number of small stock farmers diversifying into game as a viable economic venture. In some areas, an increasing number of stock farms are being converted entirely to game farms, focusing on the local and international tourism industry (Castley *et al.* 2001; ABSA 2003). This shift in land use, driven by ecological, economic and political factors, is becoming increasingly attractive to commercial farmers, who are either able to make the transition themselves, or are selling their farms to overseas investors (ABSA 2003; Turpie 2003).

It has been hypothesised that, as indigenous game function well in intact thicket, game farming has the potential to safeguard this ecosystem, and possibly even drive the recovery or rehabilitation of degraded thicket (Turpie 2003). However, this view has received some criticism (Tainton 1999; Castley *et al.* 2001). The basis for the counter argument is the influence of the motivating reason for developing a game farm. Tainton (1999) points out that a game farm manager is driven by production-related considerations, while a nature conservation manager works within a paradigm of maintaining and improving biological diversity and natural ecological processes (Castley *et al.* 2001). Game farms may be subject to overstocking or poor veld management, as in the case of stock farms. Furthermore, there is concern over the extent of exotic and extralimital game on game farms (Green and Rothstein 1998; Castley *et al.* 2001). However, the effect on ecosystem structure and functioning of stocking game farms with extralimital species such as fallow deer, giraffe, impala, lechwe, nyala, white rhinos, sable antelope, waterbuck and blue wildebeest is not known.

2.3.3 Biodiversity in the Eastern Cape

The Eastern Cape is the only province with seven of South Africa's eight biomes: - Forest; Fynbos; Grassland; Nama-karoo; Savanna; Succulent Karoo and Thicket (DEAET 2003b). It also has the largest number of vegetation types (twenty-eight), as classified by Low and Rebelo (1996). Five centres of endemism fall within the Eastern Cape, namely the Albany, the Cape Floristic region, the Succulent Karoo, the Pondoland and the Drakensberg (van Wyk and Smith 2001). Of these, the Albany Centre of Endemism is the largest, extending almost 9 million hectares across the province (Low and Rebelo 1996; DEAET 2003b). The province also includes parts of three internationally recognized hotspots – the Cape Floristic region, the Succulent Karoo and the Maputaland-Pondoland-Albany region (Mittermeier 2005).

2.4 THE SUBTROPICAL THICKET BIOME AND STEP

Extending from the eastern Western Cape through to KwaZulu-Natal, subtropical thicket is found predominantly in the Eastern Cape (Low & Rebelo 1996). This biome covers an area of close to 42 000 km^2 in the Eastern and Western Cape Provinces, most markedly in river valleys (Vlok *et al.* 2003). In the field of conservation planning, STEP (Subtropical Thicket Ecosystem Programme) has become synonymous with the subtropical thicket biome (see Box 1 Chapter One). The STEP planning domain covers an area of 116 574.82 km^2 (Lloyd *et al.* 2002), and is centred on the thicket biome, although it includes sections of thicket's neighbouring biomes (see Chapter One for more information on STEP).

The thicket biome has historically not been recognised as a distinct biome, but was previously believed to be a transitional interface between a number of different vegetation types, namely subtropical forest, Afromontane forest, fynbos, Karoo and grassland (Cowling 1984; Lubke *et al.* 1986; Everard 1987; Low and Rebelo 1998). Various portions of the biome have been described as scrub forest, savannah encroached by bushclumps, and even a tall scrubby type of fynbos, and has long been known as Valley Bushveld (Acocks 1953; Fabricius *et al.* 2003). Formal recognition of Subtropical Thicket as a distinct biome in the botanical literature only occurred recently (Low and Rebelo 1998). It is currently believed that the biome, rather than being a transitional state between biomes that share many of its characteristic species, is in fact the precursor of its surrounding biomes, and is of Palaeogene origin (Cowling *et al.* 2005). Mosaic thicket occurs where thicket vegetation is interspersed with the vegetation of other biomes (Vlok *et al.* 2003).

Presenting highly diverse floristic and structural characteristics, the thicket biome in its pristine condition exists as an impenetrable evergreen closed shrubland or a low forest, consisting of sclerophyllous or succulent trees, shrubs and vines (Vlok *et al.* 2003*;* Cowling *et al.* 2005*).* It often consists of a network of inter-connected bush-clumps (Fabricius *et al.* 2002). In certain areas, the biome presents a matrix vegetation resembling adjoining biomes (Vlok *et al.* 2003). Unlike the forest biome, thicket does not possess easily identifiable strata, and is dissimilar to the neighbouring savanna biome by its lack of conspicuous herbaceous or grassy groundcover except, in some types, during abnormally high rainfall years (Low and Rebelo 1998).

Over 1 550 plant species have been recorded within the biome, of which around 20% are endemic (Vlok *et al.* 2003). Disturbance processes, such as herbivory, floods, drought and fire, all play a major role in the formation and functioning of thicket. Animal/plant interactions are hypothesised to be a major force in generating and maintaining the high floristic diversity of the biome (Kerley *et al.* 1995). Many species exhibit pronounced spinescence, thought to be a result of extended herbivory on the vegetation (Vlok *et al.* 2003). *Portulacaria afra* (Spekboom) is a crucial and dominant species in many thicket types, providing a service in resisting droughts and floods, and providing a reliable source of fodder for wildlife and livestock (Stuart-Hill 1991; Vlok and Euston-Brown 2002).

2.4.1 Conservation Status of Thicket

As the majority of bioregional, particularly spatial research on thicket has been conducted within the STEP planning domain, this section will deal only with thicket and thicket mosaic within the STEP planning domain.

Within the STEP planning domain, Type 1 protected areas (Table 2.1) make up 7% of the total landcover (4 571 km^2), and are dominated by provincial protected areas. Type 2 protected areas, which are dominated by conservancies, make up 9% (6 919 km^2), while Type 3 protected areas, primarily game farms, occupy 3% (2 690 km^2) (Lombard *et al.* 2003).

As the conservation legislation of Type 2 and 3 protected areas (Table 2.1) is weak or non-existent (Lombard *et al.* 2003), there is no guarantee of their persistence. Furthermore, the current degree of protection of natural fauna and flora in some of

these areas may be questionable (Tainton 1999; Castley *et al.* 2001). This leaves effectively only 7% formally protected.

Table 2.1 STEP Classification of protected areas (Lombard *et al.* 2003)

Type 1 protected areas	Protected area owned and run by State, Province or local authority
Type 2 protected areas	Pubic or private land managed for conservation and other land uses. Conservation legislation is weak or non-existent (Lombard *et al.* 2003)
Type 3 protected areas	Areas potentially available for conservation, owing to the existence of a structure for communication between conservation planners and landowners (Lombard *et al.* 2003)

2.4.2 Pressures on Thicket

In order to identify incentives to encourage the protection of habitats outside formal protected areas, it is crucial to understand the pressures on that habitat. Suitable incentives can then be designed to address each pressure (Young *et al.* 1996; Botha 2001). Many of these pressures on thicket are linked to commercial agriculture within the biome.

Parts of the thicket biome have undergone some of the most striking degradation of all South Africa's biomes (Cowling *et al.* 2003). Furthermore, thicket has a slow recovery rate and low resilience, and can require hundreds of years to regenerate once it has been severely degraded (Midgley and Cowling 1993; Stuart-Hill and Aucamp 1993; Kerley *et al.* 1995; Fabricius *et al.* 2002; Fabricius *et al.* 2003).

The structure, floristic composition and function of the thicket biome are affected by a variety of pressures, associated with subsistence and commercial agriculture, urban development; livelihood use; and mining. Table 2.2 represents the major pressures on thicket, drawn from Lloyd *et al.* (2002); Cowling *et al.* (2003); DEAET (2003b) and Lombard *et al.* (2003).

Table 2.2 Pressures on thicket divided between agricultural pressures and other pressures

Pressures on Thicket related to:	
Commercial agriculture pressures (excluding plantations)	**Pressures not related to commercial agriculture**

- cultivation
- grazing
- invasive alien species
- encroachment of karroid shrubs
- fire
- clearing along fence lines
- predator culling
- harmful chemicals
- urbanisation and rural settlements
- mining
- fuel-wood and medicinal plant collecting
- aforestation and timber plantations

Within the STEP planning domain of 116 574.82 km^2, the 43 970.88 km^2 of thicket (covering 37.71% of the planning domain) can be categorised as “pristine”, “moderately degraded” or “severely degraded” using remote sensing, spatial modeling and expert knowledge. The remainder of the planning domain consists of other biomes. Of the 37.71%, 4.11% was pristine, 10.85% was moderately degraded and 22.75% severely degraded as determined by degradation mapping based on remote sensing data (Lloyd *et al.* 2002). In terms of land transformation, agriculture, urbanization, aforestation and alien invasive plants have transformed some 16% of the planning domain, cultivated land having the greatest impact (Lloyd *et al.* 2002).

More specifically, commercial agriculture and pastoralism have the capacity to play a large role in land transformation in thicket (Lloyd *et al.* 2002; DEAET 2003b; Cowling *et al.* 2003). Large tracts of land within the biome have been converted to grazing land or crops. Furthermore, certain agricultural practises such as problem animal control and the use of chemicals have additional negative impacts on the natural environment (DEAET 2003b; DEAET 2004).

The two major pressures on thicket, land transformation and alien invasive plants, are discussed in detail below. Following this, a brief overview of the remaining pressures on thicket, as described by the STEP planning process, is provided.

2.4.2.1 Land transformation

Crop cultivation

Crop cultivation has a significantly large impact on the natural environment. With this form of land use, the diverse cover and composition of the natural vegetation is conventionally replaced by a small number of domesticated species (Hoffman 1997). Poor management can result in soil damage, soil degradation and subsequent erosion. Harmful pesticides and herbicides are transported in water run-off (Hoffman

1997; DEAET 2003b). With the bulk of high yield land already transformed, future expansion of croplands in South Africa will increasingly encroach on economically and ecologically marginal environments where yields will be lower and environmental impacts, such as wind and water erosion, are likely to be greater (Hoffman 1997). Within the STEP planning domain, cultivated land was shown to make the highest contribution to land transformation (4.6%) (Lloyd *et al.* 2002). Currently, the only form of management over this land transformation is a permit system. Farmers are required to obtain a permit from the national Department of Agriculture to convert land from grazing to crops. The issuing of this permit is dependent on the expected impact on soil and water but not biodiversity (NDA 2003).

Land degradation through overgrazing

The thicket biome has long been a pastoral region, supporting both large and small stock (Beinart 2003; NDA 2004). In 1994, 90% of the non-conserved thicket was used for goat farming (Moolman and Cowling 1994). For many decades, it was well accepted among small stock farmers in thicket that the more 'open' form of thicket was more productive than the dense form, which provided a more suitable habitat for ticks (*Ixodidea*) and was inaccessible to livestock. As a result, dense vegetation was "opened up", via heavy grazing or mechanical clearing until the late 1960s in order to make it more accessible (Fabricius *et al.* 2003).

Overgrazing, particularly by goats, results in a decrease in the perennial cover, which is replaced by an ephemeral component (Hoffman and Cowling 1990; Stuart-Hill and Aucamp 1993). In overgrazed thicket, most of the available herbage is removed, leaving only the bare stems of the shrubs. This occurs to a height of around 1.5 m (Aucamp 1976). The tree and tall shrub component is browsed into umbrella-like forms, altering the structure of the vegetation (Hoffman and Everard 1987). Beneath these altered bushclumps, the germination micro-climates are significantly changed, and new seedlings are unable to germinate (Hoffman and Everard 1987; Fabricius *et al.* unpublished). The Karroid components of the vegetation tend to dominate in this altered environment (Hoffman and Everard 1987; Tainton 1999). Once degradation has occurred, low resilience and long recovery times result in the effectively irreversible damage to the system (Hoffman and Cowling 1990; Fabricius *et al.* 2002; Lloyd *et al.* 2002; Lechmere-Oertel *et al.* 2005a, 2005b, 2005c; Mills *et al.* 2005).

Some areas within the biome have been severely degraded by both stock and game farming (Kerley 1995; Fabricius *et al.* 2002; Lloyd *et al.* 2002; Cowling *et al.* 2003).

Within solid thicket vegetation types, 40% (800 0000 ha) has been severely degraded and 36% (750 000ha) has been moderately degraded by overgrazing (Lombard *et al*. 2003).

2.4.2.2 Alien Invasive Plants (AIPs)

On a global scale, the naturalisation and spread of alien invader species pose a threat to native biodiversity second only to habitat loss (Ewel *et al.* 1999). Within South Africa, AIPs are thought to be the single biggest threat to plant and animal biodiversity (Versveld *et al.* 1998; Le Maitre *et al.* 2004; Macdonald 2004; van Wilgen *et al. 2*004; DWAF 2005). Some 10 million hectares of land in South African have been infested by AIPs, these originating from South, Central and North America; Australia; Europe and Asia (DWAF 2005). The damage caused by AIPs is vast, including reduced water supply and quality; damage to rivers, dams and estuaries; reduced ability to farm; erosion; intensification of natural disasters such as flooding and fires; and mass extinction of indigenous plants and animals (Versveld *et al.* 1998; DWAF 2005).

The thicket biome, made more vulnerable by the disturbance of natural vegetation, is infested by a number of AIP species (Lloyd *et al.* 2002; Cowling *et al.* 2003). The mesic sections of the thicket biome are subject to the invasion of woody species such as *Acacia mearnsii* (black wattle)*, A. longifolia* (long leafed wattle)*, A. saligna* (Port Jackson) and *Psidium guava,* which tend to colonise disturbed thicket patches. Some of these species, introduced for the establishment of woodlots or plantations, have proliferated into the adjacent natural vegetation. The xeric portions of the biome are subject to the invasion of more drought tolerant alien species, such as *Opuntia* spp (prickly pear, jointed cactus), *Agave* spp (sisal) and *Atriplex* spp. (saltbush) (Lloyd *et al.* 2002).

As signatory to the Convention on Biodiversity (1992), South Africa is obliged to control or eradicate AIPs (DWAF 2005). In response to this, Working for Water was established as a public sector institution by the Department of Water Affairs and Forestry in 1995 with a two-fold mission – to combat AIPs, and contribute to the provision of employment in the country (DWAF 2005).

At the local level, the Albany Working for Water programme is being implemented within the study area. This site intervention is in the upper catchment of the Kowie and Kariega rivers (33º18’1S; 26º31’E), covering an area of 11 400 ha. Alien plant

cover in this site was estimated at 5.1 to 10%, consisting primarily of *Acacia mearnsii* (black wattle)*, A. longifolia*, *Hakea spp.* and *Eucalyptus spp*. (Hosking and du Preez 2002).

Private landowners are under legal obligation to control AIPs on their land. The laws pertaining to this are the common law relating to neighbours and nuisance; Section 151(1) of the National Water Act 36 of 1998; Section 28 of the National Environmental Management Act, 107 of 1998; Section 31A of the Environment Conservation Act, 73 of 1989; Municipal by-laws; the National Veld and Forest Fire Act 101 of 1989; and regulations in terms of the Conservation of Agricultural Resources Act, 43 of 1983 (DWAF 2005). Working for Water has been given the mandate and legal power to implement legal regulatory incentives to uphold these laws. Until now, this mechanism has seldom been put into use (C. Marais pers comm. 2005).

2.4.2.3 Other pressures on thicket

Indigenous woody plant invasion

Indigenous woody shrub encroachment, primarily the result of domestic herbivory, ploughing and reduction in fire frequency, can cause serious degradation in thicket (Lloyd *et al.* 2002; Vlok and Euston-Brown 2002). *Acacia karroo*, *Rhus pallens* and *Scutia myrtina* are evident in large tracts of post-disturbance land throughout the biome. Pastoralists consider woody plant invasion to be detrimental to farming, as it decreases grazing for their stock. Attempts to control the encroachment include clear felling, burning followed by intensive browsing by goats, and chemical control (Trollope 1974; Lloyd *et al.* 2002).

Fire

Fire is often utilised in the management of thicket's neighbouring biomes – Fynbos and Grassland (Trollope 1974; Tainton 1999). However, thicket edges are being damaged by frequent, hot fires, often as the result of excessive and injudicious burning (Lloyd *et al.* 2002). Coastal dune thicket is particularly susceptible to fire (Lloyd *et al.* 2002).

Clearing along fence lines

Dense thicket is often cleared in a wide strip along fence lines in order to aid access to the fence for repairs (Lloyd *et al.* 2002).

Culling of problem animals

A large number of potential livestock predators have been, and continue to be, exterminated in order to protect livestock from the perceived threat. These include Lions (*Panthera leo*); Leopards (*Panthera pardus*); African Wild Dogs (*Lycaon pictus*); Spotted Hyaena (*Crocuta crocuta*); Brown Hyaena (*Hyaena brunnea*); Servil (*Felis serval*); Cheetah (*Acinonyx jabutas)* and Black-backed Jackal (*Canis mesomelas*) (Knight and Cowling 2003). Many of these predators, such as Lion, Wild Dogs, Cheetah and Hyaena have been exterminated to the extent of local or regional extinction (Skead 1987; Knight and Cowling 2003). While these predators pose little threat to crops, natural herbivores and omnivores have been targeted for the protection of various crops. These include baboons (*Papio cynocephalus ursinus*) and bushpig (*Potamochoerus porcus*).

Agricultural chemicals

Commercial agriculture has long utilised a variety of chemicals to aid and encourage product growth, often to the detriment of the natural environment (DEAET 2003b). Dips, pesticides, herbicides and fertilizers used on stock and crops often have a much further reaching impact than the desired target.

2.5 CHARACTERISTICS OF STUDY AREA

2.5.1 Socio-Economics

Major towns in the study area are Grahamstown, Port Alfred and Bathurst (Fig 2.2). The Makana and Ndlambe local municipalities have growing populations, with the largest age group being 20 to 24 years of age. Africans represent the major population group (78%), followed by white (12%), coloured (9%) and Indian (1%). Only 16% of the adult population has completed high school, and 9% have completed a higher education course beyond secondary school (Statistics South Africa 2001). Over 40% of the population within the two local municipalities are not economically active, and only 32% are formally employed. Fifty two percent of the working population earn below R801 a month. The major industries providing employment in the municipalities are community, social and personal services (26% of employed population); agriculture, hunting, forestry and fishing (16%); private households (16%) and wholesale and retail trade (12%) (Statistics South Africa 2001).

2.5.2 History

The study area falls within an area that saw great conflict between the European colonisers and the Xhosa nation. The nine frontier wars were fought here between 1779 and 1878. In an attempt to create a buffer zone between the British colony in the Cape and the Xhosa people who were moving south, Britain provided passage and incentives for citizens to leave England to settle in the Albany District, now informally known as “Settler Country” (Mostert 1992; Beinart 2003). The first wave of these immigrants landed in 1820, and they were completely unprepared for the hardships that the new country offered. However, many became successful farmers, settling around Port Alfred, Bathurst and Grahamstown (Beinart 2003). Many farmers within the study area are direct descendants of these setters, with the sixth and seventh generation of these families currently taking over the farms of their forefathers (Appendix V).

Up until 1994 the Great Fish River formed the boundary between the Republic of South Africa and the Republic of Ciskei, one of four Apartheid homeland or Bantustans. At the fall of the Apartheid, the Ciskei, along with the larger Transkei Bantustan, was amalgamated into the newly created Eastern Cape Province (Nel and Davies 1999).

2.5.3 Natural Characteristics

The land rises from sea level to a maximum height of 535 m around Grahamstown. Mean annual rainfall ranges between 500 and 600 mm (ECSECC 2003), although rainfall is highly variable temporally, and tails off rapidly away from the coast (Nel and Davies 1999). Major rivers in the area are the Great Fish River (the western boundary of the study area) and the Kowie River. The climate is temperate, being semi-arid inland, and becoming more mesic along the coast (Nel and Davies 1999). Poor shallow soils predominate (Nel and Davies 1999; Fabricius *et al*. 2003), although the river valleys in which thicket predominates have well-drained, deep, lime-rich, sandy loams derived from the Karoo Supergroup inland and the Cape Supergroup on the coastal plain (Low and Rebelo 1996).

2.5.4 The Fish Kowie Corridor and land transformation

The study area covers the lower reaches of the Fish Kowie Corridor, described in section 2.4. Ninety percent of the Fish Kowie Corridor is made up of thicket biome (Cowling *et al*. 2003). The corridor captures both the north-south lowland gradients as well as the east-west macroclimatic gradients along the escarpment (Cowling *et*

al. 2003). Covering an area of 3685.59 km^2, 14.35% of the Fish Kowie Corridor falls under Type 1 protected areas, with 15.6% Type 2 and 3 protected areas (Cowling *et al.* 2003). Much of the land has been degraded by overgrazing, with 31.33% degraded, and 3.77% transformed (Cowling *et al.* 2003).

GIS analysis of untransformed land

The study area covers 301 952 ha, the majority of which is rural, comprising natural ecosystems (298 032 ha) (Table 2.3). According to a GIS analysis, 10.4% of the land within the study area has been transformed (Table 2.3 and Table 2.4). With a further 0.04% of the surface area within the study area consisting of water bodies, the remaining 89.6% of the land within the study area supports untransformed vegetation (this includes non-thicket, thicket mosaic and solid thicket vegetation, see Table 2.3). On excluding settlements and protected areas from the study area, 9.6% of the remaining land (with can be assumed to be predominantly used for commercial agriculture) is transformed land (Table 2.4).

Table 2.3 Extent of transformed land per biome within study area

	Hectares	**Percentage of total study area**
Study area: total area	301 952	100%
Transformed land: Non-thicket	2 204.5	0.7%
Transformed land: Thicket mosaic	12 151.3	4%
Transformed land: Thicket solid	16 952.8	5.6%
Transformed land: ALL Thicket	29 104.1	9.6%
Transformed land: ALL vegetation	31 308.6	10.4%
Water	127.0	0.04%

Table 2.4 Extent of transformed land per land use in study area

	Total Area	**Transformed Area**	**Percentage transformed land**
Study area	301 952.3	31 435.6	10.4%
Settlements	3 920.5	2 628.4	67%?
STEP Protected areas (Types 1, 2 and 3)	60 205.1	5 877.6	9.8%
Sum of settlements and protected areas	64 125.6	8 506.0	13.3%
Remaining land (predominantly agricultural land)	237 826.4	22 929.6	9.6%

2.5.5 Farm and farmer characteristics

The farm and farmer characteristics presented in this chapter are drawn from Phase One and Phase Two. The study area covers 580 parent farm parcels (the original

designated farm units) (Surveyor General Office, Department of Land Affairs 2004). Small stock pastoralism predominates in the drier areas north of Grahamstown, in particular Angora and Boer goats. South of Grahamstown, where rainfall is higher, dryland crops (pineapple, chicory and vegetables) are combined with beef cattle pastoralism (Nel and Davies 1999; Turpie 2003). The area around Bathurst is the centre of pineapple farming in the Eastern Cape (Appendix III).

