AN INVESTIGATION INTO THE COMPLIANCE OF SELECTED NURSERIES AND GARDEN CENTRES WITHIN KWAZULU-NATAL ETHEKWINI AND THE UMSUNDUZI GEOGRAPHICAL REGIONS, WITH THE CONSERVATION OF AGRICULTURAL RESOURCES ACT 1983 (ACT NO. 43 OF 1983) CARA AND THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT 2004 (ACT NO. 10 OF 2004) NEMBA.

by

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DECLARATION

I, Astrid Badenhorst, declare that this dissertation entitled:

An Investigation into the Compliance of Selected Nurseries and Garden centres within KwaZulu-Natal EThekwini and the uMsunduzi Geographical Regions, with the Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983) CARA and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004) NEMBA;

is my own work, and has not been submitted before for any degree or examination and that all the sources have been indicated and acknowledged by means of complete references.

Astrid Badenhorst

Feb. 2011

DATE

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DEDICATION

This researcher would like to dedicate this work to her mum, Linda, and extends her sincere gratitude to Shawn and Darren for their support, patience and encouragement during the course of this dissertation.

ABSTRACT

This dissertation examines nursery/garden centre compliance with Invasive Alien Plant (IAPs) legislation in eThekwini and uMsunduzi, South Africa.

Despite South African governmental programmes, an apparent lack of public awareness regarding IAPs persists. The cost to clear IAPs in South Africa is estimated to be 12 billion Rand over 20 years.

Nurseries/garden centres should be able to increase customer awareness of IAPs. However, Government regulation/instruction of nurseries/garden centres seems inadequate.

A mixed methods approach involving quantitative and qualitative analyses of questionnaires, observations and interviews was used in this study.

There was little evidence that nurseries/garden centres stocked/sold CARA plants. However, they were stocking/selling NEMBA plants in spite of knowing CARA, NEMBA and indigenous alternatives. There is little interaction with relevant government/industry programmes.

It is recommended that the Department of Environmental Affairs institute a IAPs Advisory Committee to see to the dissemination and provision of relevant information and training concerning IAPs to the industry.

Key Words:

- Alien Invasive Plants
- Conservation and Agricultural Resources Act, CARA
- Invasive Plant legislation
- National Environmental Management: Biodiversity Act , NEMBA
- Knowledge of alien invasive and indigenous plant alternatives in eThekwini and uMsunduzi, South Africa,

TABLE OF CONTENTS

LIST OF APPENDIXES

LIST OF TABLES

LIST OF FIGURES

GLOSSARY

Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983),

CARA : Invasive Alien Plant legislation. CARA Regulation 15 was promulgated in 2001 and lists 198 plant species identified as declared weeds and invader plants under three categories:

- Category 1: Plant species that may not be grown anywhere in South Africa and must be eradicated;
- Category 2: Plant species with commercial or utility value, which may only be grown with a permit under controlled circumstances;
- Category 3: Plant species which have amenity value and which need not be eradicated, but which may not be planted, propagated, imported or traded

(Department of Water Affairs and Forestry, 2001; Hanks, *circa,* 2004; Wildy, 2005; Paterson, 2006).

Garden Centres: Core Business is selling plants and garden-related products, with added value lifestyle products and services affiliated to the business. Garden centres do not raise or grow plants on site

(http://gardencenternursery .wsu.edu/site/RetailNursery SiteSelection.html, *circa,* 2002).

Gatekeepers: People of authority, like business owners, managers and individuals who can provide and facilitate access for the researcher to a research site (Okumus *et al.,* 2007, p.10).

Invasive Alien Plants: Non-indigenous, exotic plant species that have been introduced either intentionally (for domestic or commercial use) or accidentally to an area and are aggressively out-competing and replacing indigenous vegetation, causing major impacts on natural resources (Wildlife and Environment Society of South Africa, 2010).

Mixed Methods Research: Combining both quantitative and qualitative research and methods in a research study. It involves philosophical assumptions and the use of quantitative approaches so that the overall strength of a study is greater than either quantitative or qualitative (Creswell, 2009, p.152).

National Environmental Management: Biodiversity Act 2004 (No. 10 of 2004),

NEMBA: Proposed invasive alien plants legislation. “Should the regulations become law, any species designated under section 70 cannot be propagated, grown, bought or sold by industry without a permit” (www.sana.co.za/NEMBA-Proposed-IAP-List-May-2009.pdf, 2009).

Nurseries: Core business is selling plants and garden related products, with no added value lifestyle products and services affiliated to the business. Some nurseries may buy in smaller plants and raise them into saleable plants or grow and propagate plants on a small scale on site (Regan, *circa,* 2002).

Qualitative Research: Research techniques are associated with the gathering, analysis, interpretation and presentation of narrative information (Creswell, 2009, p.4; Teddlie & Tashakkori, 2009, p.343).

Quantitative Research: Involves the "analysis of numeric data using a variety of statistical techniques" (Teddlie & Tashakkori, 2009, p.256).

Voluntary Codes for Nursery Professionals: The aim is to create and promote voluntary initiatives to prevent horticultural introductions of IAPs. These 'Codes' outline preventative measures such as monitoring new species for invasiveness and forgoing sales of known invasive plants. They encourage self-regulation by the horticulture industry, are in conjunction with regulatory laws and designed to ensure compliance with legislation (Bradshaw & Jones, 2005; Burt *et al*., 2006).

ABBREVIATIONS

CARA	Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983)
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
EDRR	Early Detection and Rapid Response
EEMD	EThekwini Environmental Management Department
GISP	The Global Invasive Species Program
IASP	Invasive Alien Species Programme
IAPs	Invasive Alien Plants
NDA	National Department of Agriculture
NEMBA	National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004)
NGOs	Non – Governmental Organisations
SAGIC	South African Green Industries Council
SAPIA	Southern African Plant Invaders Atlas
SANA	South African Nursery Association
SANBI	South African Biodiversity Institute
WESSA	Wildlife and Environment Society of South Africa
WfW	Working for Water
WfW NPP	Working for Water Nursery Partnership Programme
QUAT	Quantitative
QUAL	Qualitative

CHAPTER ONE

SCOPE OF THE STUDY

1.1 Introduction

South Africa has a major problem with invasive alien plants (IAPs) (Richardson & Van Wilgen, 2004, p.45). Studies have shown that IAPs impact negatively on biodiversity, natural resources and agricultural systems (www.gisp.org, 2003). Despite governmental legislation and programmes of Working for Water and the Wildlife and Environment Society of South Africa, there still seems to be a lack of public awareness regarding the extent of the problem (Wildy, 2002). This poses an obstacle to the effective implementation and management of control systems (Richardson, Henderson and Ivey, 2006, p.43).

Many of the IAPs within South Africa were introduced for agricultural [e.g. food crop] or horticultural [e.g. ornamental plant] cultivation (Wildy, 2005). In this light, the nursery industry is often accused of being a source of "garden escapees" [ornamental plants that were introduced for horticultural practices and later became IAPs] (Chin, 2006, p.1).

This is a significant issue for the Industry and, therefore, nurseries/garden centres have an important role to play in promoting responsible plant choices, garden management practices and to increase public awareness regarding IAPs to their customers, the general public (Richardson *et al.*, 2006, p.44).

To achieve these roles, nurseries/garden centres need to be working with the appropriate authorities and have to be compliant with governmental legislation (Richardson *et al.*, 2006, p.44). Principle among these is the Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA (Le Cook, 2004, p.15) and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA (South Africa Government Gazette No. 32090, April 3, 2009).

1.2 The Research Problem

According to Richardson *et al.* (2006, p.45), nurseries and garden centres are well positioned to inform customers regarding plant choices, such as indigenous and non-invasive exotic alternatives to IAPs. Therefore, they can play a significant role in increasing public awareness regarding IAPs amongst the general public. As an Industry, all stakeholders' need to be compliant with the Conservation of Agricultural Resources Act 1983 (Act 43 of 1983), CARA, Section 15 (Le Cook, 2004, p.15) as well as with the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA, under section 70 and would, therefore, need to be working with the appropriate authorities to prevent the propagation, sale and/or movement of alien invasive plants (Richardson *et al.*, 2006, p.43).

In her study, Le Cook (2004, p.46) found that senior staff at most nurseries are aware that legislation regarding IAPs exist, but are unable to accurately define categories of IAPs or to identify many of the plants that may be on the invader list. Le Cook (2004, p.46) stated that senior staffs are aware of the negative effects that IAPs may have on the environment, but their knowledge appears to be superficial with little comprehensive understanding of the ramifications to society or the economy. Further, the study found that junior staff had little or no knowledge of IAPs.

1.3 The Aim of this Study

The aim of this study is to assess the compliance of selected nurseries/garden centres, within KwaZulu-Natal EThekwini and uMsunduzi geographical regions, with the Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA, under section 29 (15) and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA, under section 70 (1b) and (3) and to investigate the associated communication between Government and the horticulture industry in this region.

1.4 Research Objectives, Questions and Hypotheses

This study will investigate the extent of nurseries'/garden centres' compliance with legislation regarding alien invasive plants, and will be concerned with the following research questions, objectives and hypotheses.

Table 1.1 shows the relationship between the research objectives, questions and hypotheses of this study.

Table 1.1: Relationship between Hypotheses, Research Questions and Research Objectives

Research Objectives	**Research Questions**	**Research Hypotheses: H_i**
1. To determine if/to what extent nurseries/garden centres stock/sell a selection of IAPs (defined as per CARA/NEMBA).	1. To what extent (if any) do nurseries/garden centres stock/sell a selection of IAPs (defined as per CARA/NEMBA)?	1. Nurseries/garden centres do stock/sell a selection of IAPS (defined as per CARA/NEMBA).
2. To determine whether certain characteristics/factors of nurseries/garden centres or their personnel affect their stocking/selling a selection of IAPs and thereby their compliance with CARA and NEMBA.	2. To what extent (if any) do the following characteristics/factors of ornamental plant retail outlets (nurseries/garden centres) or their personnel affect the stocking/selling of a selection of IAPs and thereby their compliance with CARA and NEMBA? 2.1 Experience* ↓ 2.10 Exposure to training.	2. Low scores on one or more of the following characteristics of ornamental retail outlets (nursery or garden centre) or their personnel contribute positively to the likelihood (risk) that they do stock/sell a selection of IAPs and thereby do not comply with CARA and NEMBA: 2.1 Experience* ↓ 2.10 Exposure to training.
3. To determine if/to what extent nurseries/garden centres stock/sell a selection of indigenous non-invasive plants and thereby contribute to responsible plant choices by customers	3. To what extent (if any) do nurseries/garden centres stock/sell a selection of indigenous non-invasive plants and thereby contribute to responsible plant choices by customers?	3. Nurseries/garden centres do not stock/sell a selection of indigenous non-invasive plants and thereby do not contribute to responsible plant choices by customers
4. To determine whether certain characteristics/factors of nurseries/garden centres or their personnel affect their stocking/selling a selection of indigenous non-invasive plants and thereby contribute to responsible plant choices by customers.	4. To what extent (if any) do the following characteristics/factors of ornamental plant retail outlets (nurseries/garden centres) or their personnel affect their stocking/selling a selection of indigenous non-invasive plants and thereby contribute to responsible plant choices by customers? 4.1 Experience* ↓ 4.10 Exposure to training.	4. Low scores on one or more of the following characteristics of ornamental retail outlets (nursery or garden centre) or their personnel contribute positively to the likelihood (risk) that they do not stock/sell a selection of indigenous non-invasive plants and thereby do not contribute to responsible plant choices by customers: 4.1 Experience* ↓ 4.10 Exposure to training
5. To determine the extent of communication between nurseries/garden centres and Governmental programmes and/or initiatives directed at managing IAPs and emerging invasive plants.	5. To what extent (if any) is there communication between nurseries/garden centres and Governmental programmes and/or initiatives directed at managing IAPs and emerging invasive plants?	5. There is little or no communication between nurseries/garden centres and Governmental programmes and/or initiatives directed at managing IAPs and emerging invasive plants.
6. To determine whether certain characteristics/factors of nurseries/garden centres or their personnel are associated with their having received Governmental programmes and/or initiatives directed at managing IAPs and emerging invasive plants.	6. To what extent (if any) are the following characteristics/factors of ornamental plant retail outlets (nurseries/garden centres) or their personnel associated with their having received Governmental programmes and/or initiatives	6. Low scores on one or more of the following characteristics of ornamental retail outlets (nursery or garden centre) or their personnel are associated positively to the likelihood (risk) that they do not receive Governmental programmes

	directed at managing IAPs and emerging invasive plants? 6.1 Experience* ↓ 6.10 Exposure to training.	and/or initiatives directed at managing IAPs and emerging invasive plants: 6.1 Experience* ↓ 6.10 Exposure to training.
7. To determine if/to what extent nurseries/garden centres are able to identify a selection of plants on the CARA and NEMBA plant lists and thereby contribute to responsibly advising customers on plant choices.	7. To what extent (if any) are nurseries/garden centres able to identify a selection of plants on the CARA and NEMBA plant lists and thereby contribute to responsibly advising customers on plant choices?	7. Nurseries/garden centres are little or not able to identify a selection of plants on the CARA and NEMBA plant lists and thereby contribute to responsibly advising customers on plant choices.
8. To determine whether certain characteristics/factors of nurseries/garden centres or their personnel are associated with their being able to identify a selection of plants on the CARA and NEMBA plant lists and thereby contribute to responsibly advising customers on plant choices.	8. To what extent (if any) are the following characteristics/factors of ornamental plant retail outlets (nurseries/garden centres) or their personnel associated with their being able to identify a selection of plants on the CARA and NEMBA plant lists and thereby contribute to responsibly advising customers on plant choices? 8.1 Experience* ↓ 8.10 Exposure to training.	8. Low scores on one or more of the following characteristics of ornamental retail outlets (nursery or garden centre) or their personnel are associated positively to the likelihood (risk) that they are not able to identify a selection of plants on the CARA and NEMBA plant lists and thereby contribute to <u>not</u> responsibly advising customers on plant choices: 8.1 Experience* ↓ 8.10 Exposure to training.
9. To determine if/to what extent nurseries/garden centres are able to identify a selection of indigenous non-invasive plants that are alternatives to plants on the CARA/NEMBA lists and thereby contribute to advising customers on plant choices responsibly.	9. To what extent (if any) are nurseries/garden centres able to identify a selection of indigenous non-invasive plants that are alternatives to plants on the CARA/NEMBA lists and thereby contribute to advising customers on plant choices responsibly?	9. Nurseries/garden centres are little or not able to identify a selection of indigenous non-invasive plants that are alternatives to plants on the CARA/NEMBA lists and thereby do not contribute to advising customers on plant choices responsibly.
10. To determine whether certain characteristics/factors of nurseries/garden centres or their personnel are associated with their being able to identify a selection of indigenous non-invasive plants that are alternatives to plants on the CARA/NEMBA lists and thereby contribute to advising customers on plant choices responsibly.	10. To what extent (if any) are the following characteristics/factors of ornamental plant retail outlets (nurseries/garden centres) or their personnel associated with their being able to identify a selection of indigenous non-invasive plants that are alternatives to plants on the CARA/NEMBA lists and thereby contribute to advising customers on plant choices responsibly? 10.1 Experience* ↓ 10.10 Exposure to training.	10. Low scores on one or more of the following characteristics of ornamental retail outlets (nursery or garden centre) or their personnel are associated positively to the likelihood (risk) that they are not able to identify a selection of indigenous non-invasive plants that are alternatives to plants on the CARA/NEMBA lists and thereby do not contribute to responsibly advising customers on plant choices: 10.1 Experience* ↓ 10.10 Exposure to training.