In investigating farmer income generators, only on-farm income generators were considered. This excluded supplementary income not derived from the farm on which the landowner lived, or any other piece of land that was rented for farming. Dry-land crops are the major generator of income for farmers within the study area (Table 2.5). Approximately 44.7% of the farmers derived the majority of their income from crop farming, and 36.8% from stock farming. Two farmers sourced the majority of income equally from two sources (both were stock and off farm jobs), and five fell into the "Other" category. These landowners sourced the majority of their income from game (one), tunnel farming (one), fish farming (two) and tourism (one) (Table 2.6). This shows that the majority of the commercial farmers are willing to diversify in their income generating practises. However they tend to diversify among different agricultural enterprises rather than combining agricultural income generators with non-agricultural income generators.

Table 2.5 Farmer frequency and percentage of the major income generator and land use on farms in the study area

	Crop	**Stock**	**Mixed**	**Other**	**Fallow**
Major income generator for farmer					
Frequency	17	14	2	5	N/A
Percentage	44.74	36.84	5.26	13.16	N/A
Major land use for farmer					
Frequency	5	24	5	1	3
Percentage	13.16	63.16	13.16	02.63	7.89

Table 2.6 On-farm income generators and the frequency with which they occur on farms within sample group

Income generator	Frequency
Stock Large	31
Dryland crop	21
Stock small	14
Game	8
Irrigated crop	7
Fish farming	3
Land leased out for agriculture	2
Tourism (excluding hunting)	2
Furniture making	1
Horse stud	1
Plant nursery	1
Taxidermy	1
Transport business	1
Tunnel farming	1

The grazing of small stock consumes cumulatively the largest portion of land (Table 2.5). The major land use on the majority (63.2%) of the farms was stock farming, followed by crop (13.2%) and mixed (13.2%) (equal amounts of land dedicated to two different land uses) (Appendix V).

The bulk of farmers within the study area are English speaking, middle-aged males (Appendix V). They have been farming all their lives, and most come from several generations of farming families (Appendix V). There is a preference for organised agriculture, as many belong to their local farmers association, and are members of conservancies. Decisions regarding the management of the farm are made by the farmer, sometimes in consultation with his immediate family, but are never made by or shared with anyone outside of the immediate family (Appendix V).

Although half of the farmers interviewed indicated that they would be willing to sell their farm “for the right price”, only one farm out of thirty eight was on the market (Appendix V). Farm prices in the region do not reflect the agricultural productivity or agricultural potential of the land, but are inflated to reflect the value of game farms, which are able to yield a higher return, and are often subsidised by developers (ABSA 2003). Farmers can therefore not purchase more land at the current market price with the hope of farming it sustainably (Appendix III). The indication by farmers that they would be willing to sell “at the right price” reflects that the farmers may be, essentially, waiting for a developer to offer to buy their farm, with the intention of converting it to a game farm.

The farmers in the study area profess to value the natural environment, through statements supporting the value of biodiversity and the importance of conservation (Appendix VI). However, the land use decisions and actions of farmers indicate that they are profit driven and make decisions based largely on agricultural productivity (Appendix V).

The next chapter (Chapter Three) discusses the methods used for this research, and the following two chapters discuss the specific role that incentives can play in mitigating pressures on thicket; Chapter Four focuses on the pressure of land transformation and Chapter Five on alien invasive plants. The final chapter, Chapter Six, presents recommendations for implementing an incentive programme suitable for the study area.

CHAPTER THREE
METHODS

3.1 OVERVIEW OF RESEARCH METHODS

In considering and designing conservation incentives, two broad approaches have been used. One approach considers incentives from the perspective of the implementing agency, and takes into account factors such as the ease of implementation, the cost, and possibly the effectiveness of different incentive programmes (McNeely 1988; Young *et al.* 1996; Clough 2000; Doremus 2003). Such studies generally take the form of collating the possible options that have been used in the past (often restricted to the country within which the study is being done) and occasionally go on to evaluate the options based on specified criteria (Clough 2000; Doremus 2003).

The second approach is to consider incentives from the perspective of the target stakeholder group, in this case the private landowner. This approach is grounded in the knowledge that an incentive programme can only be successful if it is accepted by the landowner, and addresses the landowner's particular needs and wants (Bergsma 2000; May *et al.* 2002; Bekele and Drake 2003; Doremus 2003; Langholz *et al.* 2000). With this approach, research is often conducted once an incentive programme has been in operation for a number of years, and focuses on the landowners' actions and opinions towards land management, conservation and the particular incentive programme. In these studies, the landowners party to the incentive programme as well as those choosing not to be involved are surveyed (Falconer 2000; Langholz *et al.* 2000; Bekele and Drake 2003; Bieling 2004; Illukpitiya and Gopalakrishnan 2004). Some studies have been conducted before the inception of an incentive programme, either to inform the design of the programme, or to determine whether a programme would be accepted in the area (Amigues *et al.* 2002, Moore and Renton 2002; Winter *et al.* 2005).

Studies that follow the second approach rely largely on attitudinal surveys or interviews to obtain data (Kline *et al.* 2000; Amiques *et al.* 2002; Bekele and Drake 2003; Illukpitiya and Gopalakrishnan 2004). At times, socio-economic data on the landowner, as well as information on the land unit are also collected in an attempt to explain landowner attitudes or behaviour (Kline *et al.* 2000; Amiques *et al.* 2002; Bekele and Drake 2003; Illukpitiya and Gopalakrishnan 2004). Socio-economic factors that influence the efficacy or otherwise of incentives include farmers'

biographical profiles, financial situations and land management strategies, as well as contextual factors such as farm characteristics. External factors such as technical support and credit availability also play a role in determining whether incentives are effective (Table 3.1). Methods used to collect this information include mail surveys followed by personal interviews (Moore and Renton 2002), questionnaires to investigate landowners' willingness to accept (WTA) compensation (a form of contingent valuation) for setting aside land for conservation (Amigues *et al.* 2002), and personal interviews to develop indexes to measure conservation attitudes (Winter *et al.* 2005).

Although not directly linked to designing an incentive programme, numerous studies have been conducted on landowner attitudes towards conservation related issues or practises (Traoré *et al.* 2000; Beedell and Rehman 1999; Plieninger *et al.* 2004; van Gossum *et al.* 2005). These studies were also used to provide guidance in developing an approach to investigating the use of incentives with landowners.

The importance of understanding attitude in predicting behaviour has long been recognised. A well accepted model for explaining this relationship is the Theory of Planned Behaviour (TPB), first developed as the Theory of Reasoned Action by Ajzen and Fishbein (1980), and modified by Ajzen in 1991 and 1992 (Ajzen 1991; Ajzen and Driver 1992). According to this theory, actual behaviour can be explained by behavioural intentions. This behavioural intention is causally preceded by the attitude towards the specific behaviour, how the actor perceives his peer group to be acting (the 'subjective norm') and how the actor perceives the ease or difficulty of the actions expected of him (the 'behavioural control') (Ajzen 1991; Karpinnen 2005).

Based on this theory, one can postulate that understanding a landowner's *intention* to act will help to predict his actual behaviour. The TPB has been applied by Beedell and Rehman 1999; Bieling (2004); Burton (2004); Karpinnen (2005) and van Gossum *et al.* (2005) in predicting or explaining landowner action, although it has been modified somewhat in various studies. For example, Karpinnen (2005) extended the model to include "external factors" such as landowner demographics, objectives of forest ownership and past experience. Bieling (2004) applied a socio-psychological behavioural model that combined the TPB with the "cultural theory" and the "modernisation theory".

Despite the benefits of personal interviews, attitudinal surveys with landowners have predominantly taken the form of mail surveys (Traoré 2000; Beedell and Rehman 1999; Amigues *et al.* 2002; Plieninger *et al.* 2004), although Beedell and Rehman (1999) conducted 53 semi-structured personal interviews in a pilot study prior to constructing the mailed questionnaire. Kline *et al.* (2000) conducted telephonic interviews using professional telephonic interviewers. The general favouring of mail surveys as a survey methodology is due at least partly to financial and time constraints presented by personal interviews (Bourque and Fielder 1995).

In studies with a stronger economic approach, econometric models have been used to explain landowner behaviour (Beach *et al.* 2005). Another economic approach has been to investigate landowner willingness to pay (WTP) for conservation (White *et al.* 2001; Illukpitiya and Gopalakrishnan 2004) or willingness to accept (WTA) compensation for conservation (Kline *et al.* 2000; Amiques *et al.* 2002). Both WTA and WTP are contingent valuation (CV) methods (Field 2001). The CV method relies upon landowner attitude and stated valuation of a good, and therefore can be included in the larger grouping of attitudinal studies. However, this approach relies on an analysis of a monetary value placed on a good, rather than a stated preference of one good (unvalued) over another.

Table 3.1 Studies investigating relationships between landowner or land characteristics and conservation practises on private land

Land owner biographical information	**Shown to be significant in the incorporation of conservation practises**	**Shown to be insignificant in the incorporation of conservation practises**
Age	Kline *et al.* 2000; Amiques *et al.* 2002; Winter 2003; Plieninger *et al.* 2004	Illukitiya and Gopalakrishnan 2004; Bekele and Drake 2003
Education	Kline *et al.* 2000; Illukitiya and Gopalakrishnan 2004; Traoré *et al.* 2000	Amiques *et al.* 2002; Winter 2003; Plieninger *et al.* 2004
Years of farming experience	Traoré *et al.* 2000; Illukitiya and Gopalakrishnan 2004	Traoré *et al.*2000
Number of generations of owning the land	Plieninger *et al.* 2004	
Membership and participation in govt farm programmes		Traoré *et al.* 2000
Land tenure arrangements	Plieninger *et al* 2004	Traoré *et al.* 2000

Financial considerations		
Total Income	Amiques *et al.* 2002	Kline *et al.* 2000
Relative amount of income derived from farm	Kline *et al.* 2000	
Existence of off farm income	Illukitiya and Gopalakrishnan 2004	
Level of debt	Illukitiya and Gopalakrishnan 2004	
Land management considerations		
Land management objectives	Kline *et al.* 2002	
Natural resource use	Plieninger *et al. 2004*	
Type of livestock		Bekele and Drake 2003
Type of crop		Bekele and Drake 2003
Number years farming plot of land		Bekele and Drake 2003
Plan to harvest forest (in the case of forest owners)		Kline *et al.* 2000
Landowner not farming land		Kline *et al.* 2000
Landholding per economically active person within household	Bekele and Drake 2003	
Participation of women in farming activities		Bekele and Drake 2003
Farm characteristics		
Land use	Kline *et al.* 2000	
Farm size	Bekele and Drake 2003	Traoré *et al.* 2000; Amiques *et al.* 2002
Slope of plot	Bekele and Drake 2003	
Plot soil type		Bekele and Drake 2003
Extent of natural vegetation on land	Winter 2003	
External factors		
Availability and access to suitable information	Traoré *et al.* 2000; Bekele and Drake 2003	
Availability of credit	Illukitiya and Gopalakrishnan 2004	Bekele and Drake 2003

Support for initial investment in programme	Bekele and Drake 2003

3.2 FROM THEORY TO PRACTISE: RESEARCH METHODS USED IN THIS STUDY

This dissertation considers incentives from the landowners' perspective. As no incentive programme was operating in the area at the time of the study, landowner attitudes and attributes were investigated, in order to inform a new incentive programme. The Theory of Planned Behaviour formed the basis for predicting landowners' expected behaviour, using their attitudes as a predictor.

Economic models were not used in this study to predict behaviour, as it was felt that economic models are incomplete in their explanation of human behaviour, as they are not able to take into account the important effect of socio-psychological factors. Madson (2003) found that with regard to conservation issues, landowners did not operate as economically rational actors. Kaplan (2000) supported the sentiment that the "economic man" explanation of an individual is too extreme and narrow in focus.

The research was conducted in three parts: a literature survey; phase one, consisting of interviews and workshops; and phase two, consisting of farmer interviews, which was piloted on seven individuals (Figure 3.1).

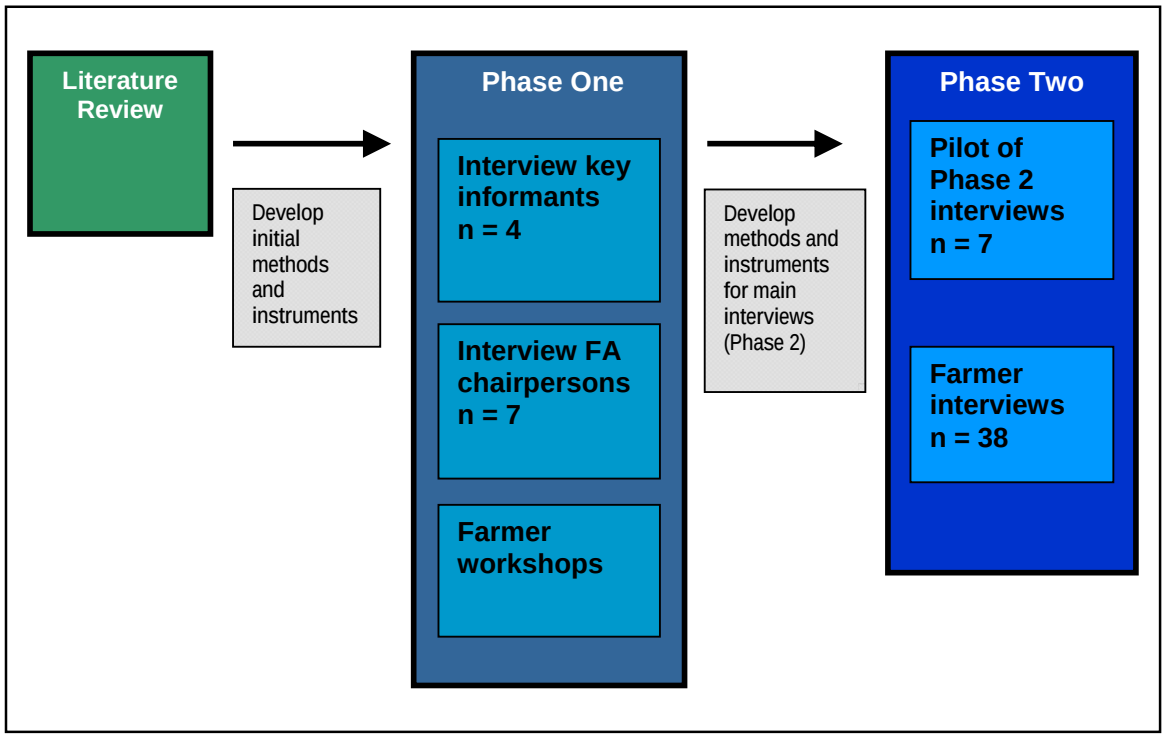


Figure 3.1 Schematic flow of research steps (FA = farmers association)

3.2.1 Phase One

The aim of phase one was to obtain a general impression of land use patterns and practises in the study area, to achieve a better understanding of the nature and causes of pressures on thicket, and to gain provisional insights into farmer attitudes on various agricultural pressures on thicket and conservation. The purpose of phase one was to provide an initial data set for subjective interpretation, to inform and guide the second phase. In investigating landowner attitudes, Beedell and Rehman (1999) conducted initial personal interviews before a more extensive mail survey was carried out. Van Gossum *et al.* (2005) conducted an initial survey with experts on forest management to inform the development of a more extensive interview schedule with actual forest owners.

3.2.1.1 Subtropical Thicket Ecosystem Planning (STEP) workshops

The pilot phase time frame coincided with two farmer workshops held by STEP (see Box 1 Chapter 1) and these were incorporated into the pilot phase.

Two workshops were held under the auspices of STEP to inform local farmers of the STEP project, and to open a dialogue between STEP practitioners and local landowners and land use decision makers. The half day workshops took place in

Grahamstown and Somerset East (north of the study area) on consecutive week days. Local farmers were informed of the workshop in advance through their local farmers associations.

The Grahamstown workshop was attended by 28 individuals, the majority of whom were local farmers. The Somerset East workshop was attended by only seven local people, five of whom were commercial farmers and farmer's wives, one representative of a communal farm, and a conservation extension officer. Although the group was significantly smaller than expected, this seemed to facilitate a good deal of discussion that did not occur at the Grahamstown workshop.

The author attended the workshops to observe and record responses and issues raised by participating farmers. These findings contributed to the development of the pilot questionnaire.

3.2.1.2 Individual Key Interviews

Informants enable researchers to construct a picture of not only the interviewee, but also the group that they represent (Babbie and Mouton 2001; Moore and Renton 2002). Key individuals included four key informants who were knowledgeable about conservation and farming in the study area, and the chairs of seven Farmers Associations (Table 3.2). The author also interviewed four government and public entity officials, the Chairpersons of the six Farmers Associations that covered the study area, as well as one chairperson of the Farmers League (one tier above Farmers Association) as key informants.

All of the above interviewees were initially contacted telephonically or via email to make an appointment and interviews were conducted at their place of work. The interviews were semi-structured and open-ended to allow for exploring particular issues that arose (Bourque and Fielder 1995; Gillham 2000). The duration of the interviews ranged from 30 min to 60 min.

3.2.1.3 Interview Questions: Key informants (non-farmers association chairpersons)

The four interviewees were asked questions that dealt specifically with their expertise, enabling the interviewer to develop a better understanding of the environment in which farmers operated. The specific focus of each interview is presented in Table 3.2.

Table 3.2 Key informants interviewed in Pilot Phase

Name	Affiliation	Focus of interview
Dave Murray	Pineapple Research Farm in Bathurst	Nature of pineapple farming in South Africa; pineapple farming in the Bathurst area; the pineapple market; pressures experienced by local pineapple farmers
Quintus Hahndiek	Manager for the Settlers Sub-Region, Environmental Affairs, Department of Economic Affairs, Environment and Tourism (Eastern Province)	Pressures of agriculture on subtropical thicket; conservancies in the Settlers sub-region
Xolani Mkutshulwa	Bathurst agricultural extension officer	Information on land use; the extent of particular land uses; information on land units; the corresponding landowners and their contact details
Patrick Nelani	Grahamstown agricultural extension officer	Information on land use; the extent of particular land uses; information on land units; the corresponding landowners and their contact details
Raymond Schenk	Albany and Bathurst Farmers League chairperson	Information on farmers and farming practises within the Farmers Association area
Colin Stirk	Bathurst West Farmers Association chairperson	
Rob White	Carlisle Bridge Farmers Association chairperson	
Merrick Clayton	Eastern Border Farmers Association chairperson	
Dick Palmer	Koonap Farmers Association chairperson	
Gloria Oxenham	Lower Albany and Bathurst Border Farmers Association chairperson	
Rodney Austin	Central Albany Farmers Association chairperson	

3.2.1.4 Survey design and data collection: FA Chairperson Interviews

The choice of conducting personal interviews with the chairpersons of local farmers associations (as opposed to telephonic, postal or electronic) was made for two reasons. Firstly, some of the concepts discussed in the interview were unfamiliar to the interviewees, and required a level of explanation that would not be possible in a mail or e-mailed survey (Rosnow and Rosenthal 1999). Secondly, it allowed the interviewer to establish a rapport with interviewees and develop trust (Rosnow and Rosenthal 1999).

The interviews were conducted at the interviewees' place of work, or in Grahamstown, according to the interviewee's preference. The interviews were semi-structured to allow for exploring particular issues that arose during the interview in more detail through discussion (Gillham 2000) (See Appendix I for the Farmers Association representative interview schedule). The pilot study made use of a combination of open-ended, closed-ended, Likert scale questions and cue cards (Appendix II). The cue cards were used to illustrate the concept of heterogeneity and homogeneity among landowners. Winter (2003) utilised cue cards with landowners in her attitudinal research in order to "break the monotony" of her interviews. In this study, they were used to illustrate a concept that was difficult to explain to the interviewee. The interview questions were predominantly explanatory or descriptive, and contingency questions were incorporated (Babbie and Mouton 2001). The pilot interviews lasted between 30 and 120 minutes, depending on the need for explanation and the amount of discussion following a question, particularly open-ended questions.

The interviews with the Farmers Association Chairs sought descriptive information on general characteristics of the farmers within the interviewees' Farmers Association area. These included major land use practises, the existence of conservancies as defined by the Eastern Cape Department of Economic Affairs, Environment and Tourism (DEAET 2003a), and membership to Farmers Associations. Furthermore, the issue of pressures felt by farmers was investigated, as well as their opinions towards conservation issues.

An open-ended question was used to obtain information on pressures felt by farmers, thus enabling the interviewee to discuss any issues he/she felt to be of particular importance. Once the interviewee had covered all the points they regarded as important, the interviewer raised a number of issues that had emerged as general problems encountered by farmers, highlighted by farmers at the STEP workshops and the key informants. These issues were raised with the farmers to determine whether their concerns concurred with the STEP workshop participants'. Conservation incentive literature suggests that, to be of any value, incentives must address the specific needs of the targeted farmers (Botha 2001; Langholz *et al.* 2000). Additional general issues raised by the interviewer for discussion, provided they had not already been raised by the farmer, were:

- Agricultural markets and the impact these had on farmers;

- Agricultural extension services and the support that government provided to farmers, including access to information;
- Farm security with regard to stock theft, poaching and the perceived threat of land invasion;
- Personal security of the farmer and immediate family living on the farm; and
- The new municipal rates bill that is soon to be implemented in the farming area.

Environmental issues

The interviewee's opinion was obtained on the general attitude of the farmers within his/her Farmers Association area on various local environmental pressures. These issues were alien invader plants; pesticides; problem animals; soil conservation and biodiversity conservation.

Alien invader plants, the use of pesticides and eradicating problem animals have all been highlighted as agricultural pressures on thicket (Lloyd *et al.* 2002; Cowling *et al.* 2003; DEAET 2003b; Lombard *et al.* 2003). Conservation incentive literature suggests that each pressure and its root cause must be isolated and addressed by at least one incentive (McNeely 1988; Young *et al.* 1996), and it is important to determine whether these pressures are also perceived as problems by farmers or not. Similarly, it is necessary to understand farmer's stance on soil conservation and biodiversity conservation, as farmer attitudes play crucial roles in the effectiveness of conservation incentive programmes (Winter 2003; van Kooten and Schmitz 1992).

The methods and tools for Phase Two were developed after a qualitative analysis of Phase One (see Appendix III for the Phase One report). The research in Phase One revealed a number of factors that were useful in designing the methods of Phase Two. While Winter (2003) found it necessary to avoid months that were considered to be 'too busy' for farmers within her study area, Phase One revealed that farmers within this study area did not experience a specific 'busy' time of year in their farming activities. An aversion to mail surveys among farmers reinforced the choice of personal interviews as the data collection method. Also, when arranging farm interviews, apart from obtaining directions to the farm, it was important to determine how to gain entry onto the farm and whether there was cell phone reception (in the event that the interviewer got lost or delayed on the way to the farm, and for security reasons).

It was originally thought that the research would be conducted in two study areas with different land uses, in order to make a comparison between farmer choices in the two areas. However, Phase One showed that there was a diversity of land use within the commercial farming community in the Phase One study area, as well as multiple land uses on individual farm units. It was therefore felt that it would be difficult and possibly inappropriate to delineate two distinct study areas based on farming practises, as originally envisaged. Furthermore, viewing the area as one study area rather than two allowed for a larger number of farmers to be sampled within the study area.

The analysis of Phase One results assisted with the development of a list of suitable incentives to present to interviewees in Phase Two. This was based on landowner activities and attitudes revealed in the Phase One.

3.2.2 Phase Two

3.2.2.1 Sample selection

In sample selection, the landowners were both the sampling unit (i.e. landowners' names were selected, rather than land unit) as well as the observational unit. In situations where data on land units rather than landowners were more readily available or possibly more applicable, the land unit was the sampling unit, while the landowner remained the observational unit (Winter 2003). In this research, the study area fell within the Fish Kowie Corridor planning domain (see Study Area section), and as a result STEP had already compiled a database of all rural landowners within the Megaconservancy Network, with corresponding farm names and contact details. This database unfortunately excluded the contact details of Fish Kowie Corridor landowners around Cookhouse and Somerset East and they were therefore not included in the sample. Landowners were randomly selected (Babbie and Mouton 2001) from the STEP database.

Data on landowners from Port Alfred, Bathurst and Grahamstown were extracted from the database and copied to a Microsoft Excel © spreadsheet. The pooled number of entries totaled 235. Using the RANDOM tool in Excel ©, a unique and random number between 1 and 235 was assigned to each entry. The entries were then sorted by number, and the first 38 entries were selected for inclusion in the sample. However, once the contacting of potential interviewees got underway, a

number of entries were found to be unsuitable, mainly because the land was not used for commercial agriculture and these data sets were removed from the list.

Once the sample group was selected, telephone calls were made to determine whether they were practising commercial farmers, introduce the author, briefly explain the research and set up an interview. If the landowner was suitable and willing to be interviewed, an appointment was made either on the landowner's farm or in a nearby town frequented by the landowner.

3.2.2.2 Survey design

The structured interview combined qualitative and quantitative questions (Bourque and Fielder 1995; Babbie and Mouton 2001), but was primarily quantitative in nature to allow for statistical analysis (Babbie and Mouton 2001). The majority of the questions were closed-ended, Likert statements or ranking, with few open-ended questions (Bourque and Fielder 1995; Babbie and Mouton 2001). Contingency questions, i.e. "if you answered yes, explain why…" were also utilised (Babbie and Mouton 2001). The survey was designed to gather information on farmer, farm and farm management characteristics; farmer attitudes towards conservation; attitude and behavior regarding particular conservation related issues, in particular land transformation; alien invasive plant clearing and environmental management plans; and attitude towards potential incentive programmes and incentive types. This required a combination of explanatory, descriptive, causal and predictive questions in the interview (Babbie and Mouton 2001). The detailed second phase interview schedule is presented in Appendix IV.

The interview schedule for phase two was piloted on seven farmers, in order to reveal problems and make amendments where necessary (Rosnow and Rosenthal 1999; Gillham 2000). As a result, minor changes were made to the wording and explanation of some questions.

3.2.2.3 Interview questions

The interview schedule (Appendix IV) was designed to obtain information on:

- Landowner characteristics
- Farm characteristics
- Farm management characteristics
- Farmers' attitudes towards conservation

- Farmers' attitudes and actions around particular conservation related issues, i.e. land transformation and alien invasive plant clearing
- Attitude towards potential incentives programmes and incentive types.

Section A: Landowner information

The landowner's full name, farm name and contact details were obtained. Beyond that, a range of information on farmer, farm and farm management characteristics was collected, in order to determine whether any of these characteristics was correlated to the landowner's choice of incentive types. The person(s) responsible for strategic management and for short term management, respectively, of the farm was determined in order to understand who the target audience would be for an incentive programme. Demographic information on age group, gender and first language was gathered. It was determined whether the interviewee belonged to the local Farmers Association, and if so, how their membership benefited them. This information would assist with developing an effective communication network between farmers and implementing agencies. It was also ascertained how many generations of farmers the interviewee came from.

Two factors that could be considered potential indicators of landowner response to conservation, but were not investigated here, were income and education. It was felt that total income was a potentially sensitive issue, and was therefore avoided. However, other factors relating to income were investigated, such as number of income generating practises the farmer was involved in, as well as the particular type of income generating practisethat the farmer derived the majority of his income from. Level of education was also felt by the author to be a potentially sensitive issue, which could influence a farmer's attitude towards being interviewed by an "educated" student. Findings on the relevance of education in incentives vary in their correlation or causative relationship with conservation practise. Amiques *et al.* (2002) (France); Winter (2003) (South Africa) and Plieninger *et al.* (2004) (Spain) found education to be insignificant, while Kline *et al.* (2000) (USA) and Traoré *et al.* (2000) (Canada) found education to have a statistically significant effect on landowner adoption of conservation practises. Illukpitiya and Gopalakrishnan (2004) (Sri Lanka) found education to be significant, but in their case education did not refer to the level of formal education, but rather local knowledge of soil and soil management practises.

Section B: Land management and land unit information

Section B of the interview focused on the land unit. Information was gathered on the number of years the interviewee had been farming his/her particular farm and the size of the property. The different land uses were then determined, with the corresponding area (ha) per land use, percentage contribution to income per land use, and the number of years each particular land use had been practised.

Landowner membership of a conservancy was determined, and the name of the relevant conservancy. Conservancies can play a role in conservation, as in the Eastern Cape; conservancies are required to develop and adhere to a management plan, part of which includes environmental concerns (Hahndiek, pers comm.) The interviewee was also asked if there was any tourism initiative on the farm, and what the nature of this was. Eco-tourism and some forms of hunting can play a role in providing economic benefits from conservation (Anon 2000; Wunder 2000; Turpie 2003).

Finally, the interviewee was asked whether he/she was planning to sell the farm in the short term (five years). The pilot phase revealed that in certain rural areas there were a significant number of farm sales, which have resulted in the conversion of stock farms to game farms. The basis of the incentive approach was to determine what the farmer wants, and attempt to provide this in return for a desired action or non-action. It would therefore be important to determine whether the landowner truly wanted to sell the farm or not. This will also become important in designing an incentive contract. Should there be a high probability of the landowner selling the farm, it would be important to tie the incentive agreement to the title deeds rather than to the landowner (Young *et al.* 1996).

Section C: Attitudes and specific environmental issues

Section C dealt with specific environmental issues, and attempted to determine the interviewee's attitude towards conservation and conservation related issues. Education and awareness, an important incentive type, relies on a conservation-related attitude, and requires the landowner to value the natural environment. For this reason, it is important to determine the landowner's current attitude towards conservation and the natural environment (Vickerman 1998; Curtis and De Lacy 1996; Botha 2001; Doremus 2003).

Issue 1: Land Transformation

Land transformation was investigated using two methods. Landowners were asked how much, if any, natural vegetation remained on their farm. Natural vegetation was described as vegetation that had not been removed or significantly disturbed (this included browsing or grazing by stock animals) for thirty years, and appeared to the landowner to be the original vegetation. This excluded, for example, land that had been overgrazed in the past and was now supporting species indicative of poor management, e.g. *Acacia karroo*. This question clearly provided a subjective answer, as both the farmer's perception of untransformed land, as well as his estimate of the extent of untransformed land, was subjective. For this reason, a geographic information system (GIS) analysis was conducted on the study area to verify the results of this question and help determine the extent of untransformed land (See section 3.2.4 for an explanation of the GIS exercise).

The landowner then categorised the majority of his/her untransformed land into one of four categories, based on his/her opinion of the land. These categories were: prime agricultural land; potential agriculture land (including grazing); marginal land for agriculture, and land that was of no use for agriculture. There was opportunity for the interviewee to explain his/her answer if necessary. Reasons for not transforming this land were determined, as well as any future plans for the land. Finally, the barriers to landowners setting aside more land for conservation were investigated through a close-ended question in tabular form. It was important to understand why landowners had untransformed land before recommending incentives to encourage its conservation. If untransformed land was primarily prime agricultural land, a significant financial incentive might be required. If the land was of no agricultural use or marginal, the opportunity cost of setting the land aside for conservation would be less, and therefore the required incentive may be less (Norton-Griffiths and Southey 1995).

Issue 2: Alien invader plants (AIPs)

The practiseof landowner control of alien invader plants, and the motivating reasons for this action, was investigated through open and closed-ended questions. Landowner attitudes towards various issues surrounding alien invader plants were investigated through a Likert statement question. The first question dealt with the landowners' perceived balance of the costs and benefits of AIP clearing. The second question focused the landowners' opinion on who carried the responsibility of the

cost of alien clearing. The third statement investigated the landowners' view on compensation for past AIP clearing. The fourth and final statement centred on the landowners' perceived inherent benefits of alien plant clearing. Attitude towards alien invasive plants and alien invasive plant control is expected to have a significant effect on the effectiveness of various incentive types (Vickerman 1998; Curtis and De Lacy 1998; Botha 2001; Doremus 2003).

Section D: Incentives

Landowner attitudes towards an incentive programme were established through a closed-ended binary question. If the landowner showed a negative response, the interview was concluded. If the landowner showed a positive response, attitude towards various incentive types was investigated in a contingency question. A list of incentives pertaining to both pressures was presented to the landowner. For the pressure of land transformation, the landowner was provided with a list of eight incentives aimed at inducing the landowner to set aside untransformed land for conservation. These incentives were:

1. Assistance with the management of the tracts of natural land
2. Tax deductions (other than the municipal land tax)
3. Municipal rate rebates
4. Information on managing natural tracts of land, indigenous plants and animals
5. Green-branding for marketing farm products as eco-friendly
6. Law enforcement such as controlling snaring, monitoring of squatting
7. A green award system making public recognition of farmer's effort towards conservation
8. Tourism promotion such as ecotourism advertisements made on the farmer's behalf

For mitigating the pressure of AIPs, the landowner was provided with a list of nine incentives designed to induce the control of AIPs on their land. These incentives were:

1. Technical advice and information on alien vegetation clearing
2. Assistance with marketing the secondary products such as charcoal and wood
3. Physical assistance with alien vegetation clearing such as labour or equipment
4. Enforcement of clearing on neighbouring land
5. The provision of subsidies on herbicides

6. Green branding for marketing farm products as eco-friendly
7. A subsidy on the labour component of alien clearing
8. A green award system making public recognition of farmer's efforts
9. Advice on legal compliance procedures with regard to AIP clearing

Each list also included the option of "wouldn't need any incentives" and "other". For each list, the respondent was required to point out their least favourite incentive, and rank the three most appealing incentives. A similar ranking technique for incentives was used by Winter (2003) in her thesis. Based on the three positive ranks, a "weighted positive" score was allocated to the incentives. The incentive ranked first received a weighting of three, the incentive ranked second received a weighting of two, and the incentive ranked third received a weighting of one.

An open-ended question was used to determine landowner willingness to accept compensation (WTA) in exchange for 10 percent of land being taken out of production. While there remains debate on the most effective question format in obtaining WTA, the open-ended format has been used with private landowners (Amiques *et al.* 2002), and is supported by Harrison (2002) in his critique of the NOAA (National Oceanic and Atmospheric Association) report[1] on Contingent Valuation (Arrow *et al.* 1993). Other methods involve an incentive-compatible (IC) open-ended question such as Vickrey auctions (Gregory and Furby 1987; Horowitz and McConnell 2000); bidding (Sullivan *et al.* 2003) and closed-ended questions (Kline *et al.* 2000).

While it is important to identify the type of incentives that appeal to landowners, it is equally important to offer these incentives in a programme that is acceptable to landowners (Young *et al.* 1996; Clough 2000; Falconer 2000; Botha 2001). Few studies on incentives have gone further to look into practical aspects of incentive programmes, such as suitable implementing agencies, an effective duration of an incentive contract or monitoring compliance. Winter's thesis (2003) investigated landowner attitude towards various implementing agencies, and towards different durations of contractual agreements.

For an incentive programme to be effective, it must be implemented by an agency that landowners are willing to work with (Doremus 2003). Landowner attitude toward

[1] The NOAA report, as it is commonly known, is widely used as the "rule-book" on conducting contingent valuation studies.

various government and non-government implementing agencies was investigated, with eight options being offered to the landowner (Appendix IV). For the purposes of this study, suitable agency was defined as one that is mandated to address conservation issues on private land (in the case of a government agency) or whose primary function lies in addressing conservation or natural resource issues (in the case of a non-government agency) and one that is acceptable by the target population. While capacity is another important factor, investigating the capability of organisations to implement stewardship programmes was considered to fall beyond the scope of this study. The agencies which farmers were asked to choose from were Eastern Cape Parks, Dept of Agriculture, Local Municipality, District Municipality, Provincial government (Department of Economic Affairs Environment and Tourism), National government, Non-government organisation (NGO), Local farmers group and "Other".

Other programme variables that were investigated included allowing an expert onto the farm to monitor compliance (as this would be necessary in a contractual agreement where real benefits accrued to the landowner), the preferred duration of a contractual incentive programme (also investigated by Langholz *et al.* (2000)), and at what phase of an incentive programme the landowner would prefer to join (i.e. in the initial stages or once the programme had been running for a number of years).

3.2.2.4 Data collection

The main surveys were conducted as personal interviews on the landowners' farms, or at pre-arranged meetings in the local town if this was more convenient for the interviewee.

For the purpose of this research, it was felt that a personally conducted interview would be the most appropriate form of data collection, as conducted by McDowell (1988), Moore and Renton (2002), Bekele and Drake (2003), Illukpitiya and Gopalakrishnan (2004) and Winter *et al.* (2005) in similar studies. The motivation for this was five-fold: firstly, some of the concepts discussed in the interview were unfamiliar to the farmers, and required effective explanation that would not be possible in a mail or emailed survey (Bourque and Fielder 1995; Rosnow and Rosenthal 1999). Secondly, it allowed the interviewer to establish a rapport with subjects and encourage trust (Rosnow and Rosenthal 1999). Thirdly, phase one had revealed a dislike among farmers for mail surveys (Oxenham pers comm. 2004). Fourthly, the survey was too long to be conducted telephonically (Babbie and Mouton

2001). Lastly, and arguably most importantly, the Fish Kowie Corridor has been highlighted as an area for developing a social network of stakeholders as part of a new approach to the implementation of conservation plans (Knight and Cowling 2003). This requires concerted efforts to build personal relationships with stakeholders. Therefore, the research was designed to be one of the initial steps in building a relationship with landowners and encourage a two-way flow of information.

The major trade-off with conducting personal interviews was the significant increase in required resources, particularly time and travel expenses, and the resultant reduced sample size (Rosnow and Rosenthal 1999; Babbie and Mouton 2001). While the small sample size was a disadvantage, the personal interviews allowed for a much more in-depth exploration of key issues, with a resulting richness of qualitative information. These insights proved to be extremely useful in the design of a practical incentive programme. Moore and Renton (2002), for example, conducted a survey on landowner needs, using a sample size of 27 and compensating for the small sample by conducting in-depth personal interviews, while Winter *et al.* (2005) used a sample of 36 to investigate landowner attitude and incentives.

The duration of interviews ranged from 45 minutes to 120 minutes, depending on the amount of time available to the landowner, the extent of discussion that various questions generated, and the need for contingency questions. The surveys were conducted between October and November 2004 and February to April 2005.

3.2.3 Statistical analysis

Given the predominantly categorical nature of the data and small sample size, the statistical analysis was limited to descriptive statistics (percentages and histograms for visual representation) and two-way Chi-square tests (contingency tables) (Fowler and Cohen 1992; Sprent, 1993; Gravetter and Wallnau 1995). All statistical tests were conducted in statistical package Statistica© version 7.

The descriptive statistics involved determining frequencies and percentages for the categorical data. The mean, standard deviation and variance were determined for continuous data sets.

Two-way Chi-square tests were conducted on a variety of variables to investigate significance of association. Both the existence of association and causation have been used in investigating the influence of landowner, land or land management

characteristics on a landowner's decision to incorporate conservation related practises on his land. Association (often in the form of a correlation test) is a non-directional hypothesis – establishing only that two variables are related by chance. Causation is when variable A is caused by variable B (in this case, variable A would be the dependent variable, and variable B the independent variable) (Sprent 1993). In investigating the presence of a relationship between characteristics and conservation practises, a test of association was used by Kline *et al.* (2000), Winter (2003); Plieninger *et al.* (2004), Illukpitiya and Gopalakrishnan (2004), and Bekele and Drake (2003), while Amiques *et al.* (2002) and Traoré *et al.* (2000) tested for causation. This study investigated the presence of association, as it was felt that the relationship between investigated characteristics and conservation practises was too complex to effectively test for causation. The issue of complexities influencing choice are discussed in Douglas (1985). As the data were nominal and non-parametric, the two-way Chi-square test was used to determine association between variables (Sprent 1993).

Two-way Chi-square tests determine whether the observed frequencies (counts) differ markedly from the frequencies that would be expected by chance (Sprent 1993). Observed frequencies are laid out in a contingency table, and the observed frequencies in each cell in the table are compared to the frequencies expected if there were no relationship between the two variables in the populations from which the sample is drawn. Chi-square therefore compares what actually happened to what hypothetically would have happened *ceteris parabis* – which is the null hypothesis. If the actual results are significantly different from the predicted null hypothesis results, the null hypothesis is rejected and a statistically significant relationship can be assumed between the variables (Sprent 1993).

As with all non-parametric tests, the two-way Chi-square test accepts weaker, less accurate data as input than parametric tests do (Levin 1999). Chi-square tests require the following data characteristics:

- The sample must be randomly drawn from the population;
- Data must be reported in raw frequencies;
- Measured variables must be independent;
- Values/categories on independent and dependent variables must be mutually exclusive and exhaustive; and

- Observed frequencies cannot be too small (predicted frequencies must be greater than 5).

For the Chi-square tests conducted in this research, the different incentive options were categorised into incentive types. For example, a labour subsidy incentive and a herbicide subsidy were both categorised as a financial incentive. In some cases, only one incentive option fell into a category, such as green award (a recognition incentive). A relationship was investigated between the incentive type ranked *first* by the landowner, and various characteristics pertaining to that landowner and their land.

In investigating preferred incentive types to motivate conservation of land, the incentive types *law enforcement*, *financial incentives* and *management assistance* were used. A relationship was investigated between the choice of these incentive types, and the following land and landowner characteristics:

- Income predominantly derived from crops
- Land use predominantly stock
- Farm part of a conservancy
- Farmer a member of local Farmers Association
- Extent of natural vegetation on farm less than 10 ha
- Attitude towards conservation responsibility
- Farmer age 45 or older
- Farmer not planning on selling farm within next five years
- Farm size smaller than 1 000 ha

In investigating preferred incentive types for clearing AIPs, only the incentive type *management assistance* was used. This was because of the strong preference for ranking management assistance first – no other incentive type had a high enough frequency to be used in a Chi-square test. A relationship was investigated between the incentive type *management assistance* and the characteristics shown below

- Income predominantly derived from crops
- Land use predominantly stock
- Farm part of a conservancy
- Farmer a member of local Farmers Association
- Farmer age 45 or older
- Farmer not planning on selling farm within next five years

- Farm size smaller than 1 000 ha

The Yates correction was applied on all tests, as it should be used for contingency tables that have exactly two rows and two columns (Sprent 1993). The Yates correction is conservative in the sense of making it more difficult to establish significance (Levin 1999). As with general practise, a probability of .05 or less was considered to be a significant difference.

3.2.4 Geographic Information System (GIS) Analysis

Using the ArcView© extension XTools, the data falling within the study area were extracted. STEP vegetation data were overlaid with the transformation data, as well as protected areas and settlements data. After changing the projection from decimal degrees to Transverse Mercator, the XTools extension was used to calculate the extent of transformed land in relation to biomes (based on STEP data), protected areas and settlements. The purpose of calculating transformed land in settlements and protected areas was to exclude this from the study area in an attempt to isolate transformed land on commercial farmland.

The GIS analysis was conducted to determine the extent of untransformed land within the study area, with the aim of comparing the data with information provided by interviewees. The analysis was conducted in ArcView©, using STEP vegetation data, transformation data, protected areas data, and Eastern Cape Socio-Economic Consultative Council. All STEP data was collected from 2000 to 2003, at a scale of 1:100 000, with the exception of the STEP transformation data, which was at a scale of 1:250 000.

The STEP **vegetation data** was made up of two sections – one being thicket vegetation (mapped in the field in 2002 by Vlok and Euston-Brown), and the other non-thicket vegetation using existing vegetation maps (see Vlok *et al.* 2003 for details).

Transformation data was derived from STEP landcover data (Lloyd *et al.* 2002). The transformation data represents the degree of vegetation transformation within the planning domain, and refers to the transformation of vegetation patterns (Lombard *et al.* 2003). Three classes were provided, these being transformed land (i.e. lost to agriculture or urban areas), extant (existing vegetation) in moderate condition, and extant land in good condition.

The **protected areas** data represents three types of protected areas, based on the level of conservation legislation pertaining to the land, and land ownership (Lombard *et al.* 2003). Type 1 protected areas are owned and run by the State, Province or a local authority, and enjoy strong conservation legislation. Type 2 protected areas are public or private land managed for conservation and other land uses. Here, conservation legislation is weak or non-existent. This category includes conservancies, natural heritage sites, state land, private nature reserves and RAMSAR sites. Type 3 protected areas are potentially available for conservation, owing to the existence of a structure for communication between conservation planners and landowners. These include game farms and proposed conservancies (Lombard *et al.* 2003).

3.3 CONCLUSION

The methods described above proved to be most effective in investigating the role of incentives in mitigating against major pressures on Thicket. Chapter Four presents the data relevant to curbing land transformation through the use of incentives, and Chapter Five presents the results relevant to motivating AIP control through the use of incentives.

CHAPTER FOUR

INVESTIGATING THE EFFECTIVENESS OF AN INCENTIVE PROGRAMME TO MITIGATE LAND TRANSFORMATION IN THE LOWER REACHES OF THE FISH KOWIE CORRIDOR

4.1 INTRODUCTION

This chapter focuses on land transformation and the use of incentives to encourage landowners to set aside land for conservation purposes on their farms. The methods used to obtain these results are discussed in Chapter Three. This information will be related to farmer and farm characteristics, as presented in Chapter Two (Study Area). These results are then discussed with relevance to other programmes and findings internationally.

Commercial farmers have been transforming land within the thicket biome for almost two centuries (Beinart 2003). Land transformation has been recognised as a major pressure on thicket (Lloyd *et al.* 2002; DEAET 2003b). Thicket's apparent inability to regenerate once severely degraded magnifies this pressure (Midgley and Cowling 1993; Stuart-Hill and Aucamp 1993; Kerley *et al.* 1995; Fabricius *et al.* 2002; Fabricius *et al.* 2003; Lechmere-Oertel *et al.* 2005c). Within the study area, the majority of landowners are commercial farmers (Chapter Two). Given the high cost of purchasing land and the opportunity cost of setting aside land strictly for conservation, it has been recognised that innovative ways need to be found to mitigate this pressure on thicket (Knight and Cowling 2003). Incentives have been recognised as an effective tool for addressing pressures on the natural environment on privately owned land, both internationally (van Kooten and Schmitz 1992; Clark and Downes 1999; Anon 2003; Boody *et al*. 2005; Langholz *et al.* 2000) and within South Africa (Baviaanskloof Mega-reserve Project Management Unit 2005; WBI 2006). Nationally, incentive programmes are currently underway in several areas, for example the Wine and Biodiversity Initiative (WBI 2006) and Baviaanskloof Mega-reserve Proud Partners initiative (Baviaanskloof Mega-reserve Project Management Unit 2005).