* .1 Experience
.2 Qualification attained
.3 Type of business (nursery or garden centre)
.4 Degree of customer attractions
.5 Awareness of Voluntary Codes of Conduct for Nursery Professionals
.6 Awareness of CARA
.7 Awareness of NEMBA
.8 Affiliation to Trade Associations
.9 Awareness of Working for Water Partnership Programme
.10 Exposure to training.

In addition, computation of medians and thei 95% Confidence Intervals (CI) will afford a method of testing whether there are differences in the central tendencies of the data sets, and on the likely medians of the whole sample (nurseries plus garden centres).

1.5 Chapter Outline

The following is a brief chapter outline for this study:

Chapter 1 – is an introduction to the study; a description of its purpose as well as the rationale for the study; and states the research objectives that guided the study;
Chapter 2 – is the literature review of published materials relative to the study to establish a theoretical foundation for the study;
Chapters 3 – examines the research methodology and explains the method utilized as being an appropriate one for the carrying out of the study;
Chapter 4 – defines the analysis and presentation of the data for this study;
Chapter 5 – is the discussion and comparison of the results generated from the data analysis for this study.
Chapter 6 – covers the conclusions and recommendations of the findings.

1.6 Conclusion

The aim of this study is to assess the compliance of selected nurseries/garden centres, within KwaZulu-Natal EThekwini and uMsunduzi geographical regions, with IAPs legislation. The aim and objectives of the study are achieved by conducting a literature review; establishing the theoretical framework; and adopting appropriate research methods for the collection, analyses and presentation of sources of data. In the next chapter, the literature of published materials, relative to the study to establish a theoretical foundation, will be reviewed.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature surveyed suggests that the horticulture industry might be a major source of alien invasive plants (Bradshaw & Jones, 2005; DiTomaso, 2005, p.114; Groves, Boden and Lonsdale, 2005; Burt, Muir, Piovia-Scott, Veblan, Chang, Grossman and Weiskel, 2006, p.911; Chin, 2006, p.1; Bell, DiTomaso, Davis and Wilen, 2007; McFadyen & Martin, 2007). Studies have found that some of these IAPs were intentionally introduced through the horticulture industry, as ornamental plants and are still available for sale in garden centres and other retail outlets (Groves, *et al*., 2005; Bell, *et al*., 2007). This poses a significant issue to all stakeholders in the Industry as gardeners and landscapers do not intentionally plant IAPs (DiTomaso, 2005, p.114). However, the Industry benefits financially from exotic plants as they add new and different species to landscapes and gardens. Furthermore, most exotic plant species introduced through horticulture often grow readily with little maintenance in climates where they are introduced (Burt, *et al*., 2006, p.912).

The gardening public demands ornamental plants that are attractive, hardy, disease and pest resistant, fast growing, flower profusely and that spread so densely that weeds cannot penetrate (Vartanian, 2005, p.106). They [the gardening public] also prefer to buy exotic plant species as the exotics introduce diversity to gardens and landscapes. Many of the characteristics required for a plant to be successful as garden or landscape plants are also qualities found in invasive plant species (DiTomaso, 2005, p.114; Bell, *et al*., 2007). Further, these exotic plants have few natural enemies. They mature and bears large amounts of seeds and are able to reproduce faster than indigenous plants. These exotics out-compete indigenous flora, resulting in the replacement of the natural vegetation, which impacts negatively on water resources, natural ecosystems and biodiversity (Richardson, MacDonald, Hoffman, and Henderson, 1997, p.537; Invasive Alien Species Programme, 2008).

Studies have documented that not all exotic plant species introduced for horticulture are invasive. However, a small percentage has escaped from cultivation and has been identified as one of the main causes of biodiversity loss and direct habitat destruction worldwide (Bradshaw & Jones, 2005; Burt, *et al*., 2006, p.913; Culley & Hardiman, 2008).

2.2 Impacts of Invasive Alien Plants

IAPs do not only have an ecological impact on the environment, but also a significant impact on the country's economy (Pimentel, Zuniga and Morrison, 2000, p.55 and 2005, p.275; Richardson *et al., 2005, p.16*). In South Africa, the cost to clear alien plant invasions is estimated to be around R12 billion or roughly R6000 million per year for the estimated 20 years that it would take to deal with the problem (McDonald, van Wilgen, and Mgidi, 2004; Wildy, 2005). Therefore, the public needs to be aware that IAPs are not only an environmental issue, but have a negative economic impact on every South African. Table 2.1 documents these effects.

Table 2.1: Effects of Alien Invasive plants on the Environment and their Economic Consequences

ALIEN PLANT EFFECT	**ECONOMIC CONSEQUENCES**
Reduction of available water resources	Rates increase: - because of cost of construction of dams. Reduction in agricultural yield: - leads to Increase in food prices.
Loss of Biodiversity and Ecosystems	We are dependent on biodiversity for food, water, clean air, soil retention, and pollination, decomposition of waste, recreation, ecotourism and medicine. Therefore, biodiversity is a resource that should be conserved and sustainably used.
Loss of potentially productive agricultural land	Loss / reduction in land value.
Poisoning of Livestock and Humans	Cost of medical care.
Loss of grazing for livestock	Cost of supplementary feed: - leads to increase in meat prices.
Greater incidence of bush and veld fires	Increase cost of fire control and increase insurance premiums.
Soil Erosion	Cost of rehabilitation work.
Coagulation of dams and estuaries	Rates increases and redirection of tax income. Reduce fish yields: - job losses, loss of income.

Source: Adapted Wildy (2005).

2.3 Invasive Alien Plant Legislation in South Africa

Studies have documented the significance of the economic and ecological threats posed by IAPs globally (Pimentel *et al.,* 2000, p.55 and 2005, p.275; McDonald *et al*., 2004; Bradshaw & Jones, 2005; Cully & Hardiman*,* 2008). Similarly, the South African Government has identified the removal of IAPs as a priority and has enacted eleven national and various provincial laws which contain mechanisms for regulating the different threats posed by IAPs (Paterson, 2006, p.10). Principal among all these laws is the Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA (Le Cook, 2004, p.15; Paterson, 2006, p.5).

2.3.1 Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA

CARA was originally enacted to regulate IAPs that may have an impact on agricultural resources, but in the absence of alternate relevant legislation, CARA regulations have been applied to regulate IAPs that impacted on biodiversity, water resource management and fire management (Paterson, 2006, p.7).

Regulations in terms of CARA were passed in 1984 and 50 plant species were declared as "weeds" or "invader plants" (Hanks, *circa,* 2004; Department of Water Affairs and Forestry, 2001). In March 2001, The Minister of Agriculture promulgated an amendment to the CARA regulations and increased the list of legally declared invasive alien species to 198 (Hanks, *circa,* 2004; Wildy, 2005) and these are divided into three categories:

- Category 1: Plant species that may not be grown anywhere in South Africa and must be eradicated;
- Category 2: Plant species with commercial or utility value, which may only be grown with a permit under controlled circumstances; and
- Category 3: Plant species which have amenity value and which need not be eradicated, but which may not be planted, propagated, imported or traded

(Department of Water Affairs and Forestry, 2001; Hanks, *circa,* 2004; Wildy, 2005; Paterson, 2006, p.5).

The enforcement of the CARA legislation is the responsibility of the Executive Officer appointed by the Minister of Agriculture (Department of Water Affairs and Forestry, 2001; Paterson, 2006, p.6).

Landowners are under legal obligation to control IAPs occurring on their properties and, if found to contravene any section of the Act, a criminal case may be brought against them (Department of Water Affairs and Forestry, 2001; Wildy, 2005). Penalties range from fines to imprisonment. Further, the Department may issue a directive setting a date by when the property must be cleared. The directive is binding on a successor-in-title (Department of Water Affairs and Forestry, 2001; Wildy, 2005). If the directive is ignored, the Department can clear the land or engage someone to do so. The cost of this clearing can then be recovered from the landowner and can also be registered against the title deeds of the property in terms of the Agricultural Credit Control Act. This will result in the property not being able to be sold until monies spent, to clear the property of IAPs, have been repaid (Department of Water Affairs and Forestry, 2001; Wildy, 2005).

CARA was promulgated over twenty years ago, but despite these Regulations; IAPs continue to invade valuable South African land at an alarming rate and, to date, there has not been one successful conviction under this legislation (Paterson, 2006, p.15).

Paterson's (2006, p.15) critique includes the following;

- "The lack of public awareness regarding the nature and extent of the IAPs problem, despite the various nationwide information campaigns implemented by organisations, such as Ukuvuka, Working for Water, WfW. and South African National Biodiversity Institute, SANBI.
- "CARA is administrated by the Department of Agriculture whose core function is to protect agricultural production and not issues of biodiversity conservation and water resource management.
- "CARA also fails to provide any clarity on the roles to be played by the various spheres of government in invasive alien plant control.
- "Budgetary constraints compel officials to limit their focus to the agricultural sector.
- "CARA Regulations do not provide adequate guidance regarding what control measures would be appropriate within a given context. This causes problems with regard to the implementation and enforcement of the CARA Regulations, given the scale of the problem, the range of the species involved and the need to tailor area-specific control measures.
- "CARA Regulations provide no monitoring requirements and the sanctions imposed by the Act are so minimal that they do not constitute a deterrent."

[CARA (S 29(3): *Sanctions for non-compliance with CARA Regulations are limited to R500 and/or three months imprisonment* (South African Government Gazette No. 22929, December, 14, 2001)]

2.3.2 National Environmental Management: Biodiversity Act 2004 (No. 10 of 2004), NEMBA

South Africa is rated the third-most biologically diverse country in the world (Department of Environmental Affairs and Tourism, 1997). However, this rich biodiversity is one of the most threatened worldwide and rapid spread of IAPs poses one of the greatest threats to it (Preston & Siegfried, 1995, p.51; Richardson & Van Wilgen, 2004, p.45).

The National Environmental Management: Biodiversity Act 2004, NEMBA, was promulgated in 2004 and deals directly with the prevention of unauthorised introduction, spread and eradication of IAPs (Gubb, *circa,* 2005; Paterson, 2006, p.32). NEMBA is administrated by the Department of Environmental Affairs and Tourism, DEAT, and they have tasked the South African National Biodiversity Institute, SANBI, to assist the Minister in executing the various facets of the Act (Gubb, *circa,* 2005; Paterson, 2006, p.32).

NEMBA radically reforms South Africa's biodiversity conservation legislation and contains provisions with specific relevance to the control of IAPs (Paterson, 2006, p.32) including emerging species.
The Act specifies that:

- No person may import, export, grow, propagate or have alien species in their possession without a permit;
- Permits may be issued only after the prescribed assessment of risk to and potential impacts on biodiversity has been carried out; and
- An individual can be held liable should an alien species establish itself in nature as an invasive species as a result of the actions of that individual. (Gubb, *circa,* 2005; Paterson, 2006, p.32).

NEMBA, together with the revised CARA legislation, lists six categories that reflect the importance of preventing new invasions (Southern African Plant Invaders Atlas, 2006). Categories 1, 2 and 3 (CARA) remain basically the same (refer to point 2.3.1), except that 1a (NEMBA) are high priority emerging species that must be eradicated or strictly controlled. Category 1b (NEMBA) are wide-spread species that require a management plan. Further, Category 4 (NEMBA) lists indigenous species outside of their natural ranges that are a threat to biodiversity (Southern African Plant Invaders Atlas, 2006). Category 5 (NEMBA) known as Table X, includes all species under surveillance. These include many ornamentals, and these may be listed after due investigation. Category 6 (NEMBA) are species known to be invasive and are prohibited entry into this country

(Southern African Plant Invaders Atlas, 2006).

The Act empowers the Minister and provincial MECs to publish national and provincial lists of invasive species, respectively (Paterson, 2006, p.33). Paterson (2006, p.33) further states, that the Act, to date, is still pending and does not make provision for an interim list of invasive species to be published. Therefore, any provisions regulating these invasive species will be inoperative until such time as it has been published (Paterson, 2006, p.33) but will be included in this study to provide a benchmark as to the extent these plants are being propagated or sold in the study region.

Henderson (2001, p.15) and the South Africa Government Gazettes (No. 22929, December, 14, 2001 and No. 32090, April 3, 2009) explain that the revised CARA and NEMBA regulations list 198 different exotic plant species, 122 of which are CARA Category 1 plants, known as declared weeds, 37 species in CARA Category 2, which have commercial value and 39 species in CARA Category 3 that have ornamental value. The species in CARA Categories 2 and 3 are known as plant invaders (Henderson, 2001, p.17; South Africa. Government Gazette, No. 22929, December, 14, 2001 and No. 32090, April 3, 2009). CARA Category 4 includes bush encroachments and indigenous species outside of their natural ranges that are a threat to biodiversity, and Category 6 species that are prohibited entry into this country (Southern African Plant Invaders Atlas, 2006) [CARA list available online at: www.sana.co.za/Alien -Invasive-Plants/invasive-alien -plants-cara-list]. The latter two categories, as well as Category 2, will not be considered in this study.

NEMBA Category 5 lists a further 36 species identified as potentially invasive (Southern African Plant Invaders Atlas, 2006). This list is known as Table X: Category 5, as per NEMBA 2001(Southern African Plant Invaders Atlas, 2006). [NEMBA list available online at: www.sana.co.za/NEMBA-Proposed-IAP-List-May-2009.pdf]. Although the list is provisional as NEMBA regulations are still pending (Paterson, 2006, p.33), these plants are included in this research as many are ornamentals and are traded by nurseries/garden centres in the researcher's experience.