This chapter aims to answer two key questions:

1. Can incentives be used to motivate the conservation of untransformed thicket on commercial farms in the lower reaches of the Fish Kowie Corridor?
2. If so, what form should such an incentive programme take?

The findings are drawn from interviews with farmers within the study area, as well as research into the current institutional environment surrounding conservation issues on private land within the Eastern Cape Province.

4.2 RESULTS

4.2.1 Land transformation

Of the thirty eight interviewees, eight (21.1%) had no intact vegetation on their land. The extent of untransformed land on farm units ranged from 0 ha to 1 050 ha, with a mean of 145.3 ha and standard error of 40.7 ha. The percentage of untransformed land in relation to farm size ranged from 0% to 97.3%. Table 4.1 represents the descriptive statistical data for extent of natural vegetation on interviewee farms.

Table 4.1 Extent of natural vegetation on farm in hectares and as a percentage of total farm size

	Range	**Mean**	**Median**	**Standard deviation**
Actual area (Ha)	0 - 1050	145.3	28	250.8
Percentage	0.00 – 97.3	17.5	6.8	--

Farms that rely predominantly on cropping for income (this does not necessarily mean that the majority of the *land* is used for crop production) tended to have a higher percentage of untransformed land than farms providing a predominantly stock-based income. The average percentage of untransformed land on the crop farms was 20.7%, while the average percentage on stock farms was 8.2%. Similarly, farms where the major land use was crop had on average a higher percentage of untransformed land (25.7%) than farms with stock as the major land use (11.7%). “Untransformed land” on stock farms was defined as intact vegetation that was not grazed by stock animals.

Physical impracticalities were the major motivating reasons for the untransformed land not being utilised for agriculture (Table 4.2). The majority of the interviewees with untransformed land considered this land to be marginal or useless agricultural land (56.7%), with only 6.7% of landowners considering their untransformed land to be prime- or potential use agricultural land (Table 4.3). In describing the untransformed land, 56.7% of the interviewees explained that the majority of their

untransformed land was on slopes too steep for agriculture. Of the interviewees who owned untransformed land, 86.7% were planning to leave the land untransformed.

Table 4.2 Frequency of reasons for leaving land untransformed

	Physical	**Conservation**	**Farm Management**	**Financial**	**Other**
Major influence	19	7	7	2	0
Some influence	0	3	2	1	0
No influence	11	20	21	27	30

Table 4.3 Categorisation of untransformed land as prime or marginal, respectively, by landowners

	Prime or potential use	**Marginal or useless land**
Frequency	8	22
Percentage	26.7	73.3

Farmers claimed financial considerations to be the major reason for not conserving more land on their farms (Figure 4.1). This was followed closely by farm management considerations, i.e. conserving land did not fit into their farm management plans. Therefore, it appears that the major reason for the existence of currently untransformed land is because the land is physically impractical to use for agriculture, while farmers would not set aside any of their land that is currently under agriculture due primarily to financial considerations.

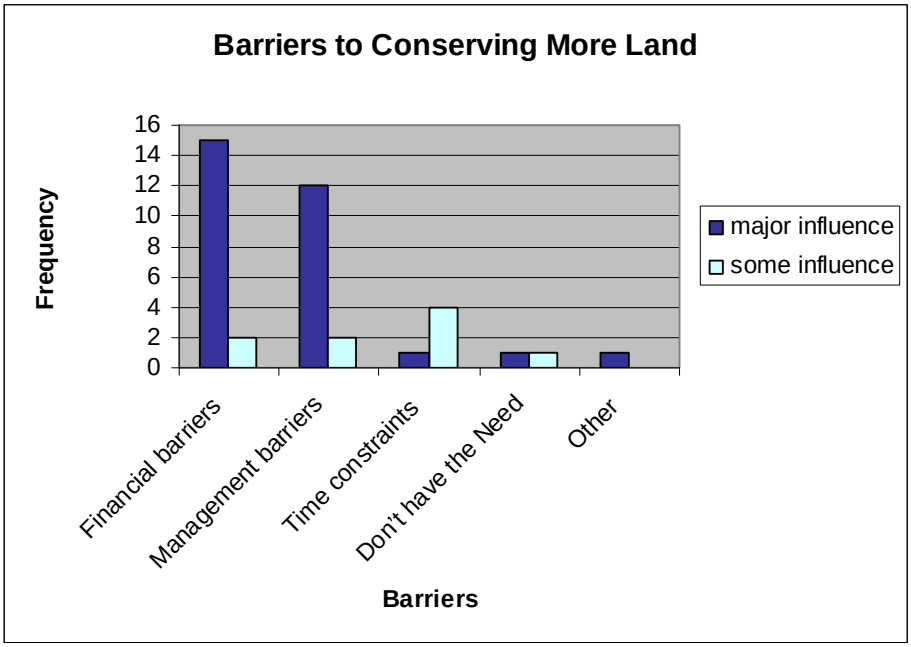


Figure 4.1 Farmer barriers to conserving more land, x axis represents barriers, y axis represents the frequency of selection by interviewees

4.2.2 Incentives to prevent land transformation

In this section, the sample size (n) varies between 33 and 38. This occurred as three interviewees did not show an interest in an incentive programme and were therefore exempt from the subsequent questions on incentives. Four interviewees were unsure, and therefore answered only some of the questions on incentives, according to what they felt comfortable answering. Due to this variation, the sample size shown below each table differs.

The majority of the interviewees, 81.6%, showed a positive response to a contractual incentive programme (Table 4.4).

Table 4.4 Farmers' willingness to join an incentive programme

	Yes	Unsure	No
Frequency	31	4	3
Percentage	81.6	10.5	7.9

n = 38

The majority of those who were willing to join an incentive programme preferred a contractual agreement with a duration of over ten years or more, with four interviewees indicating that they would willingly join in perpetuity (Table 4.5). Two

thirds (66.7%) felt that they would prefer to pioneer a project, i.e. join at project inception, rather than hanging back and waiting to see how the project worked before joining (Table 4.6). Three stated that they would not be interested in joining an incentive programme (this does not represent a lack of desire of these three interviewees to participate in the survey).

Table 4.5 Preferred duration of contractual agreement

	Short term: Less than 5 yrs	**Medium term: 5 -9 yrs**	**Long term: 10 yrs – in perpetuity**
Frequency	5	10	19
Percentage	14.71	29.41	55.88

n = 34

Table 4.6 Farmers' choice of joining an incentive programme at inception or later

	Join at programme inception	**Join later**
Frequency	22	11
Percentage	66.67	33.33

n = 33

Of the interviewees that answered yes or were unsure about an incentive programme, 91.4% (n=35) felt that they would allow an expert onto their farm to monitor compliance to an incentive programme (Table 4.7).

Table 4.7 Farmer response to monitoring of incentive programme

	Yes	**Unsure**	**No**
Frequency	32	3	0
Percentage	91.43	8.57	0

n = 35

Choice of implementing agency

Non-governmental agencies and local farmers groups proved to be the most favoured agencies for implementing an incentive programme. This was followed closely by Eastern Cape Parks, known by farmers by its former name, Eastern Cape Nature Conservation. District and Local municipalities were the least favoured agencies, followed closely by provincial government. The frequency of interviewee choices are depicted in Table 4.8 below.

Table 4.8 Frequency table representing landowner choice of implementing agency

Rank	Agency	Definitely	Possibly	No
1	Non-government organisation	30	4	2
1	Local farmers group	30	4	2
3	Eastern Cape Parks	26	9	1
4	Department of Agriculture	15	11	10
5	National Department of Environmental Affairs and Tourism (DEAT)	6	15	15
6	Local municipality	6	11	19
7	Provincial Department of Economic Affairs, Environment and Tourism (DEAET)	5	14	17
8	District municipality	4	10	22

n = 36

Incentives for leaving land untransformed

Table 4.9 represents the scores and rankings allocated to the different incentive options. Law enforcement received the highest score. The second most favoured incentive was assistance with the management of natural tracts of land, followed by tax deductions. The least favoured incentive was tourism promotion, followed by tax deductions and farmer recognition ("green award system").

Table 4.9 Landowner ranking of incentive options for leaving land untransformed. The first column represents the frequency that a particular incentive was ranked first by interviewees. The third column represents the weighted positive scores for each incentive (see Chapter Three for an explanation of the scoring system).

	Ranked first		Weighted ranking	
Incentive	**Frequency**	**Rank**	**Score**	**Rank**
Assistance with the management of the tracts of natural land	10	1	37	2
Tax deductions	7	3	33	3
Municipal rate rebates	1	5	22	5
Information on managing the natural land, indigenous plants and animals	4	4	25	4
Green branding for farm products	0	8	3	8
Law enforcement (e.g. controlling snaring, monitoring of squatting)	8	2	42	1
Green award	1	5	9	7
Tourism promotion	1	5	12	6

n = 32

4.2.3 Relationship between incentives and farmer or farm characteristics

In the Chi-square tests for association between characteristics and incentive types, three incentive types were tested (being the three incentives ranked first the most often) – law enforcement, management assistance and financial assistance. The characteristics that were suitable for testing (i.e. data sets of a high enough frequency) were:

- Income predominantly derived from crops
- Land use predominantly stock
- Farm part of a conservancy
- Farmer a member of local Farmers Association
- Farmer age 45 or older
- Farmer not planning on selling farm within next five years
- Attitude towards the responsibility of conservation on private land
- Farm size smaller than 1000 ha
- Extent of natural vegetation on farm less than 10 ha

The Yates correction for continuity was applied to all tests as the contingency table was a two-by-two table, and the sample number was small (n = 32). There was a significant positive association between the landowner not planning on selling his farm within five years and the ranking of law enforcement first. A significant positive association was also found between farmers deriving the bulk of their income from crops, and the ranking of financial incentives first. A significant association was found between farm size less than 1 000 ha and the ranking of management incentives first. No other statistically significant relationships were found (Table 4.10).

Table 4.10 Results from two-way Chi-square test for association between incentive type of farm/farmer characteristic*

Characteristic	**Incentive type ranked first by respondent**					
	Law enforcement		**Financial**		**Management**	
	Yates corrected Chi-square	**Probability**	**Yates corrected Chi-square**	**Probability**	**Yates corrected Chi-square**	**Probability**
Income: crop	0.68	0.4105	7.97	0.0048	0.2	0.6535

Land use: stock	0.18	0.6733	0.5	0.4773	0	0.9644
Farm part of conservancy	0.04	0.8379	0.05	0.8246	0.58	0.448
Farm size smaller than 1000 ha	0.18	0.6733	2.98	0.0844	4.10	0.0430
Extent of natural vegetation on farm less than 10 ha	0.42	0.5192	0.11	0.7366	0.05	0.8146
Farmer member of Farmers Association	0.78	0.3784	1.74	0.1871	0.01	0.9234
Farmer age 45 or older	0.05	0.8299	0.11	0.7366	0.05	0.8146
Farmer not intending to sell farm within next 5 yrs	4.17	0.0412	2.23	0.1278	2.74	0.0977
Attitude towards conservation responsibility	0.05	0.8204	.00	0.9782	0.12	0.7288

n = 32

Statistically significant values shown in bold

4.3 DISCUSSION

This section explores what is driving and preventing land transformation, and whether there is potential for using incentives as an effective tool to conserve untransformed thicket on agricultural land. Following this, suitable incentive programmes and incentive tools are discussed.

4.3.1 Should incentives be used to protect untransformed thicket on commercial farms within the lower reaches of the Fish Kowie Corridor?

According to the GIS analysis, there appears to remain a significant amount (270 517 ha) of untransformed vegetation within the study area. It must be noted, however, that the GIS analysis represented in Chapter Two produced a noticeably larger estimation of untransformed land within the study area than the landowner survey. Possible explanations for this are the existence of two provincial nature reserves (Waters Meeting 1 and Waters Meeting 2) within the study area, as well as private reserves and game farms that were purposefully excluded from the survey. Furthermore, the relatively course scale mapping of the area by STEP (1:100 000) might have resulted in overlooking some of the smaller patches of transformed land. Finally, the STEP data was collected from 2000 to 2002, and more land may have been transformed in the area since then. This discrepancy demonstrates a need for accurate, up to date information at a scale suitable for single farm level decision-making.

The landowner survey revealed that there was more untransformed thicket on crop farms than on stock farms, which may indicate that conservation attention should be paid to stock farms rather than crop farms. However, this does not consider the state of the remaining land. While on crop farms the distinction between degraded and undegraded land is clear, stock farms can present a gradient of severely transformed to moderately transformed land, which was not captured in the survey. This reliance of farmer opinion is not necessarily accurate. If the focus of an intervention programme to secure subtropical thicket is on conserving corridors of purely pristine vegetation, the emphasis should be on crop farms.

Commercial farmers have been transforming land within the Eastern Cape for close on two centuries (Beinart 2003). This research confirmed the belief that farmers are economic actors, behaving in a way that maximises their profit, according to their current information (Gunatilake and Abeygunawardena 1993; Bergsma 2000; Beedell and Rehman 1999; Nel and Davies 1999; Illukpitiya and Gopalakrishnan 2004). For

the most part, farms are managed to maximise output and minimise cost. Consequently, it is financial considerations that drive the transformation of thicket within the study area.

Given the above, the question must be posed: why does there remain untransformed thicket on farms within the study area? The most common explanation, given by 76% of the farmers, was that land was left untransformed because it was physically impractical to convert to agriculture or pastures. A similar finding was shown by Winter (2003) in investigating remnant renosterveld on Western Cape farm. Some farmers have chosen not to convert the land for conservation related reasons, however, this applied to only 24% of the landowners with untransformed thicket.

If the land is being left untransformed for reasons relating to physical impracticalities, are incentives necessary? Incentives remain relevant because a significant proportion of untransformed land can still practically be transformed, and has been left until now due to financial or farm management reasons. Were the economic environment to change, it might become more viable for the land to be transformed. Therefore, the security of untransformed land is tenuous. Furthermore, a few farmers are attempting to conserve land for altruistic reasons, and formalizing this arrangement or supporting it would secure the existence of these thicket patches.

The second point is more theoretical in nature. It considers the importance of stakeholder *intention* over *action*. There are individuals who are inadvertently conserving the environment through decisions and actions that have no conservation-based motivation whatsoever. What role should these individuals play in conservancy networks? Should they be rewarded for pro-biodiversity results that were not grounded in pro-biodiversity intentions? There is always the risk that their behaviour, motivated by factors other than conservation, such as profit maximisation, will alter with changing environmental factors (economic, political, social, environmental, agricultural), and the pro-biodiversity result will cease to exist. This highlights the need for awareness raising, to motivate farmers to conserve thicket for the correct reasons.

Based on these points, it is felt that there remains a need to offer incentives for commercial farmers to retain untransformed land within the study area.

4.3.2 An effective form of incentive programme for conserving untransformed thicket

The majority of landowners showed support for an incentive programme. Furthermore, over half the interviewees supported the implementation of a contractual incentive programme. The preferred duration of a contract was ten years or longer. This is a very positive indication from landowners, as a contractual incentive programme is only effective if it is in place long enough to have some effect on the ground (Young *et al.* 1996). Furthermore, landowners appeared to be open to external monitoring on their farm to ensure compliance – a crucial factor in maintaining a contractual programme of this nature.

Farmers showed a strong preference for non-government agencies as implementing agencies. Possibly more important to note was the strong aversion to government organisations as implementing agencies. The only government affiliated agency that received some support was Eastern Cape Parks. While national government has the authority to implement certain incentives that cannot be offered by non-government agencies, such as tax breaks and regulatory incentives (Doremus 2003), NGOs still have many tools at their disposal such as financial incentives, management assistance, education and awareness raising (Vickerman 1998; Defenders of Wildlife 2002). Botha (2001) recommends that government, conservation agencies and NGOs all have a role to play in supporting conservation on private land, and highlights the importance of synergistic partnerships.

Another crucial aspect of the success or failure of an incentive programme can be the presence (or absence) of a champion (Olsson *et al.* 2004). Attention need to be paid to those who indicated that they would join an incentive programme at inception, as this is the group in which a champion is most likely to be found. A number of farmers mentioned that the actual agency was less important than the agency's representative on the ground. This highlights the importance of building a strong relationship of trust and respect with landowners, as well as working effectively and efficiently to ensure that an incentive programme is supported by farmers.

In isolation, the incentives chosen by landowners indicate that the most effective incentive type would be law enforcement, followed by management assistance and possibly financial incentives. However, once the data are considered holistically, coupled with international and local literature (McNeely 1988; Young *et al.* 1996;

Vickerman 1998; Botha 2001; Doremus 2003), one can suggest that a more effective strategy would be to focus primarily on education incentives, with the option of offering more tangible incentives (such as management assistance or financial incentives) at a later stage, and possibly to a more select group of landowners within high priority areas. In this section, the incentive types are discussed individually, followed by a discussion on a suitable approach.

Farmers showed the highest weighted preference for incentives based on assistance with law enforcement. This incentive dealt primarily with monitoring and control of snaring and poaching on farms, and the monitoring of squatting. Through a conservation incentive programme, private landowners in Costa Rica also sought national government protection from local government and local groups that used squatting as a mechanism to gain control over private land (Langholz *et al.* 2000). Apart from this, there have been few examples of law enforcement offered as an incentive for private landowners. However, given the considerable impact of stock theft and poaching on South African farms (Nel and Davies 1999; ABSA 2003; Beinart 2003), the propensity towards this incentive can be understood. It must be noted, however, that using law enforcement as an incentive mechanism may raise inherent political and social justice issues, (Langholz *et al.* 2000; Langholz and Krug 2004). This could be particularly applicable in South Africa, where the issues of equality and social upliftment of previously disadvantaged communities living alongside commercial farmland is a primary focus of government.

Management assistance was the second most favoured incentive type. This high scoring correlates with Winter's findings among farmers in the Western Cape of South Africa (2003). Management based incentives have received more attention in the literature than law enforcement (Vickerman 1998; Clough 2000; Emerton 2000; Botha 2001; Defenders of Wildlife 2002). This type of incentive has been extensively utilised in Australia's Landcare programme along with education incentives (Curtis 2000).

Financial incentives were ranked third by the farmers. These incentives were also a favoured incentive in the Western Cape (Winter 2003). Financial incentives have been supported for many years as effective tools for conserving biodiversity on private land, particularly given the economic nature of commercial farming (McNeely 1988, Young *et al.* 1996; Vickerman 1998; Botha 2001; Clough 2000; Emerton 2000; Ferraro and Kiss 2002). In the USA, financial payments have been used extensively.

For example, Defenders of Wildlife, a US based NGO, offers cash payments as compensation to landowners who lose livestock to wolves, or allow wolves to den on their land (Doremus 2003). In Costa Rica, landowners are awarded cash payments for environmental services provided by their standing forests (Langholz *et al.* 2000).

The use of financial incentives for conservation has received some criticism for creating dependency, although this discourse has centred on incentive programmes for impoverished rural communities (Hellin and Schrader 2003). From an implementer's perspective, Vickerman (1998) claims that financial incentives can prove to be one of the more costly incentive types. However, the discourse on financial incentives is not unilateral, as other commentators support the use of fiscal incentives over less direct incentives. Ferraro and Kiss (2002) maintain that the potential obstacles encountered with implementing a direct payment system are equally valid for indirect schemes, if not more so. They argue that direct payments are generally more cost efficient, and less institutionally complex.

In the provision of tangible incentives, particularly financial incentives, it is important to acknowledge the full extent of the opportunity cost to both the landowner, and the local community that is dependent on the land for resources or income (Norton-Griffiths 2000). Furthermore, it must be noted that opportunity costs of leaving land undeveloped for conservation, particularly in developing countries, are gradually increasing in response to growing populations, expanding markets and new agricultural technology (Norton-Griffiths 2000).

Education and awareness has been highlighted as a crucial incentive tool for any conservation incentive programme (McNeely 1988; Young *et al.* 1996; Vickerman 1998; Kline *et al.* 2000; Botha 2001; Doremus 2003). In the study, a preference for education incentives was tested for in the form of information on managing natural tracts of land, indigenous flora and fauna. It was ranked fourth out of eight incentives. However, this ranking should not detract from the importance of this type of incentive. It is believed that education incentives underpin all other incentives (Vickerman 1998). With an ideal target audience, education incentives can stand alone in motivating behaviour, but in reality these incentives should be supported by one or more of the other incentive types to be effective (Vickerman 1998; Botha 2001). Essentially, no incentive package should be without education incentives, as these incentives hold great value.

There is a strong argument for making education and awareness type incentives the primary tool of an incentive programme in the area. International and local research supports the use of this as a basis for other incentive types, including more formal contractual agreements (McNeely 1988; Young *et al.* 1996; Vickerman 1998; Botha 2001; Doremus 2003). Landowners presented a strong generalised conservation ethic in the survey, such as placing a value on the concept of nature. However, two concerns must be raised. Firstly, while farmers proclaim a conservation ethic, land management decisions remain primarily financially driven. Secondly, there was a mismatch between what farmers perceived to be conservation, and what current conservation thinking follows. Government agencies have been promoting conservation amongst commercial South African farmers for many generations (Beinart 2003). However, the focus has been on agricultural resource conservation rather than biodiversity conservation. In some cases, agricultural resource conservation and biodiversity conservation are compatible, such as in the case of preventing soil erosion. In other cases, agricultural resource conservation may conflict with biodiversity conservation, such the contentious issue of trapping and poisoning natural predators. Education incentives provide a means to work with the conservation ethic already present among farmers, and re-align the ethic with the changing focus of conservation in South Africa.

An opportunity to develop an effective education incentive is through a new extension service to farmers, offering advice and assistance where necessary. This type of service was previously provided by the Department of Agriculture, but the assistance to commercial farmers has been significantly reduced over the last ten years as budgets have been cut and more expertise and resources have been shifted to small-scale farmers (NDA 1995). This has resulted in an all but non-existent extension service to many commercial farmers (Appendix III). Apart from providing guidance and assistance to farmers, this service could move towards building relationships of trust between farmers and implementing agencies. Landowner response to implementing agencies highlighted the importance of building a relationship of trust and respect among landowners and incentive programme implementing agencies, a factor supported by literature (van Gossum *et al.* 2005; Winter 2003; Olsson *et al.* 2004).

There was little support for market based incentives within the study area, such as green branding for agricultural products or eco-tourism promotion. This may be due to the relatively low reliance on tourism as an income generator, and the unfamiliarity

of green branding as a means of marketing farmers' products. Ecotourism and green branding have been used successfully in other parts of the world (Wunder 2000; Doremus 2003). Recognition incentives also proved to be unfavourable with interviewees, mirroring the results of Winter (2003).

The study revealed a preference for tangible incentives over less tangible or intangible incentives. However, while the preference for tangible incentives was quite apparent, direct financial incentives were not the most favoured.