2.4 Voluntary Codes of Conduct for the Horticultural Industry

Laws addressing the introduction of IAPs and potential invasive species via the horticultural industry remain inadequate (Reichard & White, 2001, p.105; Pimentel, *et al*., 2005, p.278; Paterson, 2006, p.15). Therefore, Government and Industry are looking at voluntary self-regulation of the industry, to

prevent introductions of IAPs, as an alternative to imposing higher-level rules and regulations (Harrison, 1999; Khanna, 2001, p.295; Alberrini & Segerson, 2002, p.160).

2.4.1 Advantages of Self Regulation

According to Burt *et al*. (2006, p.920), self-regulation by the horticultural industry, to reduce possible introductions of IAPs, has the potential to be successful for several reasons:

- The horticultural industry deals with non-essential commodities and IAPs can be substituted by non-invasive exotic or indigenous plant alternatives;
- Nurseries and garden centres are well positioned to inform their customers regarding responsible plant choices and therefore can play a significant role in increasing public awareness regarding IAPS among the general public; and
- High public visibility and close contact with customers also increase the potential for self-regulation, as nurseries and garden centres can benefit with cultivating an environmentally responsible business image.

The St Louis Declaration and Voluntary Codes of Conduct for Nursery Professionals was developed by non-profit organisations, trade representatives and scientists, with the aim of creating and promoting voluntary initiatives to prevent horticultural introductions of IAPs (Burt *et al*., 2006, p.920). These 'Codes' outline preventative measures such as monitoring new species for invasiveness and forgoing sales of known invasive plants. They encourage self-regulation by the horticulture industry, are in conjunction with regulatory laws and designed to ensure compliance with legislation (Bradshaw & Jones, 2005; Burt *et al*., 2006, p.920).

2.4.2 Role of the Working for Water Nurseries Partnership Programme

The Working for Water Nurseries Partnership Programme (WfW NPP) based on the St Louis Voluntary Codes of Conduct, was formed between Working for Water (WfW), the South African Nursery Association (SANA) and the National Department of Agriculture (NDA) (Richardson *et al.*, 2006, p.43). The WfW NPP plays a significant role in the fight against IAPs and embarked on nationwide projects during November, 2004 and February, 2006. The projects were based on four initiatives, viz.: training, industry stakeholder forums, communications and research (Montgomery, 2006).

Montgomery, (2006) highlighted the following activities of the WfW NPP, during their 2004 – 2006 projects:

- A range of public awareness campaigns were rolled out through media coverage, shows and exhibitions, talks at garden clubs and nurseries , as well as launching the Mulberry public communications campaign to 52 shopping complexes around the country;
- A comprehensive training programme was developed to train horticultural staff within garden centres. Once individual staff was trained, they were empowered to run workshops at their places of work to educate the rest of the staff regarding IAPs;
- A series of workshops were held informing industry stakeholders on the legal definitions and implications of the NEMBA legislation. The workshops have been valuable in forming networks between government horticulturists, garden centres and growers;
- The WfW NPP also developed the Yellow Flag endorsement scheme for the horticulture industry. The voluntary scheme would be adhered to by all members of the industry who endorsed the CARA regulations; and
- Under the Yellow Flag scheme, retailers would promote alternative species to IAPs. SANA also undertook to inspect retailers for IAPs on their shop floors, during the annual Garden Centre Association Competition.

However, the Yellow Flag project is pending, as Government signalled their desire to make registration of the scheme compulsory for all plant growers and retailers as well as to include the registration in the NEMBA regulations. To date the WfW NPP team is awaiting finalization on these regulations (Montgomery, 2006).

Of the 52 shopping complexes country wide, only one shopping centre in KwaZulu-Natal and one gardening show, was visited by the WfW NNP team, for a one-and two-hour session respectively, during the WfW NNP public awareness campaigns project (Montgomery, 2006).

In September 2009, the WfW NPP, launched a “Plant Me Instead campaign” in 150 participating garden centres nationwide (http://Lifeisagarden.co.za/home/, *circa,* 2009). The “Plant Me Instead campaign” aims to highlight plant alternatives that can be planted instead of IAPs or potential IAPs. It also promotes replanting areas where IAPs have been removed, with plant alternatives, instead of leaving the “soil barren and open to erosion” (http://Lifeisagarden.co.za/home/, *circa,* 2009).

Kay Montgomery, project leader of WfW NNP, stated that by "April 2010, 500 000 plants will reach garden centres with an approved Plant Me Instead sticker. Every plant with a sticker has been officially endorsed by the South African Nursery Association (SANA) and is deemed to be a good plant for your garden" (http://Lifeisagarden.co.za/home/, *circa,* 2009).

Two surveys of KwaZulu-Natal (KZN) nurseries, under the direction of the WfW NPP, were also conducted. One was conducted in 2002 to "correlate stock grown or sold" in nurseries, "against plants listed in CARA regulations" and one in 2010 to "correlate stock grown or sold" in nurseries "against the draft NEMBA regulations listed for proposed plant species under section 70" (Nurseries Partnership Education Programme, 2010). The 2002 study found that plants to the value of R20 million, designated Category 5, Table X, by CARA legislation, are still being grown by ornamental growers across the country (Montgomery, 2006). SANA requested that Government draft a 'grace or phasing out period' into regulations in respect of all Category 5 plants, as these plants may have a significant economic effect on the industry (Montgomery, 2006).

The 2010 study found that "45% of participating nurseries", carried "stock listed in the draft NEMBA regulations whilst 40% were carrying stock related to the plants" (Nurseries Partnership Education Programme, 2010). The study also found that "there were high levels of awareness (90%) of CARA legislation," but "only 50% respondents agreed that Species on List X should not be sold or grown by nurseries," However, "77% of the same respondents agreed that 'Garden centres' should not sell invasive alien or potential invasive (List X – CARA legislation)" species (Nurseries Partnership Education Programme, 2010).

2.5 Key Stakeholders in the Control of Invasive Alien Plants

The following highlights key governmental departments and their role played in the control of invasive alien plants.

2.5.1 The National Department of Agriculture

The National Department of Agriculture is the lead implementing agent of CARA. The Department, however, is faced with various challenges that make the implementation of CARA difficult (Haskins, 2009, p.113). Institutional structures and budgets dealing with IAP control are reduced year after year; also the scope of CARA covers many different aspects and not just IAPs control (Haskins, 2009, p.113).

Haskins (2009, p.113) explains that about 90% of the Department's time and resources are occupied by wetlands and land redistribution, with the remaining 10% being spent on vegetation, soil and water management. Therefore, very little time and resources are available for IAPs control. Further, the Department of Agriculture only has four or five staff in each province dealing with all these issues. Considering the extent of the IAP problem, implementing CARA is a task beyond the scope of what, institutionally, the Department can cope with (Haskins, 2009, p.113).

2.5.2 Invasive Alien Species Programme (IASP)

In 2004, DWAF, WfW and Ezemvelo KZN Wildlife, adopted an intergraded approach, the Invasive Alien Species Programme (IASP), aimed at controlling the spread and introductions of IAPs in KZN (Invasive Alien Species Programme, 2008). This "one-stop-shop" is co-ordinated under the Department of Agriculture and Environmental Affairs, creating employment to "the most marginalized sectors of our society" and provides training highlighting the importance of "alien species identification and controlling the spread of invasions" They are also involved in education and awareness projects, focusing on using KZN schools "as an avenue for spreading the information on the threats posed by invasive alien species, not only on biodiversity, water and agricultural potential but also on sustainable livelihoods" (Invasive Alien Species Programme, 2008).

2.5.3 EThekwini Parks Department

The EThekwini Parks Department's responsibility is to clear IAPs on Public Open Spaces and Verges; "clearing occurs out of the cutting season and are subject to the availability of funding" (Haskins, 2009, p.102). The Education Officer (Parks Department), in partnership with the Department of Water Affairs and Forestry (DWAF) and the Department of Agriculture and Environmental Affairs (DAEA) runs awareness campaigns and education programmes, to schools, to promote the IAP problem (Haskins, 2009, p.102).

2.5.4 EThekwini Environmental Management Department, (EEMD)

The mandate of this Department is to prevent the establishment of new Alien Invasive Species (AIP), fauna and flora, and to control the alien invasive species already established in the EThekwini Municipality Area (Environmental Management Department, 2010). An objective of the EThekwini Environmental Management Department is to form a co-operative partnership with all relevant stakeholders in local and national Government as well as with NGOs and non-governmental role

players (Environmental Management Department, 2010) and developed an overall AIP strategy and management plan, which aligned local Government to national legislation (Haskins, 2009, p.113). The Department is also playing a growing role in the control of IAPs and has put out a set of posters (Beautiful But Dangerous) to help with awareness and education (Haskins, 2009, p.113).

2.5.5 South African National Biodiversity Institute, (SANBI)

SANBI was formed in 2004 through the "signing in force of the National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004)" (Southern African National Biodiversity Institute, *circa*. 2010) and have been tasked by DEAT to assist the Minister in executing the various facets of NEMBA (Gubb, 2005; Paterson, 2006, p.32).

SANBI launched the "Early Detection and Rapid Response (EDRR) programme," funded by WfW (Southern African Plant Invaders Atlas, 2010). The EDRR plans to reduce the impact and cost of management of invasive plants by early intervention and management of emerging invasions. (Southern African National Biodiversity Institute, *circa*. 2010). The key aspects of implementation are early detection, risk assessment and response planning and rapid response (Southern African National Biodiversity Institute, *circa*. 2010).

The EDRR have three staff members in KZN and their main focus is on "stopping the spread" of *Triplaris americana* – Ant Tree (Reshnee Lala, personal communication, August, 12, 2010). Although Ant Tree populations are relatively few and not widespread, the EDRR have records of nine distinct populations in KZN and have identified the Berea/Musgrave suburb of Durban as a high priority area (Reshnee Lala, personal communication, August, 12, 2010). According to Reshnee Lala (personal communication, August, 12, 2010), the EDRR have embarked on an awareness-raising campaign warning private home-owners and the public about the dangers of the Ant Tree.

2.5.6 Wildlife Society of South Africa (WESSA)

WESSA, founded in 1926, is South Africa's environmental organisation (Wildlife and Environmental Society of South Africa, 2010). WESSA's aim is to ensure long-term environmental sustainability by promoting public participation in caring for the Earth (Wildlife and Environmental Society of South Africa, 2010). Their main focus is on education, awareness and acting as a watchdog (Haskins, 2009, p.113). To this effect, WESSA has launched a "Stop the Spread" campaign, which has been designed specifically as a vehicle to raise awareness of the socio-economic and environmental

impacts caused by invasive alien species (Wildlife and Environmental Society of South Africa, 2010).

In September 2010, WESSA: KZN in partnership with WfW, WfW NPP and Ezemvelo Wildlife, created an educational stand on IAPs combined with the "Plant me Instead campaign," at the Sunday Tribune Garden Show, to create awareness around IAPs and plant alternatives to IAPs (Wildlife and Environmental Society of South Africa, 2010).

2.6 Management Challenges in the control of IAPs

Haskins (2009, p.120) identified lack of political will to deal with IAPs, as one of the major challenges faced by managers in governmental departments, tasked with managing and controlling invasive alien plants. According to this author, reasons for this might be ignorance or lack of awareness on the part of politicians or that IAP issues are simply not priority on the agenda. Consequently, there is a lack of resources. This in turn leads to inadequate budgetary allocations made to the relevant department dealing with the IAPs problem (Haskins, 2009, p.120).
He underlines this statement, by adding that, sometimes, a IAPs programme is started and when available funds are used-up, no further funding is available to finish that project. Subsequently succession and continuity, key issues in the success of IAPs programmes, cannot be achieved (Haskins, 2009, p.121).

Haskins (2009, p.121) also questioned the effectiveness of municipal structures and systems to facilitate alien invasive plant control. He found that although, structures and systems were in place, they were inadequately resourced. Another concern of Haskins (2009, p.121) was that there is no co-ordinate strategy between relevant departments and, in some instances, these structures were not sufficient to facilitate the control of IAPs.

The EThekwini Environmental Department is currently addressing the challenge of a co-ordinate strategy between relevant governmental departments as well as with other stakeholders. These policies and strategies are outlined in the Department's "Framework Strategy for the control off invasive alien species in EThekwini Municipality, South Africa" document of February 2010 (Environmental Management Department, 2010).

Haskins (2009, p.119) notes that difficulties experienced with the current legal system are another challenge in the implementation of IAP legislation. He explains that there is a great deal of pressure on the courts, the prosecutors and state advocates and taking these circumstances into account, it is difficult to characterize IAP control as a priority. Over and above these challenges, there is the difficulty of explaining the principals behind invasive alien plant control to people who are not familiar with the subject (Haskins, 2009, p.119). Further, government institutions need to clear IAPs of state-owned land before they start to prosecute other land owners (Haskins, 2009, p.119).

Haskins (2009, p.119) also points out that CARA is the only legislation that could be used to gain some sort of control but CARA is no longer relevant to current lifestyles or livelihood and needs to be revamped and brought in line with modern legislation.

NEMBA radically reforms South Africa's IAPs legislation, as it contains provisions with specific relevance to IAPs and emerging species control (Gubb, circa, 2005; Paterson, 2006, p.32). However, NEMBA regulations have not been published, as there appears to be dissention between the researchers and the DAEA as to what is invasive (Haskins, 2009, p.117).

Haskins (2009, p.119) further states, that NEMBA would only gain momentum once it has been published and staff were appointed to implement and police it and concludes that enforcement of environmental legislation is a big problem for all levels of Government due to insufficient manpower, budget and training.

2.7 In Summary

Invasive alien plants produce serious detrimental economic and environmental consequences (Pimentel *et al*., 2000, p.55; Richardson & Van Wilgen, 2004, p.45; Vartanian, 2005, p.107; Wildy, 2005; Burt *et al*., *2006,* p.913) and despite regulatory laws, eradication and control methods, IAPs continue to invade valuable land at an alarming rate (Wildy, 2005; Burt *et al*., 2006, p.114; Paterson, 2006, p.16).

CARA was promulgated over twenty years ago to regulate IAPs that may have an impact on agricultural resources, but, in the absence of alternate relevant legislation, CARA regulations have been applied to regulate IAPs that impacted on biodiversity (Paterson, 2006, p.15). CARA is administrated by the Department of Agriculture whose mandate is to protect agriculture and not

biodiversity (Paterson, 2006, p.7). This poses a problem in the effective control of IAPs, as budgetary and other constraints compel officials to limit their focus to the agricultural sector (McDonald *et al*., 2004; Paterson, 2006, p.15).

NEMBA was promulgated in 2004 and, together with revised CARA legislation, radically reforms South Africa's biodiversity conservation, as it contains provisions with specific relevance to the control of IAPs and emerging species (Gubb, *circa,* 2005; Paterson, 2006, p.32). However, to date, NEMBA regulations are still pending (Paterson, 2006, p.33). The Minister published the second draft of IAPs regulations under section 70 of NEMBA in April 2009 (Department of Environmental Affairs and Tourism, 2009). These regulations are currently out for public comment (Department of Environmental Affairs and Tourism, 2009) and any provisions regarding invasive species under the Act will be inoperative until such time as the regulations have been finalised by Government (Paterson, 2006, p.33).

Most control measures have been focused on eradication and crisis management of IAPs which are already established or are aimed at preventing introductions of high-risk species (Burt *et al.,* 2006, p.918; Mgidi, Le Maitre, Schonegevel, Nel, Rouget and Richardson, 2007, p.173). Government recognises that, due to the magnitude of the problem, prevention is more cost effective than control and eradication (McDonald *et al*., 2004; Burt *et al.,* 2006, p.919; Mgidi *et al*., 2007, p.174; Cully & Hardiman*,* 2008).

Recognition of the horticulture industry, as a major pathway for introductions of IAPs, has increased steadily (DiTomaso, 2005, p.115; Groves *et al.,* 2005; Vartanian, 2005, p.107**;** Burt, *et al*., 2006; Bell, *et al*., 2007). However, laws addressing the introduction of potentially invasive plants via the horticulture industry remain inadequate (Reichard & White, 2001, p.105; Pimentel *et al*., 2005, p.278; Paterson, 2006, p.15). Therefore, Government and Industry are looking at self–regulation by the horticulture industry to reduce possible introductions of invasive plants (Bradshaw & Jones, 2005; Vartanian, 2005, p.109**;** Burt, *et al*., 2006, p.920). Participation of nurseries and garden centres with self–regulatory initiatives might ensure compliance with regulations regarding IAPs, as these initiatives are in conjunction with regulatory laws (Bradshaw & Jones, 2005; Burt, *et al*., 2006, p.921).

The St Louis Declaration and Voluntary Codes of Conduct is the most widely-recognised initiative, to prevent horticultural introductions of IAPs (Burt, *et al*., 2006, p.921) and is endorsed by many nursery trade organisations, including SANA, a key member of the WfW NPP. The KwaZulu–Natal

horticulture industry is relatively decentralised, as most nurseries and garden centres are not members of trade associations (Le Cook, 2004, p.21). Involvement in trade associations may be an important predictor of how familiar nurseries and garden centres are with perceptions of the problem of IAPs, recommended actions with regard to the IAPs problem, their acknowledgement of the Industry's role in this problem, as well as their knowledge of IAPs regulations and the implications these regulations may have on the Industry (Burt *et al*., 2006, p.920).

2.8 Gap in Literature

Despite the fact that nurseries/garden centres have been identified as a major source of invasive alien plants (DiTomaso, 2005, p.114; Groves *et al.,* 2005; Vartanian, 2005, p.106**;** Burt, *et al*., 2006, p.911; Bell, *et al*., 2007), it is surprising that so little empirical research has actually been conducted on this topic in South Africa, especially the state of nursery/garden centre compliance with legislation and the efficiency of self-regulation mechanisms of trade associations.

The only related literature found on this topic was unpublished documents viz.:
Le Cook's study to assess the awareness of KwaZulu–Natal South Coast Nurseries, with the CARA legislation in 2004.

Other studies "include" Haskins' on Managing the Control of Alien Invasive plants in the Outer West Region of EThwenini Municipality and two surveys of KZN Nurseries, under the direction of WfW NPP. The latter two documents are only available to stakeholders affiliated to the WfW NPP.

2.9 Conclusion

The literature review provides the underlying theoretical rationale for conducting this enquiry into the compliance of selected nurseries/garden centres within KwaZulu-Natal EThekwini and the uMsunduzi geographical regions, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983), CARA and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA. The following chapter defines the research methodology and provides an analysis for this mixed methods study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

A survey relating to assessing nursery/garden centre compliance with regard to invasive alien legislation has never been carried out in South Africa. As a result, no secondary data pertaining to local nurseries/garden centres and the compliance with CARA section 15 and the proposed NEMBA regulations, section 70 are available.

Therefore, primary data will be required to address the research problem specified in Chapter 1. This chapter will discuss the proposed methodology for this study.

3.2 Research Design

Creswell (2009, p.175) notes that quantitative research is “a means for testing objective theories by examining the relationship among variables. These variables can be measured on instruments, so that numbered data can be analysed using statistical procedures”. He further explains that, when using the quantitative approach, a researcher will “concentrate on the quantitative facts or data associated with the problem and develop mathematical expressions that describe the objectives, constraints and other relationships”.

“Qualitative research refers to the meaning, definition, analogy, model or metaphor characterising an occurrence” (Creswell, 2009, p.180). Cassel and Symon (1994, p.125) suggest that qualitative research focuses on the following aspects:

- Interpretation rather than quantification;
- An orientation towards process rather than outcome;
- A concern with context regarding behaviour and situations in forming experiences; and
- An explicit recognition of the impact of the research process on research situation.

This study followed a mixed methods approach as the study required both the quantitative analysis of questionnaires and the interpretation of interviews. The survey was a means to gather statistically valid quantitative data and the interviews were aimed to collect in-depth qualitative data in terms of perception, idea or explanation through participant's expressions (Creswell, 2009, p.190).

3.3 Mixed Methods Research

Many terms are used for this approach, such as the following: integrating, synthesis, qualitative and quantitative methods, multimethod, mixed methodology and mixed methods (Creswell, 2009, p.152). According to Creswell (2009, p.153), mixed methods focuses on combining both quantitative and qualitative research methods in a research study. It involves philosophical assumptions and the use of quantitative approaches so that the overall strength of a study is greater than either quantitative or qualitative alone.

This approach has many applications in diverse fields in social and human sciences, and is emphasized in journals such as the Journal of Mixed Methods Research, Journal of Social Research and Qualitative Health Research (Creswell, 2009, p.150). Creswell (2009, p.150) explains that researchers employ a mixed methods design to broaden understanding by incorporating both quantitative and qualitative methods or use one approach to better understand, explain, or build on the results from another approach. Further "mixing" of quantitative and qualitative approaches might be within one study or among several studies in one programme of inquiry. "Mixing" of the two types of data might occur at several stages within a study, i.e.; the data collection, the data analysis, the interpretation, or at all three phases (Creswell, 2009, p.150).

Creswell (2009, p.152) further states that, when planning a mixed methods study, four aspects to consider are; timing, weighting, mixing, and theorising.

Timing in mixed methods research can be sequential, where quantitative and qualitative data are collected in phases or concurrent, where both types of data are collected at the same time or phase in the study. Weighting is the priority given to quantitative or qualitative research in a particular study. In some studies, the weight might be equal; in others it might emphasise quantitative or qualitative data. Mixing means either that the quantitative or qualitative data are, intergraded at the beginning of the study, or kept separate, and combined at the end of the study or combined in some way during the study (Creswell, 2009, p.152).

Creswell (2009, p.154) also identified the following means of mixing data in mixed methods research:

- Connecting: involves connecting the data from one phase of the study to another. Quantitative and qualitative are connected between a data analysis of the first phase of research and collection of the second phase;
- Integrating: both sets of data are merged through a comparison approach or through data transformation; and
- Embedding: a secondary form of data is lodged within a larger study with a different form of data as the primary database. The secondary database provides a supporting role".

Theorizing in mixed methods research can be described as an advocacy perspective that shapes the types of question asked, informs how data is collected and analysed, and provides a call for action or change. Theory may include deductive quantitative testing and verification or inductive qualitative theory (Creswell, 2009, p.158).

Creswell (2009, p.159) further describes six strategies in mixed methods research that is organised around how data is collected, viz.:

- Sequentially (Sequential explanatory strategy and Sequential exploratory strategy);
- Concurrently (Concurrent triangulation strategy and Concurrent embedded strategy);
- Transformative lens (Concurrent transformative strategy and Sequential transformative strategy).

3.4 Application of Mixed Methods in this Study

Table 3.1: Visual model of Mixed Methods Design for this Study

Timing	**Weighing**	**Mixing**	**Theorizing**
Concurrent	Quantitative	Embedding	Explicit

Source: Adapted from Creswell (2009)

The aim of this study was to assess the local horticultural industries' compliance with CARA section 29(15), and the proposed NEMBA legislation section 70. This researcher addressed the extent to

which the local horticultural industry was playing their role in combating the spread of IAPs, as well as issues regarding communication between relevant Government agencies and the horticultural industry and to the extent that local Industry has been included in governmental initiatives to address the IAPs problem.

Following a “Concurrent Embedded Strategy”, a questionnaire was administered to sales personnel of nurseries and garden centres, within the selected study area and interviews were conducted with nursery and garden centre owners and senior managers to gauge their feelings and perceptions with regards to the problem discussed in Chapter 1. Tashakkori and Teddlie (2003, p.517) describe this approach where employees could be studied quantitatively and managers could be interviewed qualitatively, as a multilevel design.

This researcher made appointments with the respondents and conducted these interviews in English. Observations were carried out with the aid of an observation checklist, about what nurseries/garden centres are selling during on-site visits to a sub-sample of nurseries/garden centres within the selected study area.

Quantitative and qualitative data were gathered at the same time or phase of the study and were analysed simultaneously. “Collecting and analysis of both sets of data can be a rigorous and time-consuming process” (Creswell, 2009, p.206). The “concurrent embedded model” emphasises a major primary form of data collection (e.g. surveys), and includes a minor secondary form of data collection (interviews) (Creswell, 2009, p.206). He explains that the fact that both forms of data collection are not equal in size and rigour enables the study to be reduced in scope and manageable for the time and resources available.

Figure 3.1 shows that the “weighting” of this mixed methods study were assigned to quantitative data collection and analysis, and the notation for the study were “QUAN + qual.” A “concurrent embedded” approach has a primary method (in this study quantitative, QUAN) that guides the project and a secondary method (qualitative, qual) that provides a supporting role in the procedures (Creswell, 2009, p.207).

The “mixing” of the two data sources occurred during the discussion of survey and interview results, at the interpretation stage of the research process. This researcher adopted a comparative approach and compared the quantitative results and analysis of the questionnaire and observations with the

findings of the interviews.

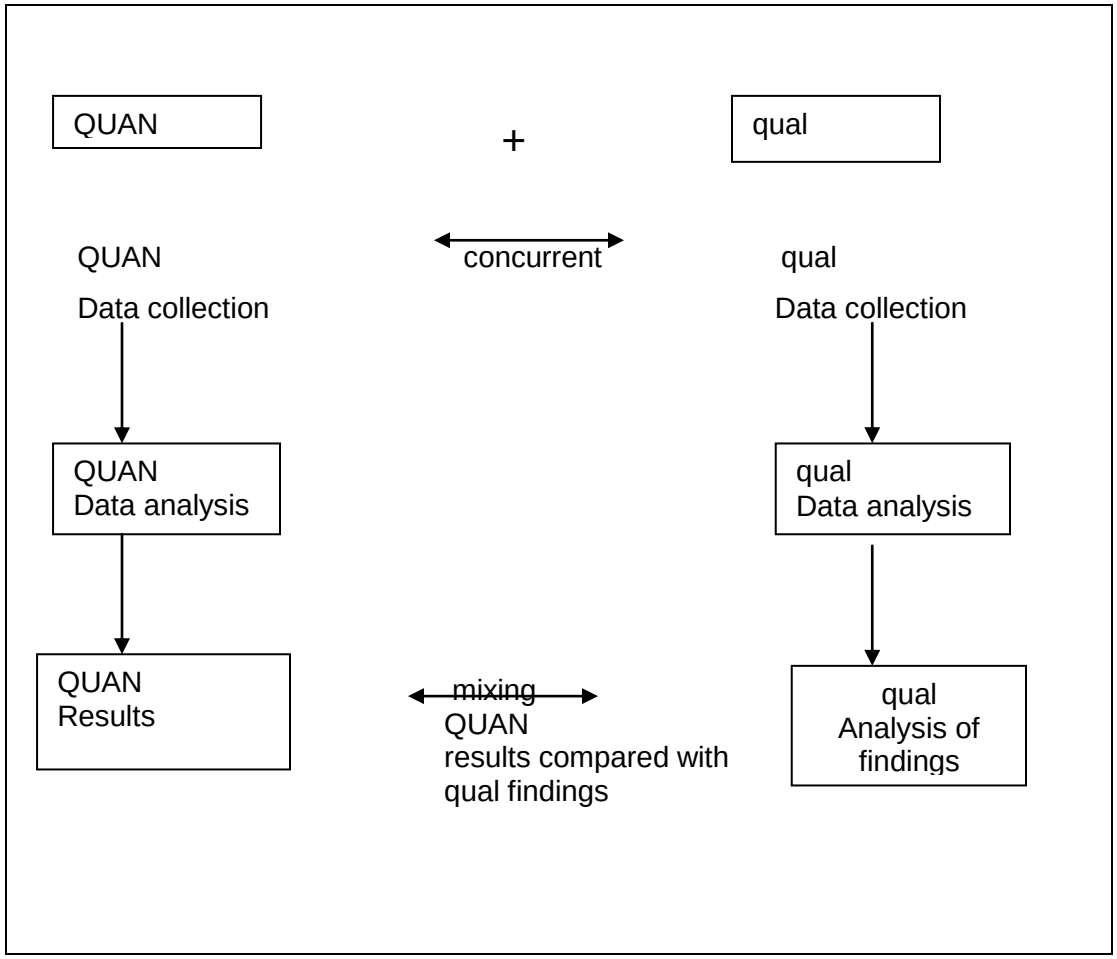

Figure 3.1 Visual model of the Concurrent embedded procedures for this study
Source: Adapted from Creswell (2009, p.208)

- Capitalisation indicates the weight or priority of the quantitative data, analysis and interpretation of this study;
- "QUAN" and "qual" stand for quantitative and qualitative respectively. The same number of letters were used to indicate equality between the forms of data;
- A "+" indicates a concurrent form of data collection, with both quantitative and qualitative data collected at the same time; and
- A "QUAN" "qual" notation indicates that qualitative methods are embedded within a quantitative design as shown above.

3.5 Area of Study

The area of study comprised of selected nurseries and garden centres within EThekwini (Durban) and uMsunduzi (Pietermaritzburg) geographical regions of KwaZulu-Natal. Through listings in the Yellow Pages telephone directory, the South African Gardening magazines and the South African Nursery Association membership list, 75 nurseries/garden centres were originally identified in this study area.