4.3.3 Can the choice of incentives be explained by farmer, farm management or farm characteristics?

Numerous studies have investigated the factors affecting landowner adoption of on-farm environmentally conscious practises. Three major groupings of determining factors have emerged – those describing landowner characteristics (Featherstone and Goodwin 1993; Lasley *et al.* 1990; Traore *et al.* 2000; Winter 2003; Illukpitiya and Gopalakrishnan 2004; Plieninger *et al.* 2004); those describing the characteristics of the land and land management (Traore *et al.* 2000; Kline *et al.* 2000; Winter 2003; Illukpitiya and Gopalakrishnan 2004; Plieninger *et al.* 2004); and psychological/behavioural factors related to the landowner (Bultena and Hoiberg 1983; Beedell and Rehman 1999; Traore *et al.* 2000; Karppinen 2005). Appendix V shows some of these characteristics that have been investigated, and their findings of significance or insignificance.

Landowner characteristics

Landowner characteristics that have been shown to be significant in affecting the adoption of conservation related practises onto the farm include landowner age (Winter 2003; Plieninger *et al.* 2004); years of farming experience (Ervin and Erin 1982; Bultena and Hoiberg 1983; Christensen and Norris 1983; Rahm and Huffman 1984; Lasley *et al.* 1990; Featherstone and Goodwin 1993) number of generations of owning the land (Plieninger *et al.* 2004) and level of education (Hoover and Wiitala 1980; Erwin and Erwin 1982; Bultena and Hoiberg 1983; Gould *et al.* 1989; Traore *et al.* 2000). However, similar studies have shown education not to have a significant influence on behaviour or conservation attitude (Winter 2003; Plieninger *et al.* 2004). Similarly, the effect of age on decisions has been discounted in comparable studies (Illukitiya and Gopalakrishnan 2004; Traore *et al.* 2000), as has farming experience and membership and participation in government farm programmes (Traore *et al.* 2000). A raised environmental awareness has been shown to be affected by

membership in farmers organisations and participation in government sponsored farm programmes (Traore *et al.* 2000), as well as education level (Traore *et al.* 2000). This raised environmental awareness, in turn, has the ability to affect adoption of environmental practises (Traore *et al.* 2000).

Farmers who intended to remain on their farms and not sell their land in the foreseeable future have a longer term perspective, and are concerned about their personal security and illegal farm occupation (Appendix III*;* Nel and Davies 1999; ABSA 2003). They were therefore associated with law enforcement as a preferred incentive.

Farm and farm management characteristics

In this study, two farm management and farm factors were shown to be significantly associated with choice of incentive type. The first was how farmers earned their income: farmers who earned the majority of their income from crops tended to prefer financial incentives over other incentive types. The second was farm size - farmers with smaller farms (less than 1 000 ha) preferred management incentives over other incentive types. It might be postulated that a third factor is present in this relationship. Farm size could be directly related to farm activity – being either crop or stock – and this could have an effect on the preferred choice of incentive. However, farm activity is not significantly associated to a preference for management incentive types.

Environmentally conscious land use decisions have been shown to be affected by land use; farm size; the relative amount of income derived from the farm; the erosion potential of the farm (Erwin and Erwin 1982; Bultena and Hoiberg 1983; Christensen and Norris 1983; Rahm and Huffman 1984; Lasley *et al.* 1990; Featherstone and Goodwin 1993; Traore *et al.* 2000; Winter 2003); land ownership (Plieninger *et al.* 2004); land management objectives (Kline *et al.* 2000); natural resource use (Plieninger *et al.* 2004); the area covered by remnant vegetation on the land unit (Winter 2003) and the availability of adequate information on the best management practises (Traore *et al.* 2000). Similar studies have, however, shown farm size to play an insignificant role in decision making, as has ownership status and relative importance of income derived from farming (Traore *et al.* 2000).

Psychological and attitudinal characteristics

It is well stated that “the causes of human actions are usually immeasurably more complex than our subsequent explanations of them” (McKenzie-Mohr 2000). It

appears that the factors driving incentive preferences are more complex than originally perceived, and attempting to explain these preferences by seeking simple associations with various characteristics may not be effective. The lack of significant associations is also affected by the small sample size. Statistical tests of this nature are more accurate with larger sample sizes and frequencies – the small sample size and low frequencies of this study therefore made it difficult to establish a relationship of association.

In the field of motivating factors for landowner behaviour, there have been relatively few studies on farmers' attitudes towards conservation (Beedell and Rehman 1999). This relationship between an individual's actions and attitude is commonly explained by the Theory of Planned Behaviour, first developed by Ajzen and Fishbein (1980), and modified by Ajzen in 1991 and 1992 (Ajzen 1991; Ajzen and Driver 1992 discussed in Karppinen 2005). According to this theory, actual behaviour can be explained by behavioural intentions. The behavioural intention is causally preceded by the attitude towards the specific behaviour, the subjective norm and perceived behavioural control. Some factors shown to have an effect on behaviour are risk orientation; perceived environmental degradation; perceived attitudes of other farmers and the perception of other farmers' adoption of conservation innovations; expected crop loss to pests and weeds; and perceived health effects of farm chemicals (Bultena and Hoiberg 1983; Karppinen 2005). The only attitudinal characteristic tested for was attitude towards the responsibility of conservation on private land, and this was not associated with landowners' choices of incentives.

4.4 CONCLUSION

The findings from this research indicate that there is a need and an opportunity to implement an incentive programme in the area to induce the protection of untransformed vegetation on private, commercial farmland. Furthermore, research indicates that an effective incentive programme for this purpose should be run through an NGO or a government supported unit that develops an identity separate to that of the "parent" government department. If an NGO implements the incentive programmes, it might do well to partner with a government organisation to provide legitimacy and resources. Landowners appeared willing to be bound by a contractual agreement that extended into the medium to long term. A crucial tool in an incentive programme in this area is education and awareness raising, brought to the landowners in the form of an extension service that builds a relationship of trust and legitimacy with landowners. Further incentives that may be accepted by landowners

are management assistance and law enforcement, although the greater social environment of South Africa needs to be carefully considered before implementing incentives of this type, and the cost of such incentives must be carefully weighed against the perceived threat to the natural environment.

CHAPTER FIVE

INVESTIGATING THE ROLE OF AN INCENTIVE PROGRAMME TO MOTIVATE THE CONTROL OF ALIEN INVASIVE PLANTS ON PRIVATE LAND

5.1 INTRODUCTION

Chapter Four investigated the potential for utilising incentives to prevent the further transformation of natural vegetation on farmland within the Fish Kowie Corridor in the thicket biome. This chapter considers the use of incentives to catalyse landowner control of alien invader plants (AIPs) on their farms. It is widely recognised that the negative effect of AIPs on indigenous biodiversity is second only to habitat loss (Ewel *et al.*1999; Millennium Ecosystem Assessment 2005a; 2005b). Within South Africa, alien invader plants are thought to be the single biggest threat to plant and animal biodiversity (Versveld *et al.* 1998; Le Maitre *et al.* 2004; Macdonald 2004; van Wilgen *et al. 2*004; DWAF 2005). AIPs also pose a significant threat to agriculture in the country (Versveld *et al.* 1998; Le Maitre *et al.* 2004; Macdonald 2004; van Wilgen *et al. 2*004). It is believed that the introduction of AIPs began in South Africa in the 1600s with the colonial settlement at the Cape of Good Hope (Beinart 2003; Zimmermann *et al.* 2004). Over the years, hundreds of exotic plants that have become invasive were brought into the country, particularly plants from Australia and South and Central America (Zimmermann *et al.* 2004; DWAF 2005). These plants have the ability to become invasive when introduced to an area that does not support their natural suite of enemies such as plant-feeding insects and pathogens that suppress them in their natural areas (Zimmermann *et al.* 2004).

Many of the exotic plants within South Africa have become significant threats to biodiversity and human well-being, having deleterious effects on agricultural lands, catchment areas and downstream river courses, soil resources and native biodiversity (Versveld *et al.* 1998; Latimer *et al.* 2004; Le Maitre *et al.* 2004; Zimmermann *et al.* 2004). AIPs on commercial farms pose a significant threat to both farmers and biodiversity (Versveld *et al.* 1998; Le Maitre *et al.* 2004; Macdonald 2004; van Wilgen *et al. 2*004).

For many years the National Department of Agriculture (NDA) provided a subsidy on plant poisons for the control of specific invasive plant species. In the study area and surrounds, these plant species included *Opuntia* spp, in particular prickly pear and jointed cactus. This subsidy was substantial – around 1987, a subsidised litre of poison would cost the farmer 50c, while the shelf price for the equivalent quantity

was R100 (W. Penny pers comm. 2006). However, this subsidy has decreased substantially, and for some plant species it has been removed entirely. Today, farmers are able to access a poison subsidy of 50% on poisons for certain plant species through the NDA (K. Barnard pers comm. 2006).

However, the control of AIPs carries a major cost with regard to labour, chemicals and time (Hosking and du Preez 2002; Marais *et al.* 2004). Despite regulatory legislation, including Conservation of Agricultural Resources Act (CARA) (National Department of Agriculture 1983), the draft Sustainable Use of Agricultural Resources Bill (National Department of Agriculture 2003), the National Biodiversity Act (Department of Environmental Affairs and Tourism 1997), the National Water Act (DWAF 1998b), the National Veld and Forest Fire Act (DWAF 1998a) as well as local by-laws, private landowners are not controlling the invasion of exotic plants on their land (Marais pers comm. 2005). Working for Water (WfW), a national public sector organisation, is attempting to control AIP infestation in South Africa (Hobbs 2004; Macdonald 2004; WfW 2006).

The WfW policy on clearing with regard to land tenure is to prioritise State land, and only work on private (or municipal) land that falls within areas where land users are paying an alien clearing charge, or in priority clearing areas that have been identified according to water or biodiversity needs (WfW 2000). However, a new strategy for engaging with private landowners is currently being developed (DWAF 2004). There is a clear need to investigate not only the role that incentives can play in motivating AIP clearing among private landowners, but also the role that WfW can play in implementing an incentive programme with private landowners.

There has been very little research dealing specifically with incentives to motivate landowners to control AIPs. It has been recommended at an international level that incentives be used to prevent exotic species introductions and ensure their control (Glowka and Klemm 1999). Education and awareness campaigns around the dangers of introducing exotic species and the benefits of controlling invasive species may also play a positive role (Glowka and de Klemm 1999; Dodiza 2000; Low 2000). The control of AIPs has been included in overviews on incentive options for environmental management (Young *et al.* 1996; Doremus 2003).

What *is* present in the literature is a focus on using incentives to motivate costly actions such as land restoration (Bergsma 2000; Hellin and Schrader 2003; Bieling

2004; Arnalds 2005; Boody *et al*. 2005; Milton *et al.* 2003). Similarities can be drawn between such activities and the control of AIP clearing, as this is also expensive (Hosking and du Preez 2002; Marais *et al.* 2004). Therefore, the results from this research will support a growing body of research on using incentives to motivate landowners to engage in costly activities.

This chapter aims to identify incentive types that will be effective in motivating an action on clearing AIPs. It considers the effect of farmer or farm characteristics on the type of incentive preferred by the landowner. It also looks at the type of incentive programme and implementing agency that would be effective in operating an incentive programme. In particular, it looks at the role the Working for Water programme can play in implementing an incentive programme for commercial farmers.

5.2 METHODS

The same methods described in Chapter Three were used, and Section C3 and D of the questionnaire (Appendix IV) dealt with alien plant control and possible incentives for this.

5.3 RESULTS

In order to prevent duplication, this section presents only the results relevant to AIP control on private land that have not been presented in previous chapters. The discussion will then incorporate relevant results presented in Chapter Two (Study Area) and Chapter Four (Incentives for preventing the transformation of land) with the results presented in this chapter.

5.3.1 Alien Invasive Plant Control

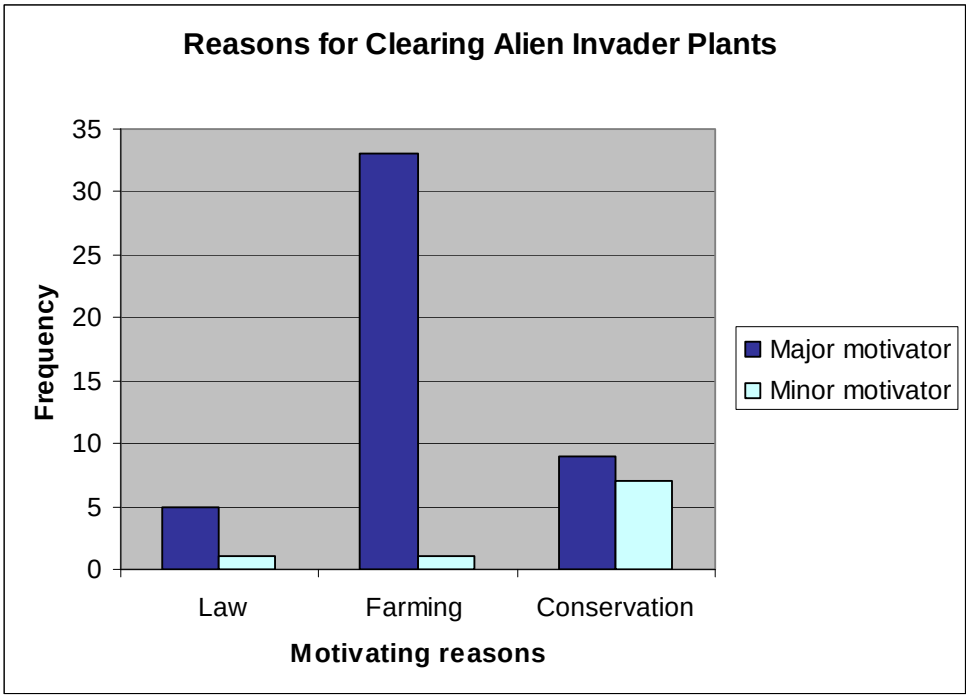
AIPs are viewed as a serious problem by farmers *(*Appendix III*).* Thirty five (92.11%) of the interviewed farmers said they were attempting to control AIPs on their property (Table 5.1). Clearing invader plants have two major cost implications for landowners. Firstly, some of the species, such as jointed cactus, are best controlled with herbicide. This was previously heavily subsidised by government, but this state assistance is no longer offered. Secondly, the new wage laws and the resulting reduction of permanent staff have resulted in landowners having insufficient labour to clear alien invader plants (Appendix III).

Table 5.1 Number and frequency of landowners attempting to control AIPs on their farms

	Yes	No
Frequency	35	3
Percentage	92.11	7.89

n = 38

The major motivator for clearing AIPs on farms, stated by 33 interviewees, was for the benefit of agricultural activities. Conservation considerations and the legal requirement of clearing aliens played a small role in the decision making process (Figure 5.1).



n = 38

Figure 5.1 Motivating reasons for clearing AIPs amongst landowners (n = 38)
"Law" represents farmers meeting regulatory requirements, "Farming" represents clearing to benefit farming practises, and "Conservation" represents clearing for a conservation motive.

Farmer attitude towards alien clearing

The majority of the interviewees (59%) believed that the benefits of alien plant management should match the cost of control. A small majority (56%) felt that the spread of alien invasive plants was the responsibility of the landowner and that the cost should be borne by the landowner. A similarly small majority (58%) felt that the

benefits of alien plant control were felt mainly by the landowner himself. A much larger majority (72%) felt that landowners who had been controlling alien invasive plants in the past should be rewarded or compensated for their efforts. Table 5.2 presents the interviewee responses.

Table 5.2 Landowner response to AIP attitudinal questions

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Question 1: *The benefits from the control of alien invasive plants should match the cost of their control*					
Frequency	6	19	1	9	1
Percentage	16.67	52.78	2.78	25	2.78
Question 2: *The spread of alien invasive plants is the responsibility of the landowner and therefore the cost must be borne by the landowner*					
Frequency	0	14	2	16	4
Percentage	0	38.89	5.56	44.45	11.12
Question 3: *Landowners who have been controlling alien invasive plants in the past should be rewarded or compensated for their efforts*					
Frequency	4	22	1	8	1
Percentage	11.12	61.12	2.78	22.23	2.78
Question 4: *The benefits of alien plant control are mainly to the landowner*					
Frequency	2	19	4	10	1
Percentage	5.56	52.78	11.12	27.78	2.78

n = 36

5.3.2 Incentives for Clearing Alien Invasive Plants on Farms

When considering only the incentives ranked first by interviewees, the most favoured incentive was assistance with the clearing of alien invasive plants. This was followed by a subsidy on the herbicide, and then by technical advice.

Based on the weighted positive totals (described in Chapter Three), the most favoured incentive was assistance with the clearing of alien invasive plants. The herbicide subsidy rated second, followed by labour subsidy as the third most favoured incentive.

Table 5.3 represents the scores and rankings allocated to the various incentive types. The first column represents the frequency that a particular incentive was ranked first by interviewees. The second column ranks the incentives according to the frequencies of the first column. The third column represents the weighted positive scores for each incentive (see Chapter Three for explanation of weighting

system). The final column represents the ranking of the incentives according to the weighted scores.

Table 5.3 Landowner response to incentives types to motivate AIP clearing. Incentives arranged in order of preference of incentives ranked first by landowners. Weighted ranking is the sum of landowner scoring of top three incentives, with the incentive ranked first awarded a score of 3, the incentive ranked second awarded a score of 2 and the incentive ranked third awarded a score of 1.

	Ranked first		**Weighted ranking**	
Incentive	**Frequency**	***Rank***	**Score**	***Rank***
Assistance with alien invasive clearing (resources provision, e.g. labour, equipment)	15	*1*	58	*1*
Subsidy on herbicides	7	*2*	47	*2*
Technical advice and information on alien invasive vegetation clearing	4	*3*	26	*4*
Enforcement of clearing on neighbouring land	3	*4*	16	*5*
Subsidy on the labour component of alien clearing (farmer uses own labour)	2	*5*	41	*3*
Advice on legal compliance procedures	1	*6*	3	*6*
Assistance with marketing the secondary products	1	*6*	3	*6*
Green branding for agricultural products	0	*8*	3	*6*
Green award system	0	*8*	3	*6*

n = 34

5.3.3 Relationship between Alien Invasive Plant incentives and farmer or farm characteristics

The tests for association between farmers selecting a management type incentive and farmer or farm characteristics showed no significant association (Table 5.4). Chapter Three provides further explanation of the statistical tests.

Table 5.4 Results from two-way Chi-square test for correlation between a management incentive type and farm/farmer characteristic

Farm or Farmer Characteristic	**Management incentive type ranked first by respondent**	
	Yates corrected Chi-square	**Probability**
Income: crop	3.14	0.0766
Land use: stock	0.02	0.8817
Farm part of conservancy	0.15	0.6990
Farm size smaller than 1 000 ha	0.77	0.3800
Farmer member of Farmers Association	0.07	0.7944
Farmer age 45 or older	0.07	0.7944
Farmer not intending to sell farm within next 5 yrs	0.09	0.7601

n = 34

5.4 DISCUSSION

During this study it became clear that the barriers to clearing alien invasive plants on farms are substantial and multifaceted. AIP control presents major cost implications through the purchase of chemicals, labour costs and time, a finding supported by Hosking and du Preez (2002) and Marais *et al.* (2004). Furthermore, farmers do not necessarily feel responsible for the extent of AIPs on their land, with about 61% of respondents believing this is not the farmer's responsibility. This makes them reluctant to expend time and resources on the control of AIPs.

Farmer attitudes and actions towards clearing AIPs are strongly influenced by public policy decisions made at a national level. Firstly, during the pilot study (Appendix III) it became apparent that the cost of clearing has been significantly increased with the increase in herbicide costs since the government subsidy has been removed. Secondly, landowner response to new labour laws increasing the cost of permanent labour (Department of Labour 2002) has been to significantly reduce the number of permanent staff on their farm (Appendix III). During informal discussions (Appendix III) many farmers also stated that they did not have enough labour to conduct what they view as "secondary" tasks such as AIP control, despite the fact that the majority agreed that these pose a threat to their agricultural enterprises.

Landowner attitudes and clearing actions were also influenced by a lack of enforcement of government regulations. Regulatory measures requiring private landowners to clear AIPs on their land are not being enforced (C. Marais pers comm. 2005). As a result, it became clear during the interviews that the presence of these regulations had very little effect on farmers' management of their infested land. Farmers who have attempted to clear AIPs from their properties are frustrated that these plants are not being cleared on neighbouring land – either private land, state owned land or communal land – resulting in the more responsible landowners continually having to combat infestations arising on their land due to non-clearing on neighbouring land (Appendix III). Finally, many landowners simply do not feel that clearing AIPs on their land is their responsibility.

All these factors result in a lack of effective control of AIPs by farmers, and indicate that a significant intervention is required for this pressure on the natural vegetation to be removed. The key is to determine what type of intervention will be most effective.

Clearly, regulatory methods have not been effective in inducing sufficient AIP clearing among farmers. This is consistent with previous research on conservation behaviour among farmers in South Africa (McDowell 1988), as well as Working for Water's concerns over the lack of clearing on private land, regardless of current legislation (C. Marais pers comm. 2005).

Landowner responses support this idea that law enforcement on its own is not the answer. The successful eradication of invasive species can be technically demanding, prone to setbacks and difficult to monitor. This enables landowners to minimise their eradication efforts without much fear of detection (Doremus 2003). Therefore, positive incentives may be more suitable than regulatory incentives to induce a management action (Doremus 2003).

The major incentive types supported by farmers can all be directly translated into financial gains. The most favoured incentive was physical assistance (such as labour and equipment) with clearing AIPs. This incentive type was recommended by Young *et al.* (1996) to support farmers clearing alien species in Australia. It addresses the issue of farmers not having sufficient permanent labour to control AIPs on their land. Through the WfW programme, contractors and teams are trained up in alien clearing and small business management, and are then released from the programme to find their own work. As a result, there are fully trained teams available to clear AIPs on private land. A co-ordinating organisation which links contract teams to landowners and co-ordinates the jobs may be all that is required to link these teams with private landowners.

The second most favoured incentive was a herbicide subsidy, easing the significant cost of clearing AIPs that require herbicides. The next favoured incentive was a subsidy on the labour component of clearing. With these two incentives, landowners would provide their own labour and undertake the clearing themselves, while receiving financial compensation for their effort. In comparing the first and third incentives, both of which deal with labour, it is clear that most landowners would prefer an external labour force working on their farms to clear AIPs rather than provide their own labour and receive compensation. It is generally believed that financial or other tangible incentives are effective in motivating actions that are costly to the landowner (Bergsma 2000; Hellin and Schrader 2003; Bieling 2004). With all tangible incentives, particularly for landowners with an economic interest in the productivity of their land, it is important to ensure that incentives are reliable and

continuous (Hellin and Schrader 2003; Bieling 2004). It has been shown that once such an incentive is withdrawn, farmers often cease the conservation action that was motivated by the incentive (Hellin and Schrader 2003).

However, it appears that less tangible positive incentives such as technical advice, legal advice, market creation and recognition may not be effective in IAP control. These incentives were poorly rated by farmers in the interviews, and do not address the major cost barrier of controlling AIPs. Inducing a costly management action such as AIP control requires a substantial and tangible positive incentive that can be translated into costs saved or recovered (Young *et al.* 1996; Doremus 2003). These patterns were universal, regardless of farm and farmer characteristics.

It is also necessary to look at the role education and awareness can play in combating the threat of AIPs. While this incentive type may be effective in preventing the introduction of AIPs, it is not sufficient in being the sole motivator for the costly action of controlling AIPs by farmers. However, it is necessary to communicate the benefit to the farmer of clearing AIPs on his farm (Hellin and Schrader 2003).

The current trend in South Africa indicates that implementing agencies are encouraging landowners to source their own labour and management for AIP clearing, and to provide a subsidy as an incentive. CapeNature (the Western Cape Province conservation agency) and Botanical Society Conservation Stewardship Pilot Programme offer subsidies of varying magnitudes on the labour component of alien clearing to participating landowners, and landowners must undertake the clearing on their land themselves (Botanical Society of South Africa 2005). WfW's proposed approach to inducing landowners to clear AIPs on their land also requires that landowners must be responsible for the management of all clearing on their land (DWAF 2004).

The previous chapter strongly recommended that, owing to landowner attitude towards government agencies, an NGO should be the primary implementing agency of an incentive programme for protecting natural vegetation. However, in the case of AIP clearing, there may be reasons over and above landowner choice to support the choice of Working for Water as the key implementing agency for AIP control incentives. WfW carries national and international mandates to eradicate AIPs within the country. This agency holds the necessary extensive expertise and resources to do so. Furthermore, WfW is currently developing a means of engaging with

landowners through incentives and disincentives (DWAF 2004). Institutionally, WfW is clearly the most capacitated agency to undertake an incentive programme for clearing AIPs.

The nature of incentives to be used by WfW has not yet been determined, but a WfW draft strategic document (DWAF 2004) suggests that priority will be given to incentives that lead to job creation and training and the utilisation of exited WfW contractors and workers. In financial terms, WfW is considering covering up to 50% of the initial clearing costs and up to 75% of follow-up costs (DWAF 2004). In addition, WfW may provide additional specific support (e.g. the release of bio-control agents) in certain circumstances. The incentive will be subject to the signing of a binding contractual agreement between the landowner and WfW (DWAF 2004).

Data presented in Chapter Four indicate that landowners are comfortable to enter into contractual agreements of a medium to long term (ten year to perpetuity) for conservation. Furthermore, farmers have indicated that they would not be hostile towards an external agency monitoring their farm activities to ensure compliance of an incentive programme (see Chapter Four). Both of these factors would be necessary for an AIP control incentive programme (Young *et al.* 1996). It is becoming increasingly clear that AIP control is a lengthy process (Marais *et al.* 2004) that will require long term commitment from the landowner, and external technical monitoring for compliance (Young *et al.* 1996; Doremus 2003).

WfW is looking to form special partnerships with local government agencies to apply incentives, disincentives and advocacy on private land through the District Municipality and Local Municipality Integrated Development Plans (IDPs) (DWAF 2004). The new municipal property rates (Local Government 2004) that landowners will be charged present one opportunity to implement a financial incentive through rate rebates. Local government has the means to provide a significant incentive, but may not be accepted by private farmers if they were to be the sole implementing agency. Therefore, it may be more beneficial for a partnership to be formed between WfW and local government in implementing an AIP clearing incentive programme.

Another option could be for a partnership to be formed between WfW and a private agency managing clearing labour teams. It appears that the skilled labour is available, but neither WfW nor farmers want to take responsibility for managing the teams. A possible solution to this would be for a private company to be set up to

manage a consortium of teams in an area. The farmer could hire the company to manage one of their clearing teams on their farm, and WfW could subsidise the cost of hiring the team.

5.5 CONCLUSION

In order to ensure that any success is met at a national level of controlling AIPs, private landowners must be involved in actively controlling AIPs on their land (DWAF 2004). This research as well as other studies (Young *et al.* 1996; Doremus 2003) has shown that a significant intervention is required to motivate landowners to control AIPs on their farms. Regulatory incentives in isolation have not, as yet, been effective in doing so. Landowners are aware of the economic threats of IAPs but feel they do not have the necessary resources to control AIPs on their land, and many do not feel responsible for the control of AIPs. This indicates that some form of tangible positive incentive is necessary to complement the legal regulatory incentives already in place, in order to support landowner clearing. This study has shown that the most effective incentive would be one that addresses the high cost of clearing, particularly the cost of labour. A clear opportunity exists to utilise private AIP clearing teams that have been trained up in the WfW system and are now required to find contracts outside of WfW. WfW is already moving towards developing an incentive system with private landowners that will lead to job creation and utilising exited WfW contractors, as well as addressing some of the substantial cost implications that AIP control presents to private landowners. Furthermore, with their extensive resources, skills and co-ordination expertise, WfW is an ideal implementer for an AIP clearing incentive programme.

Chapter Six draws on findings presented in this chapter as well as Chapter Four (Incentives for Land Transformation) and the pilot study (Appendix III) to make practical management recommendations for designing and implementing an incentive programme in the lower reaches of the Fish Kowie Corridor to address the major pressures on thicket.

CHAPTER SIX

RECOMMENDATIONS FOR IMPLEMENTING AN INCENTIVE PROGRAMME FOR CONSERVATION IN THE LOWER REACHES OF THE FISH KOWIE CORRIDOR

6.1 INTRODUCTION

This thesis sought to address two key questions:

3. Can incentives play a role in mitigating the major pressures on thicket on private commercial farm land within the lower reaches of the Fish Kowie Corridor?
4. What are the characteristics of an incentive programme that would most effectively achieve this?

These questions were addressed both at a management level as well as an academic level. On a management level, I sought to develop guidelines for an effective incentive programme to address the two major pressures on thicket. At the academic level, I contributed to the debate on the effectiveness of different incentive types in promoting conservation action on private land.

The effective management of natural resources is often unsuccessful owing to, at least in part, the gap between scientists and land managers. Both parties are often reluctant to include each other in their activities, and communicate relevant needs and findings between disciplines (Briggs 2001; Knight and Cowling 2003). In this chapter, I attempt to bridge the gap between science and management by translating my research findings into practical management implications. I have drawn on findings presented in Chapter Four and Five, as well as the literature to make practical management recommendations for an incentive programme in the lower reaches of the Fish Kowie Corridor.

I considered a number of factors to determine whether there was potential for utilising incentives, as well as the nature of an effective incentive programme. These factors included landowner activities, needs, opinions and barriers to behaviour change (also considered by Bergsma 2000; May *et al*. 2002; Bekele and Drake 2003; Doremus 2003; Langholz *et al.* 2003); the nature of the pressure and the nature of the required behaviour to reduce the pressure (also considered by McNeely 1988; Young *et al.* 1996; Bowers 1999; Hoffman and Todd 2000); and current institutional arrangements (also considered by Defenders of Wildlife 2002; Doremus 2003).

In developing recommendations for an incentive programme, I focused on suitable types of incentives, possible implementing agencies, an effective duration of an incentive programme and key management requirements for an effective programme. While the majority of the literature focuses only on possible incentive types, a few also consider the crucial factors of suitable incentive agencies, duration, and incentive management requirement such as monitoring (Young *et al.* 1996; Clough 2000; Falconer 2000; Winter 2003).

6.2 UNDERSTANDING INCENTIVES

Fully understanding the significant pressures on the environment is crucial in designing suitable incentives to mitigate for these pressures (McNeely 1988; Young *et al.* 1996; Bowers 1999; Hoffman and Todd 2000). I focused on two major pressures on thicket – land transformation and AIPs. Once the pressures have been defined, it is important to understand why landowners are placing this pressure on the environment; define the necessary mitigatory action that is required to relieve this pressure; and understand the landowners' barriers to this conservation action (Bergsma 2000; May *et al*. 2002; Bekele and Drake 2003; Doremus 2003; Langholz *et al.* 2003).

At the start of the research, I had in mind the development of recommendations for one discrete incentive programme that addressed the major pressures on thicket. However, as the research progressed, it became apparent that the two major pressures (transformation and AIPs) that I focused on required separate incentive initiatives.

The fundamental difference in addressing the two pressures is the need for an 'inaction' for the first pressure (refraining from transforming thicket) and a protracted and costly action for the second (controlling AIPs). AIP control requires a costly and well co-ordinated approach, and one which cannot be addressed single-handedly by landowners (Hosking and du Preez 2002; Marais *et al.* 2004). In contrast, I found that much of the remaining thicket on agricultural land is unlikely to be completely transformed due to physical impracticalities such as inaccessibility and costs (Chapter Four). While there remained an opportunity cost for not transforming thicket for agriculture, in many cases transforming the land was simply not economically feasible to landowners, and the land was deemed marginal agricultural land. The opportunity cost of not clearing the land would in these cases be minimal. This is not

necessarily true across the entire spectrum of farmers interviewed – in some cases, large tracts of untransformed thicket remain in a pristine state only because of the conservation ethics of the landowner, but I found this to be the exception rather than the rule. This fundamental difference in the necessary action to relieve the two major pressures on thicket calls for substantial differences in the suitable incentives, as recognised by Doremus (2003).

The second difference in addressing the two pressures lies in the choice of suitable implementing agency. In determining an effective implementing agency, it is important to understand local attitudes towards different agencies as well as the current institutional environment (Doremus 2003; Langpap 2006). Current institutional arrangements prescribe the operating environment in which an incentive programme can be developed and implemented (Defenders of Wildlife 2002; Doremus 2003).

Landowners showed an aversion to working with government agencies in an incentive programme, particularly DEAT (national government), provincial government and local government. Within the grouping of government agencies, farmers showed more favour towards Department of Agriculture and Eastern Cape Parks. Major preferences were shown towards farmers groups and non-government organisations (NGOs) (Chapters Four and Five). This showed a marked discrepancy between the agencies mandated to protect biodiversity on private land and landowner preferences towards different agencies.

The mandated authority for conservation issues outside of formally protected areas in the Eastern Cape is the provincial Department of Economic Affairs, Environment and Tourism (DEAET). Apart from DEAET, LandCare, a programme of the National Department of Agriculture (NDA), is mandated to optimise productivity and sustainability of natural resources on agricultural land (NDA 1999). Currently LandCare operates in all nine provinces, although in the Eastern Cape the primary focus is on emerging farmers. The Subtropical Thicket Ecosystem Programme (STEP) endeavours to promote the conservation, enhancement and sustainable use of the thicket biome (SANBI 2006). With regard to AIP clearing, Working for Water, a national public sector organisation affiliated to the Department of Water Affairs and Forestry (DWAF), is currently mandated to addressing the problem at a national level.

In considering the two pressures and the current institutional arrangements available to address these pressures, it was found that separate institutional structures would be required to deal most effectively with the pressures. But as I would like to deal with each of the pressures and effective solutions holistically, I will return to this later in the chapter.

6.3 RELIEVING THE PRESSURE OF LAND TRANSFORMATION ON THICKET

Given the low opportunity cost of leaving land untransformed for the majority of the landowners, as well as the apparent conservation ethic of among landowners (Chapter Four), it is believed that the most effective means of addressing land transformation would be through a stewardship programme that would focus on promoting pro-conservation practises, raising awareness and disseminating information. This should take a form similar to earlier conservation extension services that farmers were exposed to. The focus should, however, be on the conservation of biodiversity, including processes and patterns, rather than the conservation of agricultural resources as in the past (Beinart 2003; Hoffman and Todd 2000). This is because, while in some cases steps to protect biodiversity are identical to protect agricultural resources, this is not always the case.

A primary aim of the stewardship programme should be to build a trusting relationship with private landowners. This programme could address not only the major specific pressure of land transformation, but also the pressures of overgrazing, predator control and chemical use (Lloyd *et al.* 2002) through providing accurate information on alternatives as well as raising conservation awareness.

A balance must be achieved between information and “marketing”. Information without landowner buy-in will be a wasted exercise, while achieving landowner buy-in without capacitating them with the knowledge to act accordingly will prove to be equally futile (Mackenzie-Mohr 2000). An intervention of this nature would lay the foundation for any future, more formalised, incentive programme should the need and opportunity arise, as landowners would be more aware of the issues at stake, and would have developed a relationship of trust with the implementing agency.

Taking all these factors into account, I believe that the most effective model is a non-contractual extension service which will build trust between agency and farmer. This service should be developed as a partnership between DEAET and organised agriculture. I believe this partnership between government and organised agriculture

is crucial to obtain farmer support and buy-in. The inclusion of an NGO in the partnership would also be highly beneficial to an incentive programme and should be at least encouraged or at best facilitated.

The stewardship unit should develop a unique identity to differentiate itself from more established government agencies. The unit must also be able to quickly and efficiently respond to farmers in order to foster a sense of trust in the unit among landowners. This unit should also be in a position to promote communication and co-ordination between other relevant agencies, such as protected area managing bodies (Eastern Cape Parks and South African National Parks) and local municipalities. The STEP programme is well positioned to provide guidance and assistance for a stewardship project in this area (SANBI 2006).

6.4 RELIEVING THE PRESSURE OF ALIEN INVADER PLANTS IN THICKET

The pressure of AIPs requires a more tangible incentive that is able to address the high cost of alien clearing (Chapter Five). Furthermore, the institutional environment provides a suitable agency (WfW) that is already well positioned to address this pressure (Chapter Five). Addressing the specific pressure of AIPs should remain with WfW. In addressing this pressure I found that more tangible incentives are required, particularly one that addresses the high cost of labour, through either providing a team to clear AIPs or subsidising such a team. I would recommend that, whichever option is implemented, it promotes the use of teams and emerging contractors that have already been trained up in AIP clearing through the WfW programme. It is also important that there be collaboration between WfW and the implementing agencies of the more holistic stewardship programme discussed above, as these linkages provide synergy and are important for programmes to be effective (Briggs 2001). Given that addressing the problem of AIP infestation is a long term task, the incentive programme would need to be set up for a sufficiently long time horizon. Furthermore, given the costly nature of the incentives as well as the importance of a co-ordinated effort to control AIPs, it is important that the incentive programme be contractual and monitored by WfW.

6.5 CONCLUSION

I have been able to answer the key questions laid down at the start of my research. Incentives do have a significant role to play in relieving the major pressures on thicket on private commercial farm land within the lower reaches of the Fish Kowie Corridor. Farmers are open to the concept of an incentive programme (Chapters

Four and Five), and agencies within South Africa are becoming more supportive of the model, including DEAET (Chapter One) and WfW (Chapter Five).

Based on my research, I have identified the characteristics of suitable incentive programmes for addressing the major pressures on thicket. The unique and shifting landscape of the Eastern Cape calls for a particular suite of incentive types, ranging from awareness raising and education to address the pressure of land transformation to more tangible incentives that assist with farm management and labour costs for clearing alien invader plants. It also calls for a suite of incentive programme tools – in addressing some incentives, a non-contractual extension service implemented by a unit formed by various partnering agencies, while with other pressures a contractual, monitored programme implemented by a sole public sector organisation.

I have also contributed to the debate on the use of purely financial incentives versus a suite of different incentives. While landowners showed a preference for tangible incentives over intangible incentives, some form of management assistance or labour assistance was always ranked above purely financial assistance (Chapters Four and Five). Furthermore, in considering opportunity costs and landowner beliefs, I found that some pressures could be addressed through intangible incentives (Chapter Four). I have conclusively found that, certainly within my study area, a suite of incentives tools would be substantially more appropriate than offering only financial incentives.

6.6 LESSONS ON STUDYING INCENTIVES FOR RESOURCE CONSERVATION

I found that talking to farmers on their farms was highly effective, in particular asking them about their problems and barriers to conservation actions. However, the time and energy required to meet farmers on the farms and speak to them is substantial, and should not be underestimated. I found it important to build a level of trust with landowners, and not to pressure them to provide an answer when they felt they could not answer a question.

I found that conducting a pilot study with key farmer representatives, in this case farmers association chairpersons, was highly informative in guiding the development of my questionnaire for landowners. It allowed me to be more accurate in addressing issues pertinent to landowners, and also helped to make me more credible to the farmers that I interviewed, as they could see that I had some knowledge of their enterprise.

I found the overall approach of understanding landowner needs and opinions, activities and barriers to conservation efforts, current institutional arrangements as well as the history of the area to be highly effective in designing an incentive programme. However, it must be stated that recommendations in isolation have little effect. The true test of this research will be in the effectiveness of an incentive programme based on these recommendations.

In hindsight, I found that my questionnaire did not ask some questions that I now feel would be important to understand. In particular, I did not test for landowner acceptance of the implementing agency WfW, but rather I tested their response to a more generic range of agencies. As the thesis progressed, it became clear to me that the pressure of AIPs on thicket was a particularly difficult one, and the most suitable agency for dealing with it would be WfW. While farmers ranked national government departments fairly poorly, they were not given the opportunity to comment on the Working for Water programme in particular as an implementing agency.

Another shortcoming was not investigating landowners' level of education, which could have been used in my tests of association. I have explained my reasons for this in Chapter Three. Essentially I was concerned with interviewee sensitivity. Another concern of my thesis was the small sample size. As explained in Chapter Three, there were reasons for the small sample size. However, this small sample size did limit the effectiveness of statistical tests, in particular the Chi-square tests for association.

6.7 PRIORITIES FOR FUTURE RESEARCH ON INCENTIVES

I believe there is great potential to expand and explore the merging of the fields of environmental science and behavioural science. The growing field of conservation psychology is filling this gap by exploring why individuals damage or protect the natural environment and how to promote environmentally sustainable practises(Clayton and Brook 2005). This understanding is crucial if policies and programmes are to be successful in protecting biodiversity now and into the future (Mascia *et al.* 2003), and the development of incentive programmes should be grounded in this field. However, I firmly believe that if the sciences, be they behavioural or environmental, are not translated into practical management solutions and effectively communicated to policy makers and implementers, no effect will be felt on the ground.

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APPENDIX CONTENTS

APPENDIX I: FARMERS ASSOCIATION REPRESENTATIVE INTERVIEW SCHEDULE (PHASE ONE)

PHASE 1 QUESTIONNAIRE

CHAIRMAN OF FARMERS ASSOCIATION

DATE: ……..

INTERVIEW NUMBER: ……..

SECTION A: BACKGROUND INFORMATION

A1.) Farmers Association represented: ……

A2.) Extent of Farmers Association: ……..... ……

A3.) Name of interviewee: ……..

A4.) Name of farm: ……

A5.) Postal Address:
P. O. Box …….. ……

……Postal Code: ……..

A6.) Phone:
H …….. W……

Cell……..

A7.) Email address: **…… ……**

A8.) First Language:
1. English
2. Afrikaans
3. Other……

SECTION B: FARM INFORMATION

B1.) What are the different land uses within your area?

B2.)Extent of farming types:
1. ……
2. ……
3. ……
4. ……
5. ……
6. ……
7. ……

B3.) Are there conservancies in your area?
1) Yes, how many? ……
2) No

.

B4.) If yes, what are the names of the conservancies and where do they exist?

……
……
……
……
……

B5.) What are the main motivators for farmers forming conservancies?

……
……
……
……
……
……
……

B6.) Do you have any tourism initiatives in your area?

1) Yes
2) No

B7.) If yes, what are they?

……
……
……
……
……
……

B8.) What is the predominant language of farmers in your area?

1. Completely English
2. Mostly English, some Afrikaans
3. Mostly Afrikaans, some English
4. Completely Afrikaans
5. Other language

B9.) How homogenous are farmers in your area, regarding:

	Completely homogenous	Majority are similar, with a few outliers	Split 50/50	Completely scattered	Highly diverse groups
1. Farming type					
2. Age of farmers					
3. Number of generations farming					
4. General attitudes					

Extra notes:

1. Farming……
   ……
2. Age of farmers ……
……
3. Number of generations farming ……..
.....
4. General attitudes ……..

.....

What opportunities are there for meeting and talking to farmers within your area?
……
……
……

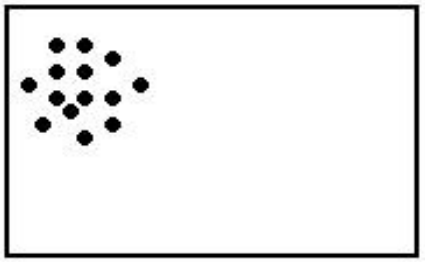
SECTION C: LANDOWNER ISSUES

C1). What are the pertinent issues and concerns that you face as a farmer and landowner in this area?
Discuss issues of concern. In particular, enquire about:
Markets
Extension services – agricultural
Extension services – conservation
Access to information
Security - farm
Security - personal
New rates bill

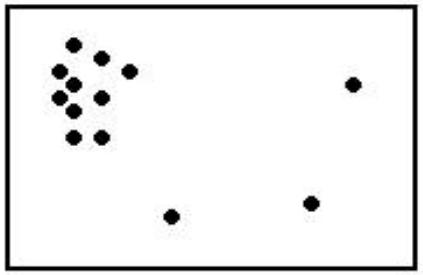
C2). What are the general attitude, as well as extreme attitudes, towards:
Alien invader plants
Pesticides
Culling pest animals
Soil conservation
Biodiversity conservation

C3). What prevents farmers in your area from conserving more land?

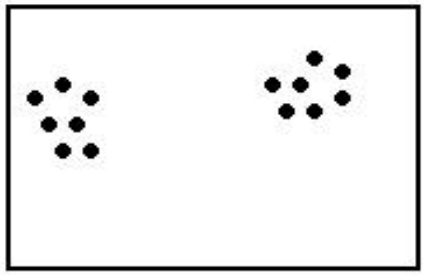
APPENDIX II: CUE CARD



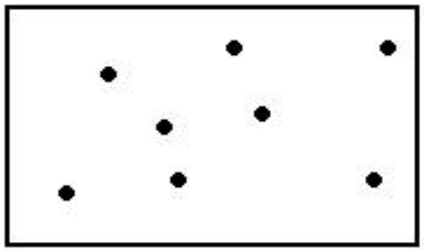
Completely homogenous



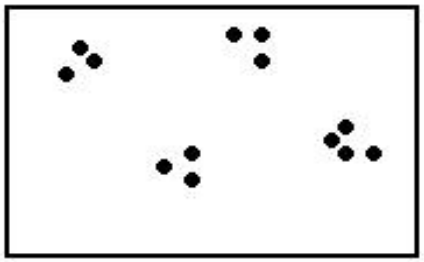
Majority are similar, with a few outliers



Split about 50/50



Completely scattered



Highly diverse groups

APPENDIX III: PHASE ONE REPORT

CONSERVATION INCENTIVES FOR PRIVATE COMMERCIAL FARMERS IN THE EASTERN CAPE'S SUBTROPICAL THICKET BIOME: REPORT ON PHASE ONE

The aim of the pilot phase was to obtain a general impression of land use patterns and practises in the study area, to achieve a better understanding of the nature and causes of pressures on thicket, and to gain provisional insights into farmer attitudes on various agricultural pressures on thicket and conservation. The purpose of the pilot phase was to inform and guide the second phase, which will consist primarily of personal interviews with a larger sample of commercial farmers within the study area. The pilot phase is expected to help determine the nature of questions posed to interviewees in the second phase, as well as to guide the survey methodology of the second phase.