Since the above-mentioned listings were posted, 26 nurseries/garden centres had closed down. An additional 11 nurseries/garden centres were identified through "snowball" sampling (www.statpac.com/surveys/sampling.htm - 8k. *circa,* 2009), during the data collection process. A total 60 nurseries/garden centres participated in this mixed methods study.

3.6 Sampling Techniques

In order to arrive at vital and reliable conclusions, adequate sampling of the population in the study area needs to be done (Tashokkori and Teddlie, 2003, p.715; Mugo, *circa,* 1995). But if a population is "so small" that sampling parts of it will not provide accurate estimates of a whole, a census is the only way to get accurate information (Salant and Dillman, 1994, p.6). It is also important to take response rate and non-response bias into account (Draugalis and Plaza, 2008, p.142). It becomes important to get a high response rate in small populations (Krejcie and Morgan, 1970, cited in Draugalis & Plaza, 2008, p.144). Table 3.2 characterises this requirement.

Table 3.2: Sample requirement from a given population to be representative

POPULATION SIZE	SAMPLE SIZE
10	10
25	24
50	44
75	63
100	80
130	97
200	132
250	152
300	169
400	196
500	217

Source: Draugalis and Plaza, 2008. Adapted from Krejcie and Morgan, 1970, based on a P value of 0.05.

Seventy five nurseries and garden centres have been collectively identified in the EThekwini (Durban) and uMsunduzi (Pietermaritzburg) study area, and for the purpose of this mixed methods study, one response represented one nursery/garden centre. A census (approach all the nurseries and garden centres within the target area) was conducted for the quantitative strand of this study, taking the response rate and non-response bias into consideration. Due to factors mentioned in section 3.5, 60 nurseries/garden centres participated in this study. Procedures followed to "Gain Entry to Research Sites" (refer 3.7) ensured a positive response rate.

A purposive sampling method was selected for the qualitative strand of this study. "Purposive sampling is a form of non-probability sampling, where units (individuals, institutions) are selected based on specific purposes associated with answering a study's research questions" (Teddlie and Tashakkori, 2009, p.343).

Non-probability sampling does not provide any basis for estimating the probability of items in the population for being included, sampling error cannot be measured and researcher bias has a great chance to enter (Sridhar, 2008). However, non-probability sampling is suitable for small in-depth inquiries, where sampling permits the selection of interviewees whose qualities or experiences express an understanding of the phenomena in question (Sridhar, 2008). It is for this reason that this researcher conducted interviews with selected senior managers/owners of nurseries and garden centres as well as with stakeholders in pertinent government agencies and trade associations, to address the research questions in chapter 1.

In most cases, quantitative studies require mathematically defined procedures that allow one to estimate the characteristics of the population within a prescribed margin of error, usually +/- 5% or 1% (Teddlie & Tashakkori, 2009, p182). This kind of precision is not possible with most qualitative studies, as the "sample sizes used in qualitative research are typically so small that they are transferable to only a small sampling frame" (Teddlie & Tashakkori, 2009, p.182). According to Patton, (2002, p.244), "There are no rules for sample size in qualitative inquiry."

Mixed methodologists have combined probability and purposive sampling techniques, to meet the specifications of mixed methods design. For example; "Stratified purposive sampling" and "Purposive random sampling", are types of purposive sampling techniques, but they also include a component of probability sampling, viz., stratified and random (Teddlie & Tashakkori, 2009, p.182).

Purposive random sampling involves taking a random sample of a small number of units from a larger target population (Kemper, Stringfields and Teddlie, 2003, p.375). This method of sampling adds credibility to the evaluation by generating qualitative process oriented results to complement the large scale, quantitative oriented research (Teddlie &Tashakkori, 2009, p.186).

Purposive random sampling selection for the qualitative strand of this current mixed methods study proceeded as follows:

Step 1: The target population was divided into two categories, viz., nurseries and garden centres (Refer to 3.8 Differences between Nurseries and Garden Centres);
Step 2: 20 Nurseries and garden centres were then randomly selected, using the random numbers table (Siegel &Castellan, 1988, p.322); and
Step 3: Nurseries' and garden centres' categories were then divided into four sub-categories, viz.; Trade Affiliated Nurseries, Non-Trade Affiliated Nurseries, Trade Affiliated Garden Centres and Non-Trade Affiliated Garden Centres.

As there were no clearly established standards for how large the sample should be to generate trustworthy results (Teddlie & Tashakkori, 2009, p.185), the sample size of this qualitative strand, interviews were done until saturation was reached.

In stratified purposive sampling, the stratified strand is similar to probability sampling and the small number of cases it generates is characteristic of purposive sampling (Teddlie & Tashakkori, 2009, p.186). Due to the sensitive nature of this enquiry [nurseries and garden centres do not want to be labeled as selling IAPs and therefore not compliant with IAPs legislation], this researcher anticipated resistance from some owners/managers. This researcher did not want to create the impression of wanting to police any nursery/garden centre. Therefore, observations were merely conducted to determine what nurseries/garden centres stock and sell, using the stratified purposive sampling technique.

3.7 Gaining Entry to Research Sites

"One of the many problems facing researchers aiming at doing research studies into organisations is gaining access", even more so if the topic being researched focuses on a sensitive matter (Okumus, Altinay and Roper, 2007, p.9).

As mentioned before, the topic of this mixed methods study is sensitive in that nurseries/garden centres do not want to be seen as non-compliant with AIPs legislation and thus contravening the law.

It is also the perception amongst nursery men that they have been excluded in the whole process around issues regarding governmental programmes and initiatives pertaining to AIPs eradication and awareness (Peter Rowels, personal communication, September16, 2009).

According to Peter Rowels (Personal communication, September16, 2009), Industry was only informed about CARA legislation about three weeks before the regulations were passed by Government. The law required plant species that had been legislated against, in terms of CARA regulations, to be removed from the sales floor and destroyed. The Industry incurred substantial losses and Government did not offer any compensation for these losses (Peter Rowels, personal communication, September16, 2009).

Also, there seems to be much confusion among nursery men regarding which plants are "allowed" and which not (Jo-Anne Hilliar, personal communication, September 21, 2009). For example: *Lantana camara* hort. Common names; Lantana, Tickberry or Cherry pie, is a declared category 1 (CARA) alien species (www.sana.co.za/Alien -Invasive-Plants/invasive-alien -plants-cara-list**,** *circa*, 2009). It is the perception of Industry (Hester McLachlan- Evans, personal communication, February 24, 2010) that the creeping, yellow Lantana cultivar, *Lantana montevidensis* 'Sundancer' does not set seed and is ,therefore, regarded as "sterile" and non-invasive (Southern African Plant Invader Atlas, 2009). Many 'Sundancers' are sold in nurseries/garden centres across the country. However, studies in South Africa and Australia found that 'Sundancer' is part *Lantana camara* hort. and is only "sterile" if planted in isolation, as it can cross pollinate with *L. camara,* and occasionally produce seed (Southern African Plant Invader Atlas, 2009).

Now, in terms of CARA, "All seed producing species or hybrids of *Lantana* that are non-indigenous to Africa," are classed as category 1 invaders and are illegal to grow, propagate or sell in South Africa (www.sana.co.za/Alien -Invasive-Plants/invasive-alien -plants-cara-list**,** *circa*, 2009). However, there is no evidence that 'Sundancer' is invasive (Southern African Plant Invader Atlas, 2009), but if 'Sundancer' occasionally produce seed, is it illegal in terms of CARA? According to the South Africa Government Gazette (No. 32090, April 3, 2009), "All seed producing species or seed producing hybrids of *Lantana* that are non-indigenous to Africa" are legislated against.

Much controversy exists around some plants that are on the proposed NEMBA, Table X list (Hester McLachlan- Evans, personal communication, February 24, 2010). For example; "*Murraya paniculata* (L)", also known as "*Murraya exotica* L., common name; Oranjejasmyn or Mock Orange, a category 1b invader in KwaZulu–Natal, Mpumalanga, Limpopo and Eastern Cape" (South Africa Government Gazette No. 32090, April 3, 2009). In terms of NEMBA category 1b species require "compulsory" control must be removed and destroyed and no permits will be issued for these species to be grown, propagated or sold in South Africa (South Africa Government Gazette No. 32090, April 3, 2009). Industry feels that *Murraya paniculata* (L) should not be legislated against; as there is not enough evidence to prove that the plant is a potential invader (Hester McLachlan-Evans, personal communication, February 24, 2010). Jacque Malan, SANA Biodiversity Representative, under the direction of Industry, has logged an appeal against *Murraya paniculata* (L), being on Table X. Industry is awaiting the outcomes (Hester McLachlan-Evans, personal communication, February 24, 2010).

Many plants species on the proposed Table X list are popular ornamental plants. When NEMBA regulations are enacted, it might have a substantial financial impact on Industry.

In view of the above, nurseries/garden centres might perceive this current study with suspicion as to the intentions of the research. Also, this researcher did not want to give the impression as to want to police anyone. Therefore, it was imperative to the study that this researcher gains the trust of the participants.

In the opinion of Okumus, *et al.* (2007, p.10), to gain the trust of participants, a researcher must first gain the trust of the "gatekeepers." Gatekeepers are people of authority, like business owners, managers and individuals who can provide and facilitate access for the researcher. These authors also noted that gatekeepers may deny access because researchers might fail to provide answers about what, how and why they will carry out a specific study and whether the study will be of any value to managers themselves and also the company.

Okumus *et al.* (2007, p.10) also recommend that to gain access, the researcher and the gatekeepers must come to an agreement in terms of what, when and how data are collected and what might be returned. The researcher must also develop a good understanding and collaboration with the relevant managers.

This researcher gained access to the selected research sites, by implementing the following procedures:

- First, the target population was grouped according to their geographical location within the area of study;
- Then the researcher made telephonic contact with owners/managers, introduced herself and gave a brief background and purpose of the study;
- After permission to conduct the enquiry was granted, a more comprehensive background of the study together with an Informed consent letter was sent via email and faxed to those that did not have an email address; and
- A day before the researcher planned to visit nurseries/garden centres in a specific geographical location; the researcher telephoned those nurseries/garden centres and informed owners/managers about the planned visit.

3.8 Difference between Nurseries and Garden Centres

The horticultural industry is a diverse industry, displaying both retail and production functions with a variety of products ranging from services to goods (Enright & McDonald, 1997), and can be divided into wholesale and retail sectors. Wholesale nurseries, propagate, produce and maintain plants for sale to retail nurseries, supermarkets, garden centres and landscapers. Retail nurseries market and promote plants, products and services, as well as maintaining plants for sale to the general public (Sellmer & Dana, *circa,* 1993).

Traditionally, retail nurseries' core business was to sell plants and gardening-related products such as fertilizer, compost, potting mixtures and garden tools (Regan, *circa,* 2002). According to Regan, (*circa,* 2002*)* many nurseries may buy in smaller plants from specialised growers and then raise them into saleable plants; often nurseries would also grow and propagate their own plants on a small scale. Regan (*circa,* 2002) further stated that during the late 1990's, nurseries were prospering, benefiting from a strong construction market, rising household incomes and growing interest in landscape aesthetics and environmental enrichment. This gave rise to a new generation of retail outlets; the garden centre. Like nurseries, the core business of garden centres is the selling of plants and garden related product (http://gardencenternursery.wsu.edu/site/RetailNurserySiteSelection.html, *circa,* 2002). The main difference was the emphasis on the supply of "lifestyle products and services" such as outdoor furnisher, gift lines and landscaping services. Some garden centres even have coffee shops, petting

zoos and children's play area's to add value to their establishments, offering clients a one-stop shop to spend a leisurely time shopping (http://gardencenternursery.wsu.edu/site/RetailNurserySiteSelection.html, *circa,* 2002).

Conversely, the garden centre developed a whole different image to a nursery, with the emphasis on the design of the structures and buildings, surrounded by lawns, paving and well-kept display gardens (http://gardencenternursery.wsu.edu/site/RetailNurserySiteSelection.html, *circa,* 2002), better plant signage, clearly marked parking bays, and a more diverse product range. Another marked difference between nurseries and garden centres is that garden centres do not grow and raise plants on site, but buy in saleable plants from wholesalers and specialised growers (Regan, *circa,* 2002).

For the purpose of this study, nurseries and garden centres were differentiated as follows:

- Nurseries: Core business - selling plants and garden-related products, with no added value lifestyle products and services affiliated to the business. Some nurseries may buy in smaller plants and raise them into saleable plants or grow and propagate plants on a small scale on site; and
- Garden Centres: Core Business - selling plants and garden related products, with added value lifestyle products and services affiliated to the business. Garden centres do not raise or grow plants on site.

3.9 Quantitative Data Collection

Quantitative data for this study were generated through a questionnaire and structured on-site observations. Data collection tools were in English.

The survey was limited to sales personnel of nurseries and garden centres. Sales personnel can include managers and owners depending on the individual business structure. The survey populations were assumed to be people who had a good grasp of the English language, as most horticultural literature and plant reference material are only available in English. Sales personnel are also well positioned to address customer queries, recommend appropriate plant choices and should have an extensive knowledge as to what plants their individual business stocks and sells.

The questionnaire was a self–administered data collection tool specifically designed for this study. According to Dillman (1978), self–administered questionnaires offer a truer reflection of points surveyed; the responses are, therefore, objective. Dillman (1978) further explains that, "respondents to self–administered questionnaires are relatively unlikely to answer to please you because they believe certain responses are more socially desirable".

Prior to delivering the questionnaire, this researcher made contact with managers and/or owners (gatekeepers) of the selected sample of nurseries and garden centres to gain permission to deliver the questionnaire and to allow sales staff to complete it the same day.

Once permission to gain entry to research sites (refer to 3.7) was granted, a comprehensive background of the study, together with an Informed consent letter were send via email and faxed to those that did not have an email address.

"When survey questionnaires are used in a study, the researcher is employing a strategy in which participants use self-report to express attitudes, beliefs, and feelings towards a topic of interest" (Teddlie & Tashakkori, 2009, p.232). The questionnaire for this mixed methods study was a closed–ended quantitative questionnaire. Teddlie and Tashakkori (2009, p.232) explains, that "items with closed–ended responses are more efficient to collect and analyze," than items with open–ended responses. Response formats associated with closed–ended questionnaires include Likert scales, checklist and rank orders (Teddlie & Tashakkori, 2009, p.232).

Likert scales were developed by Rensis Likert in 1932, and measures respondents' agreement or disagreement to multiple items related to the topic of interest (Teddlie & Tashakkori, 2009, p.234). The format of a typical 5–point Likert scale is:

1 = Strongly agree;
2 = Agree;
3 = Neither agree nor disagree;
4 = Disagree; and
5 = Strongly disagree.