Apart from literature reviews, the pilot phase required that a number of key individuals be interviewed, the details of which are provided below. The pilot phase time frame coincided with two farmer workshops held by STEP (Subtropical Thicket Ecosystem Planning), and these were incorporated into the pilot phase. The first Thicket Forum was also held during this time, and a good deal of valuable information was gathered during this event. The pilot phase was scheduled to run from May to the end of August 2004.

STUDY AREA

The study area runs from the coast inland, following the STEP Fish Kowie Corridor until roughly 20 km beyond Carlisle Bridge. Fig 1 shows the Fish Kowie Corridor.

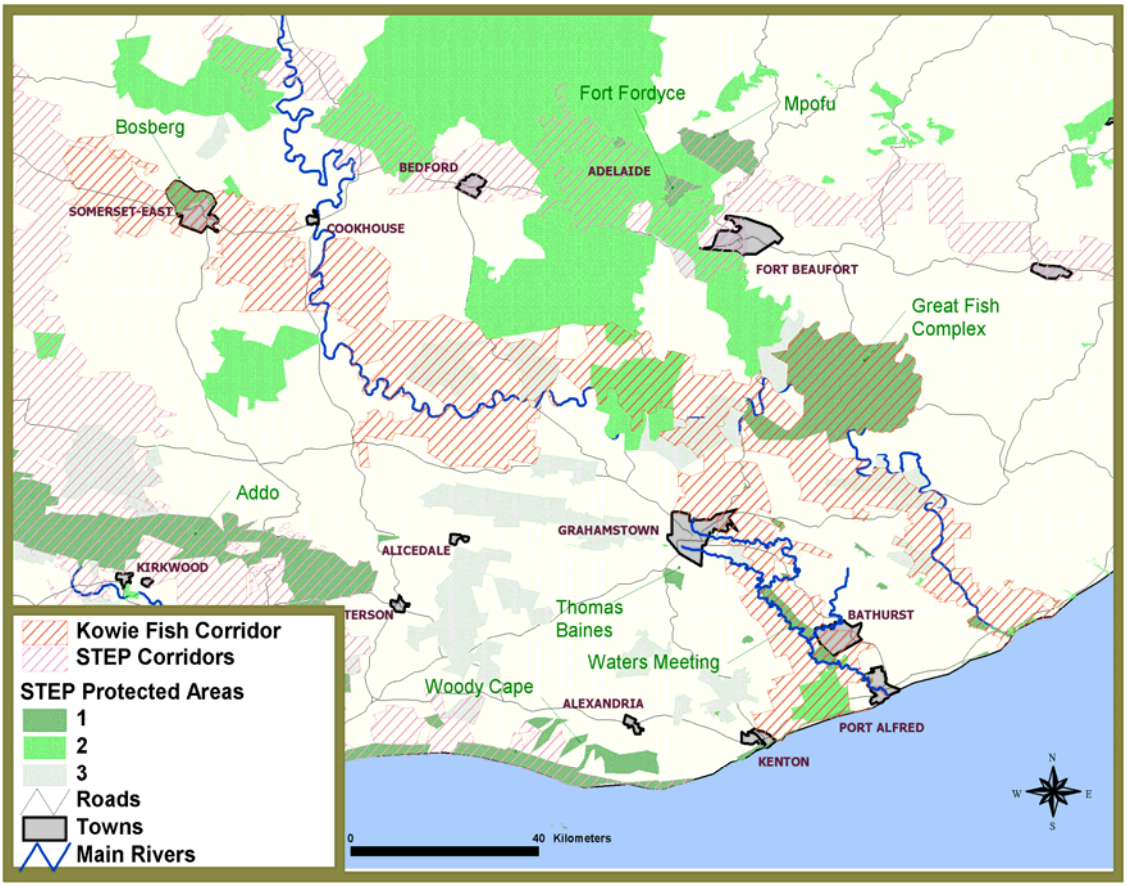


Fig 1: Fish Kowie Corridor

METHOD

STEP workshops

Two workshops were held by STEP to inform local farmers of the STEP project. The half day workshops took place in Grahamstown and Somerset East on consecutive week days. Local farmers were informed of the workshops in advance through their local farmers associations.

The workshops were attended merely to observe and record responses and issues raised by participating farmers. These findings contributed to the development of the pilot phase survey conducted with local farmers association chairpersons.

The Grahamstown workshop was attended by 28 individuals, the majority of which were local farmers. The Somerset East workshop was attended by only seven local people, five commercial farmers and farmer's wives, one representative of a

communal farm, and a conservation extension officer. Although the group was significantly smaller than expected, this seemed to facilitate a good deal of discussion that did not occur at the Grahamstown workshop.

Individual Key Interviews

I met informally with a few key informants before conducting the interviews with farmers associations. These informants and the topics discussed are shown in Table 1.

Table 1. Name, position held and contact number of key individuals interviewed in Phase One

Dave Murray, Pineapple Research Farm in Bathurst	Nature of pineapple farming in South Africa; pineapple farming in the Bathurst area; the pineapple market; pressures experienced by local pineapple farmers
Dr Martin Hill, Department of Zoology and Entomology, Rhodes University	Environmentally friendly alternatives to pesticides used on chicory crops
Quintus Hahndiek, Manager for the Settlers Sub-Region, Environmental Affairs, Department of Economic Affairs, Environment and Tourism (Eastern Province)	Pressures of agriculture on subtropical thicket; conservancies in the Settlers sub-region
Xolani Mkutshulwa, Bathurst agricultural extension officer	Information on land use; the extent of particular land uses; information on land units; the corresponding landowners and their contact details
Patrick Nelani, Grahamstown agricultural extension officer	Information on land use; the extent of particular land uses; information on land units; the corresponding landowners and their contact details
Prof Goeff Antrobus, Department of Economics and Economic History, Rhodes University	The state of stock farming in the area; conversion of stock farms to game farms; possible opportunities for investigating a willingness to accept compensation for landowners

All of the above interviewees were initially contacted telephonically or via email, and a meeting was arranged at their place of work.

Farmer Representatives

With the primary aim of the pilot phase being to inform phase two, interviews with the chairpersons of local farmer associations and the local farmers league were conducted in order to obtain a greater understanding of the nature of farming and the farmers within their respective areas. A farmers association is the major representative body for farmers in South Africa.

A list of local farmers associations, chairpersons and secretaries was obtained from the Bathurst Agricultural Extension Officer. The information proved to be outdated, but individuals on the list were telephoned and directed me to the current chairpersons and in some cases, provided their contact details numbers. The current chairpersons were then telephoned. The purpose of the telephone contact was to introduce myself, briefly describe the study, and arrange a meeting with the individual. In most cases, I arranged to visit the individual on his or her farm.

Six farmers association chairpersons were interviewed, covering the areas of Bathurst West; Lower Albany and Bathurst Border; Carlisle Bridge; Central Albany; Eastern Border and Koonap (see Table 2 for the names and contact details of the relevant farmers association chairpersons). Originally, the Coombs Farmers Association was to be included in this round of interviews, but I was unable to set up an interview with the Coombs Farmers Association Chairman in the given time. The chairperson of the local Farmers League was also interviewed, which covers the Albany and Bathurst areas.

Table 2. Name, represented farmers association and contact number of farmers association chairpersons interviewed in the pilot phase.

Name	**Farmers Association represented**	**Contact number**
Colin Stirk	Bathurst West	082 659 2905
Rob White	Carlisle Bridge	046 622 3512
Rodney Austin	Central Albany	046 622 8840 083 697 9163

Merrick Clayton	Eastern Border	046 625 0932
Dick Palmer	Koonap	046 636 7981
Gloria Oxenham	Lower Albany and Bathurst Border	046 636 1051
Raymond Schenk	Albany and Bathurst Farmers League	046 625 0097 083 558 3195

The interviews with local farmers association chairpersons followed a semi-structured format, with both open- and closed-ended questions (Babbie and Mouton, 2001). As part of the pilot phase, it was not felt necessary to obtain a great deal of personal information from the interviewee. Apart from confirming contact details, the first language of the interviewee was established, and the name of his/her farm was obtained, to add to a developing database of farm names and owners.

The physical extent of the represented farmers association was determined, with the aid of a [scale] map of the study area and surrounds. The estimated percentage of farmers within the farmers association area that belonged to the farmers association was established. The interviewee was then asked to describe the land use practises within his/her area, and highlight the most common land use practises. The open-ended structure of the questions allowed for the interviewee to elaborate on his/her answers, in most cases discussing the various land use practises.

The presence of conservancies within the farmers association area was established. If the interviewee responded positively, a contingency question (Babbie and Mouton 2001) was posed on possible reasons for the participation of farmers in conservancies. Similarly, the existence and nature of tourism initiatives within the area was also discussed.

One of the motivators for a pilot phase was to determine the required sample size for phase two. This sample size should be partially dependent on the homogeneity of the sample units. With this in mind, the interviewee was asked for his/her opinion on the range and variety of land use types, land use practises and farmer demographics, their history of occupation i.e. the number of farmers whose families have been farming for generations as opposed to new (first generation) farmers, and the general

mind-set of farmers. For instance, on the topic of age, interviewees were not asked "what is the general age of farmers in your area", but rather "how are the ages of farmers in your area distributed", in order to determine if there was, for instance, a spread of ages from 20 to 70, or if there was significant grouping. Given the potential difficulty for interviewees to describe their answer in an open-ended manner, and the need to clarify the question with examples, this question was close-ended (Babbie and Mouton 2001), with five possible options provided for each sub-question. A cue card was used to aid the interviewee in understanding the different distribution types (see Appendix II for cue card).

Interviewees were then queried on pressures that affect farming in their area. This question was initially posed as an opened-ended question, and the interviewee was able to discuss any issues he/she felt to be of particular importance. Once the interviewee had covered all the points they regarded as important, the interviewer raised a number of issues that had emerged as problems encountered by farmers in South Africa. In particular, these issues have been highlighted by farmers at the STEP workshops (Hahndiek pers comm. 2004) and the Conservation Stewardship Pilot Project in the Western Cape. These issues were raised with the farmers to determine whether they were felt to be important to farmers in this area. Conservation incentive literature suggests that it is crucial that incentives address the specific needs of the targeted farmers in order to be of any value to the landowners (Botha 2001; Langholz *et al.* 2003). If the issue had already been discussed by the interviewee, it was not reintroduced for discussion. These issues were:

- Markets
- Agricultural extension services
- Access to information
- Farm security
- Personal security
- The new rates bill

Finally, the interviewer was requested to give his/her opinion on the general attitude of the farmers within his/her farmers association area on:

- Alien invader plants
- Pesticides
- Problem animals
- Soil conservation

- Biodiversity conservation

Alien invader plants, the use of pesticides and eradicating problem animals have all been highlighted as agricultural pressures on thicket (Cowling *et al.* 2003; Knight pers comm. 2004; Hahndiek pers. comm. 2004). Conservation incentive literature suggests that each pressure and its root cause be isolated and addressed by at least one incentive (McNeely 1988; Young *et al.* 1996), and it is important to determine whether these pressures are also perceived as problems by farmers or not. Similarly, it is necessary to understand farmers' stance on soil conservation and biodiversity conservation, as farmer attitudes play a crucial role in the effectiveness of conservation incentive programmes (Winter 2003; van Kooten 1992).

Interviewees tended to respond to this question by not only providing information on attitudes, but also on the issues themselves, for example discussing the problem of alien invader plants within the area.

RESULTS

This section summarises insights gained from interviews with key individuals, the STEP workshops and interviews with local farmers associations and farmers league chairpersons.

Land use ranges from various crops to livestock and game farming. Few traditional farmers (i.e. not game farmers) rely significantly on tourism, although it is a source of additional income to some. Farmer's organisations and institutions play a considerable role for farmers, with the local farmers association being a source of information and support as well as a means of communication. The majority of farmers are aged between forty and sixty, and traditional farmers often have families that have been farming for three generations. Most game farmers, game reserve owners and game reserve managers, however, do not have this family history of farming.

Farmers in the study area face a number of pressures, some state related, some market related, and others related to the natural environment in which they operate. New labour laws and a large reduction in government subsidies are seen as significant financial pressures. The extreme decrease in government provided agricultural extension services, and the subsequent lack of technical advice and support necessitate the need for costly private agricultural consultants. The new

municipal rates bill is considered a possible threat to farming, although farmers are unsure of the full effects this will have on them. Personal security is considered to be a problem, although some farmers believe the threat has decreased over the last few years. The threat of stock theft has led to a number of farmers switching from stock farming game or crop farming, and is also one of the motivating factors for the formation of conservancies.

The occurrence of problem animals is relative to the type of land use. Crop farmers consider bushpig, warthog, porcupines and baboons to be a concern. Stock farmers hunt and poison lynx and jackal, which they see as a threat to their animals. Bush encroachment is a concern of farmers and conservationists alike.

The attitudes of farmers towards three pressures on thicket were investigated, namely alien invader plants, the culling of problem animals and biodiversity conservation. While many farmers consider alien plants to be a problem, the increasing cost of labour and pesticides are prohibiting them from clearing their land. Farmers attempt to protect their crops or livestock from problem animals with fences, but this is not always an effective method. As a result, problem animals are also hunted, often with trained hunting dogs, poisoned or trapped. There is some degree of friction between traditional farmers and private reserve managers, particularly over the hunting of problem animals. There appear to be mixed attitudes towards formal conservation, with some farmers claiming good relationships with local reserve managers, and others reporting a negative sentiment towards formal conservation, even among farmers with a pro-conservation sentiment on their own land.

The above pressures on agriculture and thicket have helped to identify a number of potentially effective conservation incentives, including financial incentives, labour assistance, information provision, green branding, education and awareness raising.

<u>Diversity of land use</u>

Land uses within the pilot phase study site include:

Small stock farming

- Merino sheep
- Dorper sheep
- Angora goats

Large stock farming

- Beef cattle

- Dairy cattle
- Ostriches

Crop farming

- Pineapple
- Chicory
- Vegetables
- Fruit orchards

Game farming / game reserve

Every farmers association area contained at least one privately owned game farm, with the largest percentage of land units converted from agriculture to game within a farmers association being estimated at 50%. Many farmers practised mixed farming, deriving an income from both game and stock on their land (Turpie 2003).

Crop farming and beef cattle occur along the coast and inland as far as Grahamstown. Beyond Grahamstown, small stock farming, ostriches and game predominate. The dairy farms are centred around Alexandria. Fruit farming is practised in Central Albany, south west of Grahamstown. Pineapple farming appears to be the most predominant land use in the coastal areas, while small stock predominates inland.

Within individual farmers association areas, most farmers practised similar land use types, with a few farmers engaged in different land use. For example, within one of the coastal areas, most farmers concentrated on pineapple crops with a few beef cattle on their land, while a few farmers had only beef cattle. Only one area, Central Albany, appeared to maintain a high variation of land use types.

Prevalence of conservancies

Most farmers association areas include at least one conservancy. Most conservancies consist of neighbouring farms, although one (Ecca Conservancy) is made up of scattered farms. The major motivators for landowners forming or joining conservancies appear to be hunting and conservation. The manager of the Settlers Sub-Region of Environmental Affairs, DEAET, believes the main motivator to be the increased security resulting from a conservancy, followed by the reduced costs of land management due to economies of scale, as well as extended hunting season concessions granted to conservancies with Certificates of Adequate Enclosure.

Tourism benefits

Every farmers association reported some form of tourism initiative within their area. Game farming brings foreign and domestic hunters into the region, and bed and breakfasts and lodges on farms provide additional income to farmers. Among the traditional farms, there appeared to be small number of bed and breakfasts, but the occurrence of this did not appear to represent a significant income generator for the traditional farmers.

Farmers organisations and institutions

"Organised agriculture farmers" refers to farmers who belong to farmers associations. Farmers organisations are four-tiered. At the lowest tier are farmers associations. Next is the farmers league, such as the Bathurst and Albany Farmers League. The farmers leagues fall under a provincial body – in this case the Agri Eastern Cape. The upper tier is a national body – Agri SA.

Farmers associations play a major role for farmers. These organisations lobby on behalf of farmers, and assist communication among farmers and between farmers and other organisations. In many cases, farmers associations are attempting to fill the role that agricultural extension services used to play.

One interviewee maintained that farmers could be categorised into those that belong to organised agriculture (i.e. those who belong to farmers associations) and those that don't. Organised agriculture farmers tend to have similar ideas, compared to farmers not involved with organised agriculture.

Pineapple farmers in the Bathurst area attend monthly study group meetings, held at a different participating farmer's home each time. According to Murray (pers comm. 2004) all the pineapple farmers in the area participate in this programme. Farmers discuss issues pertinent to pineapple farming, such as production methods and current markets. It does not appear that any of the other produce farmers hold regular formal meetings. There was a soil conservation committee consisting of local crop farmers; however, this has fallen away. There appears to be talk of re-establishing this committee, but nothing concrete has happened yet.

Farmer profiles

Age of farmers

Most farmers are between 40 and 60 years of age. The younger farmers were generally children who have returned to farming after studying [or traveling / gaining experience elsewhere]. Two interviewees claimed that there is no significant grouping in the age of farmers.

History of occupation

Most areas support families who have been on the land for a number of generations, with few first generation farmers. However, almost all of the game farms are run by first generation farmers/landowners. Only one area is farmed by mostly first generation farmers.

Homogeneity of general attitudes

No clear pattern could be ascertained on the homogeneity of farmers' general attitudes. Interview responses ranged from farmers being completely homogenous in their attitudes, through to completely scattered and highly diverse groups. One interviewee commented that farmers are very independent people, with each having their own opinion. Another claimed that most farmers within his area are conservative, although there are a few "progressive" farmers, giving the example of those farmers who are practising holistic farming.

The remainder of this report provides insight into farmer attitudes on specific topics, covering pressures on agriculture in the region, and pressures on thicket in the region.

<u>Pressures on farmers</u>

Labour laws

According to the farmers association chairpersons, the new labour laws appear to be the most pertinent issue facing farmers in the study area. These laws set a minimum wage, and prohibit [piece meal] payment and casual labour. As a result, farmers are switching to less labour intensive practises and employing less labour.

This may be an opportunity to provide labour or subsidise labour for conservation related actives, such as alien clearing or fence fixing. The Western Cape Nature Conservation Board (WCNCB) offers farmers subsidies of varying magnitudes for the labour component of alien clearing as part of their Conservation Stewardship Pilot Programme.

Agricultural extension services

Government agricultural extension services have shrunk from being a prominent element in formal agriculture to basically a non-entity for private farmers. The extension service previously provided assistance with the planning of any development schemes, was a source of general information and advice, and ensured that farmers abided by established requirements in order to qualify for subsidies. The extension officer also provided a link between farmers and the government. While most farmers currently on the land had exposure to the previous agricultural extension service, the future generations of farmers will be in a worse situation, having had no contact with the service for advice and technical support.

In some cases, the local farmers association is attempting to fill the role that agricultural extension officers used to play, while in others landowners find it necessary to seek advice from costly private consultants. Concern was also voiced over the lack of state veterinary services.

The lack of an effective government agricultural extension service for commercial farmers provides an opportunity for an external body to offer one or all of the absent services. This external body could provide information to farmers, offer advice and technical support, or form a communication link between commercial farmers and government. Two options exist here:

1. The service could be available to all farmers in the district. Along with the provision of support services on general farming matters, the service could also ensure that pro-conservation techniques are communicated to the farmers, and possibly provide a vehicle for conservation awareness and education. This would provide a voluntary incentive to landowners.
2. The service could be provided only to farmers who are party to certain pro-conservation agreements, and are practising pro-conservation agriculture. This takes the form of an informational incentive – where farmers are receiving a service in return for an action of their behalf.

Government support

Apart from the absent agricultural extension service, a number of pressures were raised that concerned government support for farmers. There was a call for renewed government subsidies, although some farmers recognised that this was unrealistic request. It was suggested that government support local meat producers rather than importing meat. It was also communicated that fencing, which is crucial for good

land management, is extremely expensive for farmers. This also applies to alien invader plant herbicide subsidies for that have recently been removed.

These issues all translate into financial pressures felt by local farmers. These could be met by a number of incentives in return for pro-conservation practise. Pure financial incentives could be offered – i.e. payment in return for conservation action by farmers. Alternatively, they could be met by an incentive implementing agency subsidising or obtaining reduced prices on commodities that aid pro-conservation farming, such as the above-mentioned herbicides. Finally, the incentive implementing agency could simply offer to lobby for subsidies for farmers from government – a service-based incentive.

Markets

Many farmers experience financial pressures. With the current strength of the Rand, wool, mohair and ostrich prices are down. A suggestion from one of the stock farmers was that government support local meat producers rather than importing meat.

Pineapple farmers are also significantly affected by the performance of the Rand. Pineapples produced in the Eastern Cape are canned, and around 70% of the produce is shipped to the European market. However, entry tariffs and thresholds act as significant barriers for South African suppliers, and farmers are paying up to 12% more than producers in other countries to get into the overseas markets. All of the commercial Eastern Cape pineapple producers are Europgap accredited, although the accreditation body is felt to be fairly protectionist.

Market pressures provide the opportunity for two possible types of incentives. Firstly, financial incentives may be seen as a way of spreading risk and allowing for an additional income. Secondly, there is an opportunity for farmers to market their produce as “environmentally friendly”. A conservation organisation could provide a certification programme, and farmers could label their products accordingly. It is recognised that not all markets have opportunity for green labeling – for instance, there is probably not a very large market for environmentally friendly goats. However, other products may suit this type of branding, such as some of the crops (pineapples, chicory, vegetables). A good example is the badger friendly honey that farmers in the Western Cape are producing.

Problem animals

Problem animals were raised as a concern by two interviewees. This issue was also explicitly discussed with all interviewees. Farmers with different land uses consider different animals to be pests. Crop farmers in the Eastern Cape thicket find warthog and bushpig to be a significant problem, and porcupines and baboons to a lesser extent. Warthog and bushpig burrow under or damage fences, and destroy farmer's produce. The holes left by these animals allow other pest animals, such as lynx and jackal, to enter, which is of particular concern when a landowner maintains both crops and stock. Small livestock, such as goats, are also able to move through these holes in the fences, making it difficult for farmers to manage their livestock grazing. Warthog are not believed to be indigenous to the Eastern Cape, and were introduced a number of years ago by a provincial game reserve. Kudu also pose a problem to farmers who have lucerne crops, and are fenced out of these fields with kudu proof fences.

Stock farmers consider lynx (also called caracal or rooikat) and jackal to be their major pest animals, with lynx being highlighted as the more problematic and abundant of the two by local farmers association chairpersons.

Fencing is used as a passive control mechanism for pest animals, and electric fencing, although often prohibitively expensive, is more effective. Farmers also actively control the animals by hunting, trapping and poisoning the animals. Hunting is often done with specifically bred and trained hunting dogs owned by the landowners. The ownership of these hunting packs is, however, decreasing, as they are becoming increasingly costly to maintain. However, hunting is not done simply as a control mechanism. The sport of hunting on farms is also a recreational activity, and during the hunting season neighbouring farmers get together on one of the farms each weekend for a hunt, particularly bushpig and warthog. Whether this would continue even if the animals were somehow stopped from damaging crops is an issue that requires investigating.