A 5–point Likert scale, ranging from strongly agree to strongly disagree, as above, was used in this study to measure the attitudes of respondents, in terms of level of agreement/disagreement to the statements posed in questionnaire items 12.1 to 14.4 (Appendix 2).

Participation in this study was voluntary. If an individual decided to participate in this study, he/she was required to sign a consent form. Refer to Appendix 1: Informed Consent Letter. Quantitative data were recorded by using a survey questionnaire, (Appendix 2) and an observation schedule, (Appendix 4).

3.9.1 Questionnaire

The layout of the questionnaire was as follows:

Questions 1 – 2
These questions were intended to establish the respondents' Experience in Industry and the level of Educational Qualification.

Questions 3 – 4
These questions were intended to establish the Type of Business and Degree of Customer Attraction.

Questions 5 – 6
These questions were aimed at establishing whether respondents are aware of the Voluntary Codes for Nursery Professionals and, therefore, compliant with IAPs regulations.

Question 7
This question was intended to establish whether respondents knew that IAPs legislation exists.

Question 8
This question was aimed at establishing whether respondents knew which key Governmental role-players are instrumental in the control and management of IAPs.

Question 9
This question was intended at establishing whether Nurseries/garden centres are affiliated to a Trade Association.

Question 10
This question was intended at establishing which Trade Association/s was/were the major role-player in Industry.

Question 11

This question was divided into two parts;

11a. was intended to establish whether the respondent received training with regard to IAPs; and

11b. was aimed at establishing who the training providers of above mentioned training would be.

Questions 12.1 – 12.3

The respondents were asked who they thought should make information pertaining to IAPs available to Nurseries/garden centres.

Questions 12.4 – 12.5

These questions were intended to establish whether there were any communication with regard to IAPs legislation between Government and Industry.

Questions 12.6 – 12.7

These questions referred specifically to CARA and NEMBA legislation in order to establish if the respondent knew what the regulations stipulate.

Questions 13.1 – 13.4

These questions were aimed at establishing whether knowledge of legislation was being conveyed to clients and whether respondents would recommend indigenous or non-invasive alternative to IAPs.

Questions 14.1 – 14.2

These questions were aimed to establish whether Nurseries/garden centres had any IAP literature visible and/or for sale in their businesses.

Questions 14.3 – 14.4

These questions were intended to obtain the respondents' opinion on whether nurseries/garden centres were stocking and selling invasive and potentially invasive plants.

Questions 15.1 – 15.6; 15.8 – 15.13; 15.15 – 15.21 and 15.24

These questions referred specifically to selected IAPs as listed in section 29(15) of the CARA regulations and potential IAPs as listed in section 70(1)(b), (3) and (5) of the draft NEMBA regulations, to establish whether nurseries/garden centres can identify these plants and whether

they stock and sell them.

Questions 15.7, 15.14, 15.22 and 15.23

These questions referred specifically to selected indigenous plant alternatives to IAPs as recommended in the “Beautiful But Dangerous” posters to establish whether Nurseries/garden centres can identify these plants and whether they stock and sell them.

3.9.2 Selected IAPs as listed in section 29(15) of the CARA regulations.

Plate 1: Questionnaire Item: 15.1,
CARA Category 1
Lantana camara – Tickberry/ Lantana

Source: “Beautiful But Dangerous” Poster, 2000

Plate 2: Questionnaire Item: 15.2,
CARA Category 1
Nerium oleander – Oleander

Source: “Beautiful But Dangerous” Poster, 2000

Plate 3: Questionnaire Item: 15.3,
CARA Category 1
Ardisa crenata – Coralberry

Source: “Beautiful But Dangerous” Poster, 2000

Plate 4: Questionnaire Item: 15.4,
CARA Category 3
Bauhinia purpurea – Butterfly Orchid tree

Source: “Beautiful But Dangerous” Poster, 2000

Plate 5: Questionnaire Item: 15.5,

CARA Category 1

Cestrum elegans – Crimson Cestrum

Source: “Beautiful But Dangerous” Poster, 2000

Plate 6: Questionnaire Item: 15.6,

CARA Category 1

Macfadyena unguis-cati - Cat’s claw creeper

Source: “Beautiful But Dangerous” Poster, 2000

Plate 7: Questionnaire Item: 15.18,

CARA Category 1

Ligustrum vulgare – Privet

Source: http://www.invasive.org/Images

Plate 8: Questionnaire Item: 15.19,

CARA Category 3

Ligustrum sinense – Chinese privet

Source: http://www.invasive.org/browse

Plate 9: Questionnaire Item: 15.24,

CARA Category 3

Solanum seaforthianum – Potato creeper

Source: “Beautiful But Dangerous” Poster, 2000

3.9.3 Selected potential IAPs as listed in section 70(1) (b), (3) and (5) of the draft NEMBA regulations.

Plate 10: Questionnaire Item: 15.8,

NEMBA Category 3 1b

Pennistetum setaceum – Fountain grass

Source: “Beautiful But Dangerous” Poster, 2000

Plate 11: Questionnaire Item: 15.9,

NEMBA Category 3 1b

Lantana motivedensis -‘Sundancer’

Source: http://davesgarden.com

Plate 12: Questionnaire Item: 15.10,
NEMBA Category 1b
Murraya paniculata – Mock orange

Source: http://www.hear.org/starr/

Plate 13: Questionnaire Item: 15.11,
NEMBA Category 3
Duranta erecta – Forget-me-not-tree

Source: "Beautiful But Dangerous" Poster, 2000

Plate 14: Questionnaire Item: 15.12,
NEMBA Category 5
Duranta reptans varigata

Source:" Beautiful But Dangerous" Poster, 2000

Plate 15: Questionnaire Item: 15.13,
NEMBA Category 3
Syngonium podyphyllum – Goose foot

Source: http://aggie-horticulture.tumu.edu

Plate 16: Questionnaire Item: 15.15,
NEMBA Category 3
Schefflera elegantissama- False Aralia

Source: http://davesgarden.com

Plate 17: Questionnaire Item: 15.16,
NEMBA Category 3
Schefflera aboricola variegata

Source: "Beautiful But Dangerous" Poster, 2000

Plate 18: Questionnaire Item: 15.17,
NEMBA Category 5
Syzygium paniculatum – Brush cherry

Source: http://www.exot-nutz-zier.de/

Plate 19: Questionnaire Item: 15.20,
NEMBA Category 3
Hedra helix – English Ivy

Source: http://www.meditiflora.com/flora

Plate 20: Questionnaire Item: 15.21,

NEMBA Category 1b

Tradescantia zebrina - Wandering Jew

Source: http://www.henriettesherbal.com/pictures/

3.9.4 Selected Indigenous Alternatives as recommended in the Beautiful But Dangerous Poster

Plate 21: Questionnaire Item: 15.7,

Plumbago auriculata - Plumbago

Source: http://www.la-jardineria.net/

Plate 22: Questionnaire Item: 15.14,

Polygala myrtifolia- Blou Kappie

Source: http://www.isaisons.free.fr/polygala

Plate 23: Questionnaire Item: 15.22,

Pavetta revolute – Dune Bride's Bush

Source: www.africanbulbs.com

Plate 24: Questionnaire Item: 15.23,

Senecio tamoides- Canary Creeper

Source: http://www.zimbabweflora.co.zw/

3.10 Qualitative Data Collection

Qualitative data collection for this mixed methods study were generated through structured open–ended interviews with owners/managers of selected nurseries and garden centres as well as from documents such as minutes of meetings. Data collection occurred concurrently with the quantitative data collection stage.

Teddlie and Tashakkori (2009, p.229) explain that, with structured open–ended interviews, "the exact wording and sequence of questions are determined in advance, all the interviewees are asked the same basic question in the same order". They further stated that questions asked in a structured open–ended format, allows the interviewer to elicit views and opinions from the interviewees and at the same time to group responses into pre–determined categories that will aid the coding of data collected.

Face-to-face interviews were conducted to collect qualitative data for this mixed methods study (Appendix 3). Singleton and Straits (1999, p.254) identified some of the advantages of face-to-face interviews as follows:

- Face-to-face interviews allow for flexibility in scheduling the interview;
- Present the opportunity to restate or clarify and use probes;
- Allow for sensitive or difficult questions to be put tactfully; and
- Generate a high response rate.

They (Singleton & Straits, 1999, p.255) further explain that reasons for a high response rate in face-to-face interviews may include: “the novelty of being interviewed, the difficulty of saying no to a direct request for an interview and the credibility of a face-to-face interview”. According to these authors, a disadvantage of face-to-face interviews is that it can be “costly” and “time consuming.”

Nurseries/garden centres were grouped into different geographical locations of the study area, allowing this researcher to schedule various interviews with different nursery/garden centre owners/managers within a specific geographical location. This grouping saved cost and time.

Another possible disadvantage of face-to-face interviews is that the researcher might “introduce bias into the data by not following the prescribed interview format or leading the respondent in their answers” (Singleton and Straits, 1999, p.256). Moreover, respondents’ answers may be influenced by the interviewer’s “gender, race, age, status and manner of dress or personality” (Singleton & Straits, 1999, p.256). Researcher’s bias is a threat to the internal validity of interview studies (Viljoen, 2003). Researcher’s bias in this mixed methods study was addressed under Researchers Role in section 3.10.

Prior to the interviews being conducted, this researcher telephoned each interview candidate and requested an interview (refer to 3.7: Gaining Entry to Research Sites). Interview data were recorded by using an interview protocol, whereby the researcher made hand-written notes during and directly after the interview. Refer to Appendix 3: Interview Schedule.

3.11 Validity and Reliability

Validity is the degree to which a study reflects or assesses the specific concept that the researcher is attempting to measure (writing.colostate.edu/guides/research/survey, 1993). Validity does not carry the same connotations in qualitative research as in quantitative research (Golafshani, 2003). In qualitative research, the researcher validates the findings throughout the steps in the process of research by employing certain procedures, viz., pilot testing, triangulation of data and the researcher’s role (Creswell, 2009, p.184). In quantitative research the researcher should be concerned with external and internal validity (writing.colostate.edu/guides/research/survey, 1993).

Internal validity can be defined “as the extent to which it actually (correctly) answers the questions that it claims to answer” (Russ-Eft & Darlene, 1980). According to these authors, data collection and

analysis is done according a set of assumptions about the process or phenomenon being observed. They further explain that if the assumptions are wrong, the findings of the survey are meaningless but if the assumptions are correct, the survey results are internally valid, and the findings of the survey are meaningful.

External validity is the extent to which the results of a study are “generalisable” or “transferrable” (writing.colostate.edu/guides/research/survey, 1993). Russ-Eft and Darlene (1980) note that threats to external validity in survey research may enter in the form of non-response or bias. Poorly worded survey questions and questionnaires designs decrease external validity through non-response or incorrect response (Russ-Eft & Darlene, 1980).

Reliability is concerned with the accuracy of the actual measuring instrument or procedure (writing.colostate.edu/guides/research/survey, 1993). It assesses the degree to which the same results will occur on repeated application (Russ-Eft & Darlene, 1980). Creswell (2009, p.190) suggests that to achieve reliability, qualitative researchers need to document as many steps and procedures as possible during the course of their study. He also recommends setting up a detailed study protocol and database.
In ensuring the validity and reliability of this mixed methods study, the following strategies were employed:

Pilot Study
A pilot study of five nurseries and two garden centres were conducted within the selected study area, to check the validity of the questionnaire. This pilot study had to be very restricted because of the limited number of nurseries/garden centres within the study area. The information of this pilot study was included in the data.

The original intention was to email and/or fax the questionnaire to nurseries/garden centres within the study area. However, this approach had to be adapted, as a result of the pilot study. Respondents found it very difficult to clearly view the images of plant species on the questionnaire that was faxed. Problems were encountered with the emailed questionnaire. Some respondents could not “open” the emailed document, or the format of the document was unreadable as the “computer programmes” of the respondents were incompatible with the “computer programme” of the researcher.

Triangulation of Data

Data were collected through multiple sources to include survey questionnaires, interviews, observations and document analysis. Quantitative and qualitative data were blended to provide a broader, deeper perspective into the compliance of the horticultural industry with current IAPs legislation. Perone and Tucker (2003) call this approach “methods triangulation”. By combining the two methods, advantages of each methodology complement the other, making a stronger research design, resulting in more valid and reliable findings, and it also reduces bias and increase validity (Perone & Tucker, 2003).

Researcher’s Role

Viljoen (2003) pointed out that researcher bias is a threat to the internal validity of interview studies. He further explained that researcher bias refers to invalid information that results from the perspective a researcher brings to a study and occurs when a researcher consciously or unconsciously interprets data based on attitudes or beliefs held prior to the research. He recommended that, in order to reduce bias, a researcher must recognise his or her own bias.

The perceptions of this researcher with regard to the topic under investigation had been shaped by personal experience, gained over 15 years of working in Industry. After obtaining her National Diploma in Horticulture, this researcher joined a leading retail nursery in the Western Cape, as a salesperson. She later worked as a horticulture consultant and then nursery manager. She found that the buying public would put a lot of trust in her, to recommend appropriate plants and would follow her “expert” advice almost blindly. Therefore, she firmly believes that nursery/garden centre sales people are well positioned to increase public awareness regarding IAPs and to promote responsible plant choices such as indigenous and non-invasive plants.

The question arises: Are nursery/garden centre sales staff able to advise their clients, if they [nursery /garden centre sales staff] are not adequately knowledgeable about which plants are legislated against and which are on the proposed NEMBA list. Through personal experience, the researcher believes that sales staff and nursery staffs, in general, were not well informed about issues pertaining to IAPs.

Although the horticultural industry is regarded as a major pathway for the spread of IAPs (see literature review chapter 2), this researcher believes that nurseries/garden centres were not included in governmental initiatives and awareness programmes directed at managing alien invasive and

emerging invasive plants. She wants to approach this enquiry from a nursery man's perspective. Due to her working experience and interest in the nursery trade, she might be biased in her perspective towards the study of enquiry. Therefore, she will need to guard against this biased perspective, possibly influencing the conclusions of this study. The researcher also addressed the question of the extent to which the local nursery industry is playing their role in combating the spread of IAPs. In addition, issues regarding communication between relevant government agencies and the horticultural industry were also addressed, as well as the extent to which the local Industry has been included in governmental initiatives implemented to address the IAPs problem.

3.12 Ethical Considerations

The Belmont Report (1979) highlights three "basic ethical principles", viz., "Respect for people"; "Beneficence" and "Justice", as the basis for research involving human subjects. Nguyen (2007) underlines these early ethical codes by proposing "that a researchers' responsibility is to maintain a participants' well-being" and that "studies must be based on trust between the two parties". Moreover, researchers must respect participants' confidentiality, autonomy and privacy.
According to Gay and Airasian (2003), "anonymity means that researchers do not know participants' identities, and confidentiality means not to disclose participants' identities to a third party".

This researcher gained permission to conduct the study at the research sites, as well as the "trust" of "gatekeepers" (refer to 3.7) by following a set-out protocol, outlined in section 3.7 Gaining Entry to Research Sites. Further the researcher obtained the participants' consent, by emailing or faxing an Informed Consent Letter to nurseries/garden centres within the study area, prior to conducting the study. Refer to Appendix 1: Informed Consent Letter. According to Nguyen (2007) requiring the participants' consent is important in terms of ethics in any research.

3.14 Conclusion

Chapter three defined the research methodology and methods for collection for the quantitative, qualitative data and sampling techniques for this mixed methods study. This chapter also highlighted the differences between nurseries and garden centres and the importance of gaining entry to research sites and addressed issues of validity and reliability as well as the role played by the researcher. In the next chapter, the data for this study will be analysed.

CHAPTER FOUR

DATA ANALYSES

4.1 Introduction

In this current mixed methods study, this researcher followed a "Concurrent Mixed Data Analysis Strategy". This strategy involved two separate processes: "QUAN analysis of data, using descriptive/inferential statistics for the appropriate variables, and QUAL analysis of data, using thematic analysis related to the relevant narrative data" (Teddlie & Tashakkori, 2009, p.266).

4.2 Quantitative Procedures

Teddlie and Tashakkori, (2009, p.256) describe quantitative data analysis as "the analysis of numeric data using a variety of statistical techniques." Non-parametric statistics is one such technique and may be used "if the sample size is very small" (Siegel & Castellan, 1988, p.35). Non-parametric statistics requires fewer assumptions about data compared to parametric statistics; can be used with ordinal and nominal scales; and have various statistical tests available to analyse data in ranks, as well as data whose numerical scores have strength in ranks (Siegel & Castellan, 1988, p.35; Teddlie & Tashakkori, 2009, p.258).

In this mixed methods study logistic regression afforded this researcher the opportunity to test whether a number of potential variables had a significant effect or association with the probability of nurseries/garden centres not complying with various requirements of CARA and NEMBA. These variables become the "independent" or "predictor" variables: variables that predicted whether a nursery/garden centre was likely to not comply (and by inference, when they were likely to comply).

A logistic regression procedure; the Poisson Model GENLOG method (Rodriguez, 2007) was applied to the data generated by the responses to the questionnaire of this study to determine whether the "risk factors" (refer to 1.4 Hypotheses) contributed positively to the likelihood, for example, that nurseries/garden centres do stock and/or sell plants on the CARA and NEMBA list.
Logistic regression parameters, however, are conventionally estimated via large samples and can be "inaccurate" and "misleading" when applied to small samples
(www.timberlake.co.uk/software/cytel/lxproc-brochure.pdf, 2004).

As mentioned before, this study is considered to be of a “small sample” (refer to 3.6 Sampling Techniques). Therefore, for the purpose of this study, the “Goodness of Fit” (Narsky, 2003), using the “Likelihood Ratio” (Okada & Rao, 2005) and the “Pearson Chi-Square” (www.statisticssolutions.com , 2009) was used to analyze the data.

For each level of the independent variables listed in the research hypotheses (refer to 1.4), the medians, together with their 95% confidence intervals (CI’s), of the dependent variable Y_1 to Y_3, were computed to find the central tendency of each Y for each “independent” variable (X’s) sub-category. The medians, and 1st and 3rd quartiles, were found using a calculator due to Arsham (2011). The 95% confidence intervals (CI’s) for the medians, i.e., the intervals within which the medians are expected to occur, were found using a formula due to Bland (2000). The same method to determine medians and 95% confidence intervals about the medians were also applied to the whole sample (60) for each dependent variable (Y_1 to Y_{17}), irrespective of differences due to the independent variables (X_1 to X_{10}).

According to this formula, the rank of lower 95% interval can be found from j = nq – 1.96 X square root (nq(1-q)), and the rank of the upper 95% interval from k = nq + 1.96 X square root (nq(1-q)); where n = size of the sample for which the median is required, and q = 0.5, for use for medians (Bland, 2000).

For each of the research hypotheses, corresponding null hypotheses deny their claims. If any "significance test" does not reach 5% probability or less, the corresponding null hypothesis will not be rejected, and the research hypothesis will not be accepted on the basis of this study’s samples. If not, the research hypothesis will be accepted (Siegel & Castellan, 1988, p.40). The results of the statistical tests of the quantitative (QUAN) data, together with the results of the qualitative (qual) data analyses, will be used to inform conclusions about the research questions.

Table 4.1 illustrates the relationship between the relevant research questions, hypotheses, research objectives to the related questionnaire items (QUAN), related observation items (QUAN), and related interview items (qual) for this study.

Table 4.1: The Relationship between Research Questions, Hypotheses and Research Objectives to the Related Questionnaire Items, Related Observation Items and Related Interview Items

Hypotheses	Research Questions	Research Objectives	Related Questionnaire Items	Related Observation Items	Related Interview Items
H_1 & H_2	1 & 2	1 & 2	1 to 11.b 13.1 to 14.4	1, 2, & 3	Section A 1 to 3b & Section B 1 to 14
H_3 & H_4	3 & 4	3 & 4	15.7, 15.14, 15.23 & 15.24	24, 25, 26 & 27	N/A
H_5 & H_6	5 & 6	5 & 6	12.1 to 12.7	N/A	Section B 1 to 14
H_7, H_8, H_9 & H_{10}	7, 8, 9 & 10	7, 8, 9 & 10	15.4 to 15.24	4 to 24	N\A

The "mixing" (integration) of the "QUAN" and "qual" results for this mixed methods study will be at the interpretation and discussion stage of the research process.

4.3 Qualitative Data Analysis

Qualitative methods can be defined as the "techniques associated with the gathering, analysis, interpretation and presentation of narrative information" (Teddlie & Tashakkori, 2009, p.343), and "involves emerging questions and procedures, data building from particulars to general themes, and the researcher's interpretations of the meaning of the data" (Creswell, 2009, p.4).

Patton (2002, p.41) further describes qualitative data analysis as "predominantly inductive in nature that leads to themes or theoretical criteria" that are, according to Teddlie and Tashakkori, (2009, p.251) "grounded in the data, and are not given a priori".

Straus and Corbin (*circa.*1990, cited in Davidson, 2002) define grounded theory as follows: "The grounded theory approach is a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon". This is "the most used methodology for inductively analysing qualitative data" (Teddlie & Tashakkori, 2009, p.521). The theory is developed from the data, rather than the other way around (Borgatti, *circa,* 1991). This method has a systematic step that involves the following:

- "Open Coding – Data is divided into categories and analysed for common themes:

- Axial Coding – Connections are made between categories; and
- Selective Coding – Categories and connections between them form a storyline to describe a phenomenon" (Creswell, 2009, p.184).

Data analyses were conducted at the same time as data gathering (Creswell, 2009, p.184). While interviews were ongoing, the researcher analysed, made interpretations and wrote reports of an interview collected earlier (Creswell, 2009, p.184). During data analysis of this mixed methods study, the data was organized categorically and chronologically, reviewed repeatedly, and continually coded. The procedure for the data analysis is outlined in Figure 2.

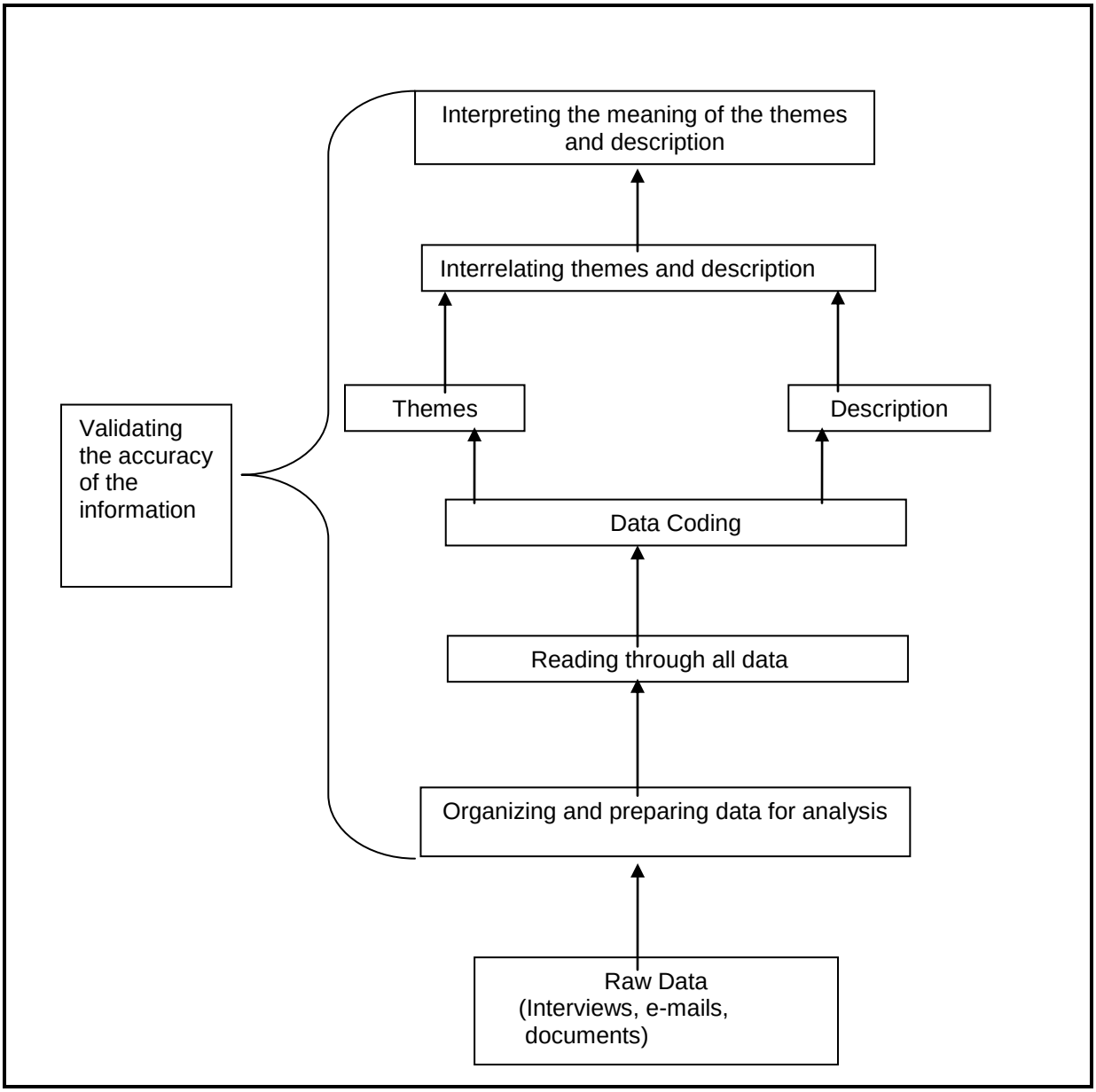

Figure 4.1: Visual model of Qualitative data analysis for this study.
Source: Adapted from Creswell (2009, p.184)

Step 1: Data were organised and prepared for analysis. This involved transcribing interviews, observations schedules and sorting out emails, documents and reports.

Step 2: To obtain a general sense of the information and to reflect on its overall meaning, data were read through and notes were written to record general thoughts.

Step 3: Coding –The material were organised into as many categories as possible, and the categories labelled.

Coding involved organising the data into segments of text before meaning were brought to the information (Rossman & Rallis, 1998, p.171). The researcher developed a codebook, which consisted of a record that contained predetermined codes used to code the data (Creswell, 2009, p.187).

Step 4: Themes were generated from the codes. These themes were then developed into a theoretical model and analysed.

Step 5: The analysed data were then integrated with the results of the quantitative strand of this mixed methods study (refer to Figure 1).

4.4 Conclusion

Chapter four defined the type of analyses and presentation of data. The first part of the analyses involved the analysis of the quantitative data, of the questionnaire and the observations. The second part involved a careful analysis of the respondents' answers to the qualitative interview questions. The following chapter will discusses the results of the data analyses.

CHAPTER FIVE

RESULTS AND DISCUSSIONS

5.1 Introduction

Descriptive statistical and inferential statistical analyses were used to generate the quantitative results for this study and thematic statistical analysis for the qualitative results.

5.2 Descriptive Statistical Results

Descriptive statistics describes the organising and summarising of quantitative data (Lind, Marchal and Mason, 2001, p.457). According to these authors univariate and bivariate analysis is most appropriate for descriptive statistics. They explain that univariate analysis is concerned with measures of central tendency and measures of dispersion. Bivariate analysis concerns the measurement of two variables at a time (Lind *et al*., 2001, p.458). Descriptive data analysis aims to describe the data investigating the distribution of scores on each variable, and by determining whether the scores on different variables are related to each other (Lind *et al*., 2001, p.458).

The following section summarises respondents' answers to Questionnaire Items 1 – 11. The aim of these questions is exemplified in section 4.3. The questions in bold type are an amalgamation of those questions asked in the questionnaire.

Figure 5.1 relates to the respondents' levels of experience in the nursery industry.

"How many years are you working in the Nursery trade?" (Question 1: Appendix 2: Questionnaire)

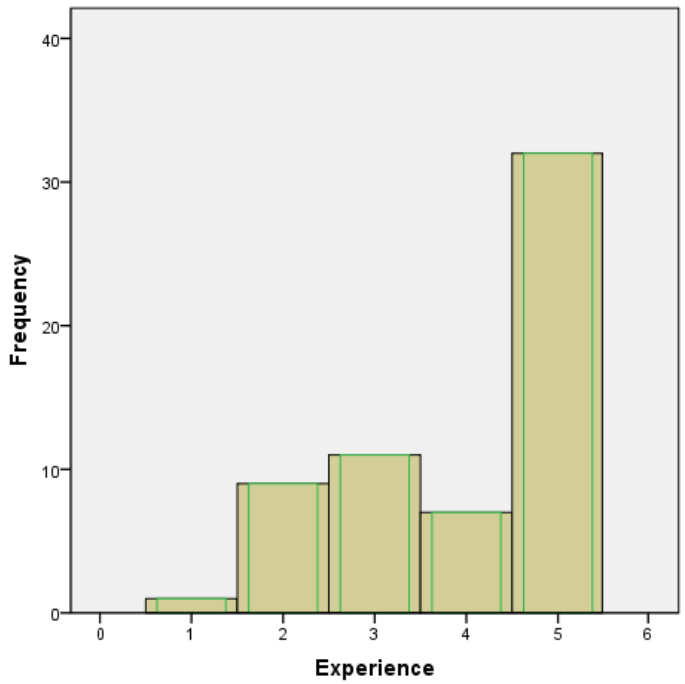

Figure 5.1: Degree of experience of workers in the nursery trade (1: less than 1 year; 2: 1 – 3 years; 3: 4 – 5 years; 4: 6 – 10 years; and 5 more than 10 years).