Many farmers believe that pest animals, in particular warthog, bushpig, lynx and jackal, are being protected by neighbouring private and state reserves. This is causing friction, particularly between commercial farmers and private reserve or game farm owners. The main point of friction is that the problem animals, when chased by hunting dogs, return to the reserves as a place of safety, and the reserve or game farm owners do not allow the dogs onto their land.

Problem animals on farm land appear to be a highly sensitive issue, and one that cannot be ignored. Reaching a compromise between conservationists and farmers will require an innovative approach. In the past, farmers were compensated by the government for livestock that was killed by problem animals, but this is no longer practised. Providing electric fencing is expensive, and not a guarantee that the animals would be controlled. It may be necessary that, in return for an incentive, farmers may continue to hunt the animals during hunting season, but are prohibited from using traps and poison on the animals.

Bush encroachment

Bush encroachment of indigenous woody plants appears to be another problem experienced by farmers. This occurs mainly on disturbed land, which experiences a predominant *Acacia karoo* pioneer establishment. On this issue, both conservationists and farmers consider bush encroachment to be a concern. It might be possible, therefore, to combat bush encroachment through simply providing farmers with the necessary information on managing this issue – an information incentive.

Information

Some farmers complained of a lack of information on sound land management, and expressed an interest in obtaining more information on this. It was felt that farmers do not know who to approach for advice on managing their land. In particular, a request was made for copies of the STEP handbook, which was developed for Local Municipalities. It was also voiced that academics do not involve farmers in their research on farm related topics.

This lack of information appears to be largely a result of the collapse of the agricultural extension service for commercial farmers. An opportunity therefore exists to fill this role and provide a conservation incentive. This has been outlined under “agricultural extension services” above.

Security

Stock theft is another significant problem, which has resulted in farmers switching from small stock to either game or crop farming. In some areas, landowners patrol their own and neighbouring farms to prevent stock theft. Some conservancies employ staff to patrol. It has been suggested that the improvement of perimeter fences

necessary for game farms may decrease stock theft on stock farms that are surrounded by game farms.

While personal security is always a concern for farmers, particularly the more isolated landowners, a number of interviewees felt that the threat of crime (such as personal robbery and farm attacks) has decreased considerably over the last few years. Some concern was voiced over the disbandment of the commando structure. This rural SADF unit is largely made up of local volunteers, primarily farmers, who provide support to the local police force in rural areas. The Commando structure has the advantages of its members knowing the area well; often being closer to the site of a reported crime than the nearest police station; and having more suitable vehicles to traverse farm roads. This SADF structure is to be phased out by 2009.

The concern over security could be used as a motivator to establish more conservancies, for which one of the motivators is increased security. However, the true value of conservancies as a vehicle for pro-conservation farming is yet to be determined, and there is definitely scope for increasing the service that conservancies provide to conservation outside of reserves. There is also an option to provide some form of security service for farmers as an incentive. However, this proposed service is far removed from the implementation of pro-conservation land management and may provide both operational challenges as well as ethical issues to a conservation incentive implementing agency.

Rates bill

The new rates bill was not raised by any of the interviewees as a problem for farmers. However, this may be due to the fact that it has not yet begun to impact the farmers and awareness has not yet been raised. When the subject was broached by the interviewer, most interviewees agreed that the new rates bill would be a problem for farmers. It appears that, in general, farmers are waiting to see what will happen, and are unsure of the full effect of the new bill.

Having identified municipal rates as a concern of local farmers, WCNCB offers varying degrees of municipal rate rebates to landowners enrolled in their Conservation Stewardship Programme. If farmers in the Eastern Cape thicket biome are concerned about the effect of the new rates bill, a similar incentive could be effective in this area. Given that Local Municipalities (LMs) are currently established

the new rates system, there exists a window of opportunity for pro-conservation practises on farmland to be inserted as a justification for a rate rebate.

Pressures on Thicket

Alien invader plants

All interviewees felt that alien invader plants are viewed as a serious problem by farmers in their area. The drier parts of the study area are infested primarily with succulents such as jointed cactus and prickly pear, while the areas nearer to the coast that experience a relatively higher rainfall, provide a suitable habitat for eucalyptus, pine, lantana, black wattle and hakea.

Many farmers are no longer attempting to eradicate the plants, due primarily to financial constraints. Clearing invader plants have two major cost implications for landowners. Firstly, some of the species, such as jointed cactus, are best controlled with herbicide. This was previously heavily subsidised by government, but this state assistance is no longer offered. Secondly, the new wage laws and the resulting reduction of permanent staff have resulted in landowners having a lack of labour to clear alien invader plants. Some landowners do not consider alien invader clearing to be their responsibility. The cost of herbicides and labour are therefore not the only factors affecting alien plant clearing.

The WCNCB Conservation Stewardship Pilot Programme offers subsidies of varying magnitudes on the labour component of alien clearing to participating landowners, which could also be a successful incentive in this area. It would also be useful to investigate the opportunities for renewing subsidies on herbicides for alien invader plants.

Culling Problem Animals

This is covered under *Problem Animals* above

Attitude towards Conservation

Interviewees claimed that farmers had a good attitude towards conservation. However, “conservation” was not always viewed by the interviewee as holistic biodiversity conservation, but rather as conservation of elements that are of particular use to the landowner. For example, soil conservation is important for pineapple farmers, and a landowner who practises good soil management is viewed as a good conservationist. Also, farmers who derive an income or enjoyment from hunting

consider themselves to be good conservationists for maintaining buck on their land. It may be found that a raised awareness among farmers of the importance of biodiversity on their land, rather than the importance of individual species, could result in a greater willingness to practise sound land management.

Crop farmers, particularly the pineapple farmers in the Bathurst area, are said to practise good soil management, having made positive changes in the farming system. The commonly practised trash incorporation system aids water retention and replaces nutrients in the soil. It is also believed that South African pineapple farmers practicing the best run-off control system in the world (Murray, pers comm. 2004). The local soil conservation committee for crop farmers, which has unfortunately fallen away, awarded a soil conservation farmer on a yearly basis. This simple system of acknowledging a landowner's conservation efforts may be effective in encouraging conservation behaviour among some farmers. The committee, which was made up of local farmers, also offered advice to participating farmers, much like the working groups in the Bathurst area. The committee seems to have been dissolved due to lack of funds. The establishment of a funded reward system, made up of farmers and a conservation representative, may be a good investment for conservation.

A local chicory farmer is currently running trials on his farm with the Rhodes University Zoology and Entomology Department to develop an environmentally friendly pesticide. The University was approached by the farmer, who was concerned about the effect of pesticides on his land. This signifies a proactive conservation attitude among certain farmers. If this attitude could be rewarded, it may encourage the development of a similar mindset among other farmers. A "green reward" scheme may be effective here.

It was reported that landowners bordering on the Kap River Reserve, a municipal reserve near the mouth of the Great Fish River, and those bordering on the [provincially owned] Great Fish River Complex Reserve had good relationships with the reserve managers. However, a number of interviewees reported tension with private reserve and game farm owners over the problem animal issue discussed above.

There is an increased awareness of the value of game among farmers, and many farmers supplement their income with hunting. On many farms, extralimital game has been introduced for hunting purposes.

There is a considerable increase in game farming in the Albany area and surrounds, occurring on traditional farming land units which have been converted to game farms. However, for a game farm to be successful it must be reasonably big, and there are a number of land units, currently supporting stock, that will not be large enough to convert to game successfully. Game farming also has significant fiscal barriers to entry, fencing costs very high, as well as the purchase of game, particularly compared the sale of agricultural animals. Some game farms combine "traditional" agriculture with game farming, maintaining some of their original stock, such as sheep or cattle, while introducing game on other sections of the farm.

There is a belief that game farming may have reached saturation point in the Albany area with the current level of travel among South Africans and overseas travelers, and those traditional farms that have not been converted to game farms yet will not do so (Antrobus pers. comm. 2004).

The hope that conservation practises will be better instilled in the land with the conversion of traditional farms to game farms is a dangerous belief. Firstly, game farming should not be mistaken for conservation, as a game farm can exist with alien vegetation, overgrazing and exotic species. Secondly, it may not be economically feasible or socially acceptable for all traditional farms to be converted to game farms. The challenge lies in maintaining a degree of traditional agriculture on the land, but incorporating sound conservation principles into the management of the land.

There appears to be a general fear among landowners of land expropriation, and the development of "another Addo" in the area. Farmers feel that they cannot compete against the dollar, and overseas money is being used to buy up land in their areas. One interviewee, farming in an area that includes two prominent private game reserves, believes that within ten years there will be almost no "traditional" farms left in the area, with landowners selling out and the land being converted to game farming and private reserves. The interviewee feels this is due to inflated land prices, where farmers cannot afford to buy more land to farm, and are simply "sitting tight" waiting for a buyer. The inflated land prices are a result of overseas investors purchasing land for private reserves.

There is also a need for channels of communication to be improved between farmers and conservation organisations, as it was reported that, even among farmers with

strong conservation motives, conservation organisations are still regarded as the "enemy" due to poor, top-down communication. This highlights the need to establish the fundamentals of conservation incentives – communication and education. The fear of land expropriation for state conservation must be removed if positive, synergistic relationships are to be built between farmers and conservation organisations.

A very telling comment was made during the pilot phase: "Education and prosperity must come before conservation [For farmers]" (Murray, pers comm. 2004). While some farmers may feel they have a positive attitude towards conservation on their land, their primary goal is to profit from farming. Education and awareness raising might go a long way in changing certain land management practises, but ultimately farmers must believe they are benefiting from incorporating a land use change on their farm.

The negative relationship between private game reserves/farms and traditional farmers may hamper meeting certain conservation objectives on farm land. In particular, the contention over problem animals may slow the process of incorporating a problem animal protection scheme into an incentive programme.

True to the nature of semi-structured questionnaires and open-ended questions, a great deal of useful information was obtained from some interviewees, while others provided less information. This was particularly apparent in the last section of the interview, which consisted of the two open-ended questions of landowner issues and the general attitude of landowners towards conservation-related issues. However, it was felt that all interviewees did participate positively in the interviews. Phase Two will rely more heavily on closed-ended questions.

Subsequent changes to project plan

Given the diversity of land use within the commercial farming community in the study area of the pilot phase, as well as the multiple land uses on individual farm units, it would be difficult and possibly inappropriate to delineate two distinct study sites based on farming practises, as originally envisaged. Rather, it is proposed that only one study area be considered, delineated by the STEP Fish Kowie Mega Conservancy Network, and extending to Carlisle Bridge. Furthermore, viewing the area as one study site rather than two will allow for a larger number of samples within

the study site. The effect of land use on the type of incentives chosen by landowners will still be tested.

The results of the pilot phase interviews have helped to identify a number of incentives that may be effective in the area. The acceptability of these incentives will be tested in the second phase through interviews with farmers within the study area. These incentives are:

- Subsidy on the labour component of fence maintenance
- The provision of technical advice and support
- Cash payments for setting aside corridors
- Subsidised herbicides
- A body to lobby government on behalf of farmers
- A green labeling scheme for products
- A green award system for farmers
- Compensation for livestock losses due to predators
- Financial assistance with erecting electric fences
- Labour assistance for erecting electric fences
- Information and advice on managing bush encroachment
- Labour assistance for managing bush encroachment
- Formation of conservancies to create corridors
- Municipal rate rebates
- Subsidy on the labour component of alien clearing
- Provision of labour for alien clearing
- Provision of labour for fence maintenance

On the subject of future meetings with local farmers, workshop participants suggested that organisers work through the local farmers associations, and possibly address farmers at farmers associations meetings. Apart from communicating through farmers associations, meetings should be advertised in the local press and agricultural press.

Potential barriers and bridges

Traveling costs resulting from both distance traveling as well as driving on poor roads for farmer interviews are expected to be high. To minimise this, the study area will not extend inland beyond Carlisle Bridge. Furthermore, whenever possible,

interviews will be conducted when farmers visit Grahamstown, or their local town. An attempt will be made to arrange meetings with farmers in the same area in a day.

In order to produce statistically sound results, the expected number of subjects has increased from what was previously envisioned. It may be found there is not enough time to interview all these people myself. A potential solution is to utilise other trained students to conduct some of the interviews. It may be necessary to attend farmers association meetings to introduce myself and my research before the interviews begin.

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APPENDIX IV: PHASE TWO INTERVIEW SCHEDULE

This questionnaire is entirely confidential. The information will be used for academic research purposes only, and we guarantee the anonymity of respondents. All respondents will receive a summary of our key findings, and a copy of their completed questionnaire

The focus of this research is on identifying potential incentives to encourage commercial farmers to incorporate pro-conservation practices into their management systems.

DATE: **NUMBER:**

SECTION A: BACKGROUND INFORMATION

A.1) Name of farm:

A.2) Name of interviewee:

A.3) Name of person(s) responsible for long term, strategic decision making (if different from A.2):

A.4) Name of manager (person responsible for day to day decision making) if different from A.2 or A.3):

A.5) Postal Address:

P O Box …….. ……..

……Postal Code: ……

A.6) Phone:

H …….. W……

Cell……..

A.7) Email address: ……

BIOGRAPHICAL DETAILS OF STRATEGIC 'LAND USE' DECISION MAKER

A.8) Gender	1. Female		2. Male	

A.9) Age Group

1. 29 or younger		2. 30 - 44	
3. 45 - 59		4. 60 or older	

A.10) First Language

1. English		2. Afrikaans		3. Other	

A.11) Number of generations your family has been farming:

A.12) Do you belong to the local farmers association?

1. No			
2. Yes		Name of Association:	

A.13) If yes: how does your membership of the farmers association benefit you?

SECTION B: LAND UNIT INFORMATION

B.1) For how many years have you and / or your family farmed this particular farm?

B.2) What is the size of the property? (ha):

B.3) What are the different land uses on the farm? (including non-extractive e.g. eco-tourism)

	Land use	Approximate hectares of land cover on farm (or %)	Percentage contribution to income	For how many years has this particular land use been practised on the farm?
1				
2				
3				
4				
5				
6				
7				

B.4.1) Are you a part of a conservancy?

1) Yes	
2) No	
3) Planning to form one	
4) Was previously in one	

B.4.2) Explain answer:

B.5) If yes, what is the name of the conservancy?

B.6) Do you have any tourism initiative on your farm?

1. Yes		2. No	

B.7) If yes, what is it?

B.8) Are you planning to sell your farm within the next five years?

SECTION C: SPECIFIC ISSUES

C.1) How do you feel about the following statement:
The government pays too much attention to conservation in SA

Strongly agree	Agree	Neutral	Disagree	Strongly Disagree

C.2) LAND TRANSFORMATION

C.2.1) Protection of plants and animals on private land should be the responsibility of:

1. The private landowner	
2. A governmental conservation body	
3. Primarily the private landowner, with assistance from a conservation body	
4. Primarily a conservation body, with private landowner assistance	
5. Equal partnership	

C.2.2) Can you estimate how many hectares of natural vegetation you have on your land?[2]

……ha

C.2.3.)How would you categorise the land covered by natural vegetation?

	Land unit 1	Land unit 2	Land unit 3
1. Prime agricultural land			
2. Marginal land			
3. Potential use land			
4. Useless land			

- **Explain why you say this** _____

For the largest portion of land:

C.2.4.) Which of the factors below influence the decision not to transform this vegetation?

	Major influence	Some influence	No influence
Financial considerations			
Conservation considerations			
Farm Management considerations			
It is physically impractical to use this land			

Other……

C.2.5.) Do you have any future plans for this land?

1. Yes		2. No	

C.2.6.) If yes, what do these plans involve?

1. Incorporation into existing agricultural land use, namely:

2. Development into a new land use, namely:

[2] 'Natural vegetation' is defined as vegetation that has not been cleared or changed through e.g. alien plant invasions during the past 30 years

3. Maintained as natural tracts of land
4. Other, namely:

C.2.7) What prevents you conserving more land on the property?

	Major influence	Some influence	No influence
1. Financial considerations			
2. Management considerations			
3. Time			
4. Don't see the need			
5. Other			

- **Explain why you say this:**

C.2.8) Having many different wild plants and animals on your farm is:

1.Very good	2. Good	3. Neutral	4. Bad	5. Very bad

C.3) ALIEN INVASIVE PLANTS

C.3.1) Are you currently controlling the spread of alien invasive plants on your land in any way?

1. Yes	
2. No	
3. You were, but not anymore	Why?
4. You plan to	

C.3.2) If yes, what are your motivating reasons?

	Major motivator	Minor motivator	Non-motivator
1. It's the law			
2. It is better for your farming practices			
3. It is important for biodiversity			
4. Other, explain			

C.3.3) Do you attempt/intend to clear all alien invader plant species, or just those that you feel to be affecting farming negatively?

C.3.4) To what extent do you agree with the following statements?

	strongly agree	agree	unsure	disagree	strongly disagree
The benefits from the control of alien invasive plants should match the cost of the control					
The spread of alien invasive plants is the responsibility of the landowner and therefore the cost must be borne by the landowner					
Landowners who have been controlling alien invasive plants in the past should be rewarded or compensated for their efforts					
The benefits from alien invasive plant control are mainly to the land owner					
Comments on the above					

SECTION D: INCENTIVES

[Explanation]

D.1) Would you be interested in changing some of your land use practices in return for some form of incentive, either financial or other?

1. Yes	
2. No	
3. Unsure	

Which of the following incentives sound attractive to you? Choose the three most attractive options, and rank them in order of acceptability to you (assuming all could be offered).

D.2) For conserving areas of natural vegetation on your land:

1. Assistance with the management of the tracts of natural land	
2. Tax deductions (other than the municipal land tax)	
3. Municipal rate rebates	
4. Information on managing natural tracts of land, indigenous plants and animals	
5. Green-branding for your farm products	
6. Law Enforcement (e.g. controlling snaring, monitoring of squatting)	
7. A green award system recognising farmer's efforts	
8. Tourism promotion (e.g. ecotourism advertisements made on your behalf)	
9. Other	
10. You wouldn't need any incentives	

D.3) For removing alien invader plants on your land:

1. Technical advice and information on alien vegetation clearing	
2. Assistance with marketing the secondary products e.g. charcoal, wood	
3. Assistance with alien vegetation clearing (resource provision, e.g. labour, equipment)	
4. Enforcement of clearing on neighbouring farms	
5. Subsidised herbicides	
6. Green branding for your products	
7. A subsidy on the labour component of alien clearing	
8. A green award system recognising your efforts	
9. Advice on legal compliance procedures	
10. Other	
11. You wouldn't need any incentives	

D.4) For developing and implementing an integrated/holistic environmental management plan for your farm:

1. Technical advice and information on environmentally responsible land use practices	
2. Financial assistance for developing and implementing an environmental management plan	
3. Labour assistance with implementing components of the plan	
4. Added value to your land	
5. A green award system recognising your efforts	
6. Green branding for your products	
7. Other	
8. You wouldn't need any incentives	

D.5) What would you require to set aside 10% of your land for conservation?

D.6) Would you be willing to have your farming practices monitored by an expert or authority as part of an incentive programme?

1. Yes	
2. No	
3. Maybe	

D.7) If you chose to enter into a contract that offered you incentives in exchange for conservation related behaviour, what do you consider to be the optimum duration of the contract?

D.8) If you were interested in joining an incentive programme, who would you prefer to deal with as the implementing agency?

	Yes, definitely	Yes, if no other alternatives existed	Definitely not
Eastern Cape Nature Conservation Board			
Dept of Agriculture			
Local municipality			
District municipality			
Provincial government			
National government			
Non-government organisation (NGO)			
Local farmers group			
Other (specify)			

D.9) Would you prefer to pioneer in a project, or would you be more comfortable becoming involved in a project that has been operating successfully for a few years?

1. Pioneer	
2. Join later	

E.) Would you like a summary of this report sent to the above address?

APPENDIX V: FARMER AND FARM CHARACTERISTICS DATA RESULTS

n = 38 unless otherwise stipulated

	Frequency	Percentage
Farmer age		
29 or younger	1	3
30 – 44	12	32
45 -59	22	58
60 or older	3	9
Farmer gender		
Female	1	3
Male	37	97
Farmer home language		
English	37	97
Afrikaans	1	3
Number of generations farmer's family has been farming		
First	4	11
Second	5	13
Third to sixth	29	76
Responsibility of decision making on farm		
Farmer is sole decision maker	20	57
Decision making is shared within immediate family	18	47
Decision making is made between farmer and external actor	0	0
Farmer membership of local farmers association		
Yes	25	66
No	13	34
Farmer belongs to a conservancy		
Yes	16	42
No	18	47
Planning to become part of a conservancy	1	3
Previously in a conservancy	3	8
Presence of tourism initiative on farm		
Yes or planning to start an initiative	8	79
No	30	21
Primary Income generator on farm		
Crop	17	45
Stock	14	37
Mixed (crop and stock farming contribute equally towards income)	2	5

Other	5	13
Primary land use on farm		
Crop	5	13
Stock	24	63
Mixed (crop and stock take up equal amounts of land on farm)	5	13
Other	1	3
Fallow	3	8
Number of income generators per landowner		
One source of income	4	10
Two sources of income	20	53
Three sources of income	12	32
Four sources of income	2	5
Farmer willing to sell farm for "right price" (n = 37)		
Yes	19	51
No	18	49
Farm actually on market (n = 37)		
Yes	1	3
No	36	97

Number of year's farmer has lived on current farm

Range	Mean	Median	Std Dev	Std Error
0.50 – 53.00	22.56579	22.00000	14.55751	2.361541

Farm size (n = 38)

Range	Mean	Median	Standard deviation	Standard error
30 - 3300	964.7105	681	835.606	

Number of income sources per landowner

Number of income sources	One source of income	Two sources of income	Three sources of income	Four sources of income
Frequency	4	20	12	2
Percentage	10.53	52.63	31.58	5.26

APPENDIX VI: QUESTIONS AND RESULTS ON FARMER ATTITUDES

Question C.1 “The Government pays too much attention to conservation:”

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Frequency	0	0	2	30	6
Percentage	0	0	5.26	78.95	15.79

Question C.2.1 “The responsibility of the conservation of plants and animals on private land should be:”

	Solely private landowner	Primarily private land owner, with government assistance	Equal partnership between private land owner and government	Primarily government, with private land owner assistance	Solely government conservation body
Frequency	5	23	7	2	1
Percentage	13.16	60.53	18.42	5.26	2.63

Question C.2.8 “Having many different wild plants and animals on your farm is:”

	Very good	Good	Neutral	Bad	Very Bad
Frequency	25	12	1	0	0
Percentage	65.79	31.58	2.63	0	0

Question C.3.4 “The spread of alien invasive plants is the responsibility of the landowner and therefore the cost must be borne by the landowner”

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Frequency	0	14	2	16	4
Percentage	0	38.89	5.56	44.45	11.12