A total of 60 nurseries and garden centres were surveyed in terms of the following years of experience:

- 1 respondent had less than 1 year experience;
- 9 had 1 – 3 years;
- 11 had 4 – 5 years;
- 7 respondents 6 – 10 years; and
- 32 more than 10 years experience.

Fifty three percent of the respondents were owners and/or managers; that also acted as sales personal due to the specific business structure of their nursery/garden centre. This means that these 32 respondents were not just sales staff but played a definite part in the running of the business.

Figure 5.2 relates to the respondents' levels of qualification.

"What is your highest educational qualification?" (Question 2: Appendix 2: Questionnaire)

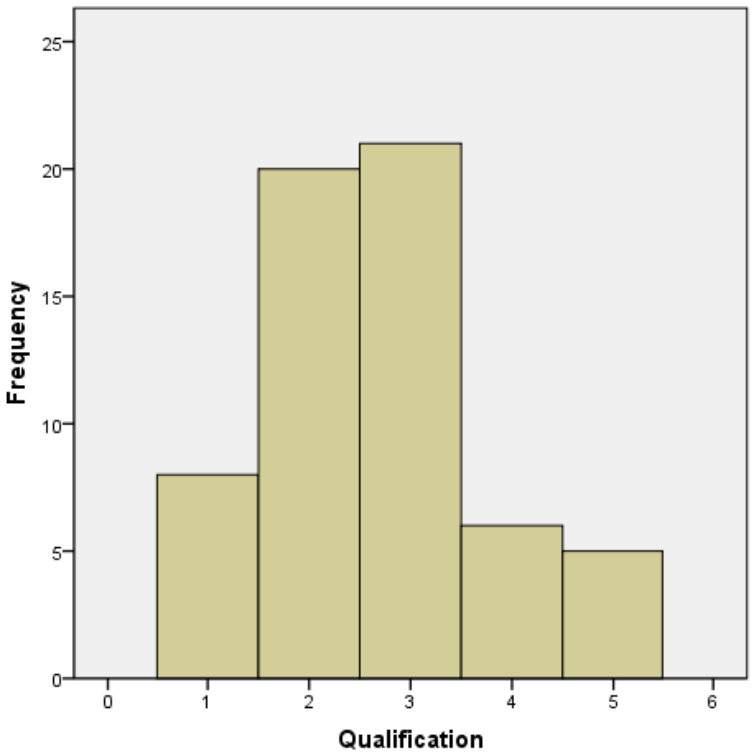

Figure 5.2: Levels of qualification of workers in the nursery trade (1: lower than matric; 2: matric; 3: degree; 4: postgraduates; and 5: other qualifications).

Figure 5.2 level of qualification shows that:

- 8 respondents had a lower than matric qualification;
- 20 with matric;
- 21 with a degree;
- 6 postgraduates; and
- 5 with other qualifications.

Figure 5.3 relates to the nature of businesses.

"In your opinion, is your place of work/business a: Nursery; Garden Centre" (Question 3: Appendix 2: Questionnaire)

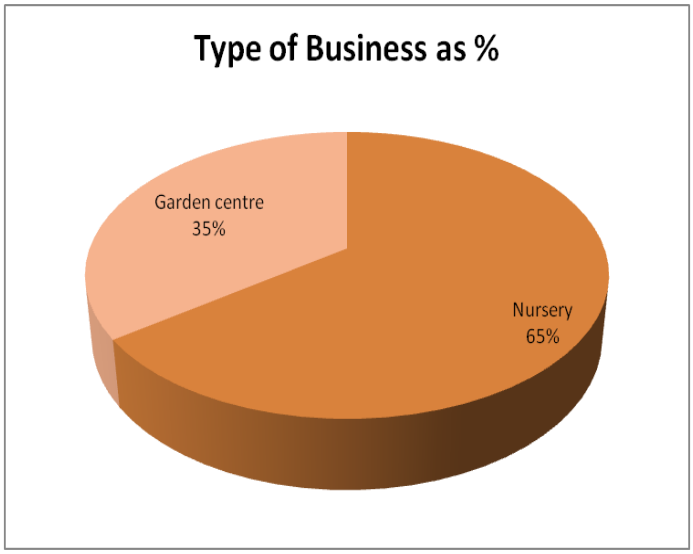

Figure 5.3: Type of Business; % that either were nurseries or garden centres.

In terms of the type of businesses:

- 65% (39) Business' were nurseries ; and
- 35% (21) were garden centres.

Figure 5.4 relates to the degree of customer attraction affiliated to a business.

"Does your place of work/business have the following? "(Question 4: Appendix 2: Questionnaire)

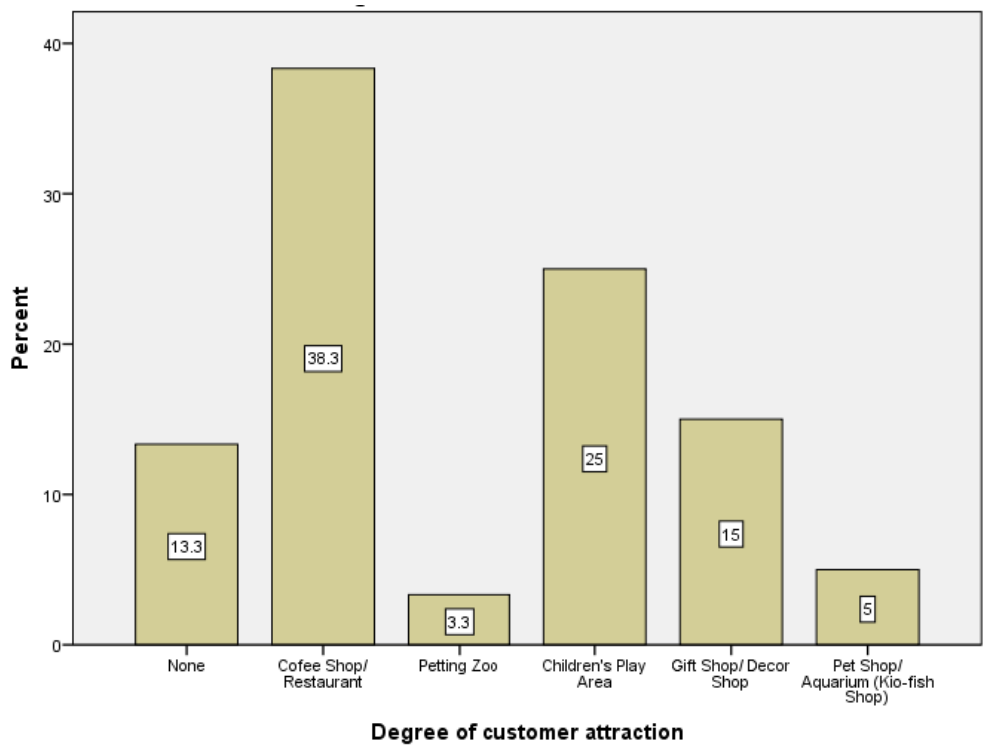

Figure 5.4: Degree of customer attraction attached to a business.

In terms of the degree of customer attractions affiliated to a business:

- The highest percentages of added value lifestyle products and services affiliated to a business were Coffee Shops at 38% (23) and Children's Play Area at 25% (15).

The answers to Question 4 (Appendix 2: Questionnaire), established whether a particular business was a Nursery or a Garden Centre.

Figure 5.5 relates to the respondents' awareness of the Voluntary Codes of Conduct for Nursery Professionals.

"Have you ever heard of the Voluntary Codes of Conduct for Nursery Professionals?" (Questions 5 & 6: Appendix 2: Questionnaire)

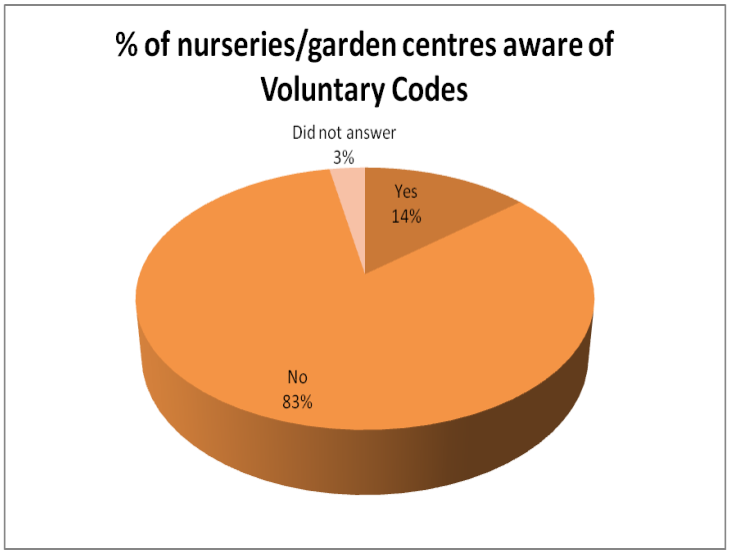

Figure 5.5: Percent of nurseries/garden centres aware of the Voluntary Codes of Conduct for Nursery Professionals.

In terms of the awareness of the Voluntary Codes of Conduct for Nursery Professionals:

- 83% respondents answered "No" to this question;
- 14% answered "Yes";
- and 3% did not answer the question at all.

Figure 5.6 relates to whether the Voluntary Codes of Conduct for Nursery Professionals were relevant to business.

If yes, do you think these Codes are relevant to your Nursery/Garden Centre?

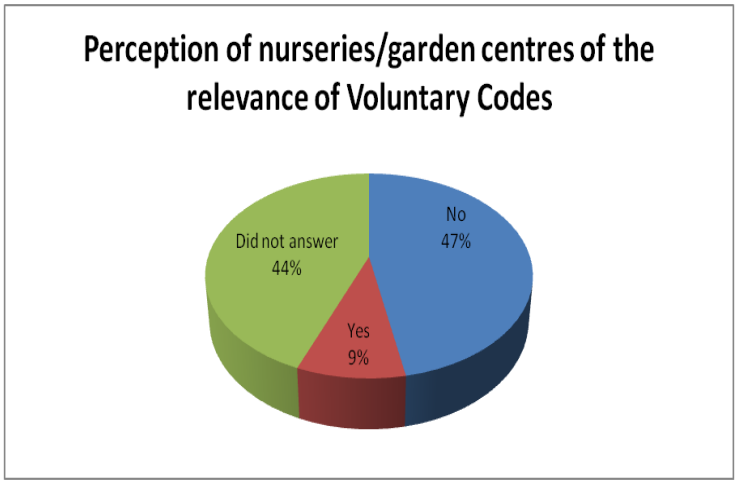

Figure 5.6: Perception of nurseries/garden centres of the relevance of the Voluntary Codes of Conduct for Nursery Professionals.

In terms of the relevance of the Voluntary Codes of Conduct for Nursery Professionals were relevant to business:

- 47% answered “No”;
- 9% “Yes”;
- and 44% did not answer the question at all.

Figure 5.7 relates to the respondents’ awareness of CARA legislation.

“Have you ever heard of the: Conservation of Agricultural Resources Act (CARA); National Environmental Management: Biodiversity Act (NEMBA)” (Question 7: Appendix 2: Questionnaire)

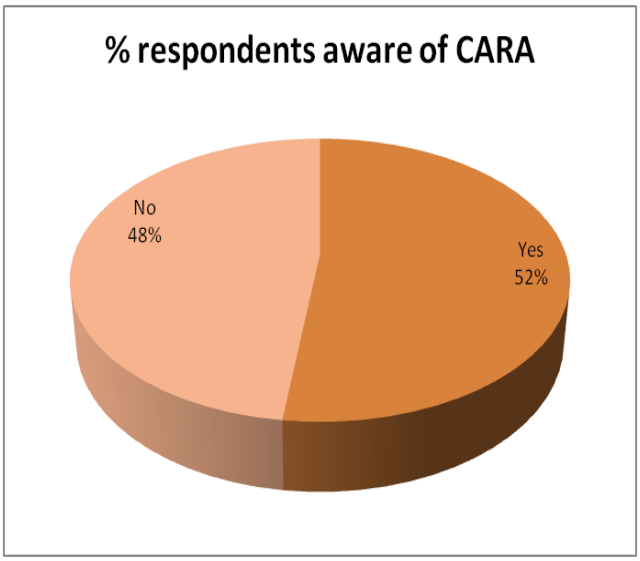

Figure 5.7: Percent of respondents aware of the CARA legislation.

In terms of CARA legislation:

- 52% respondents were aware of CARA; and
- 48% were not aware of the CARA regulations.

Figure 5.8 relates to the respondents' awareness of NEMBA legislation.

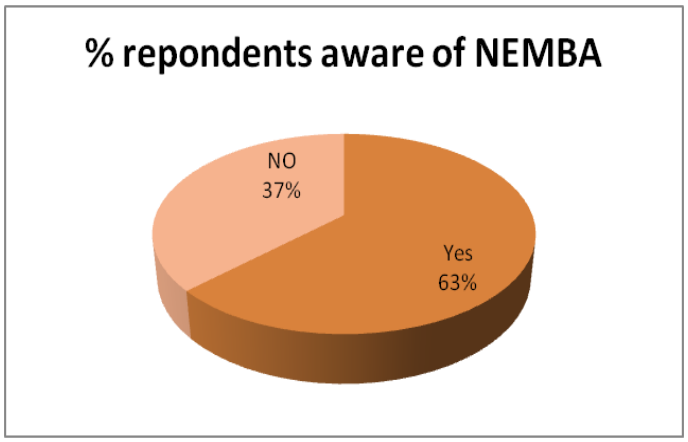

Figure 5.8: Percent of respondents aware of the NEMBA legislation.

In terms of NEMBA legislation:

- 63% respondents were aware of NEMBA; and
- 37% were not aware of the NEMBA regulations.

Figure 5.9 relates to the respondents' awareness of key Governmental role-players concerning the control and management of IAPs.

"Have you ever heard of the following organization?" (Question 8: Appendix 2: Questionnaire)

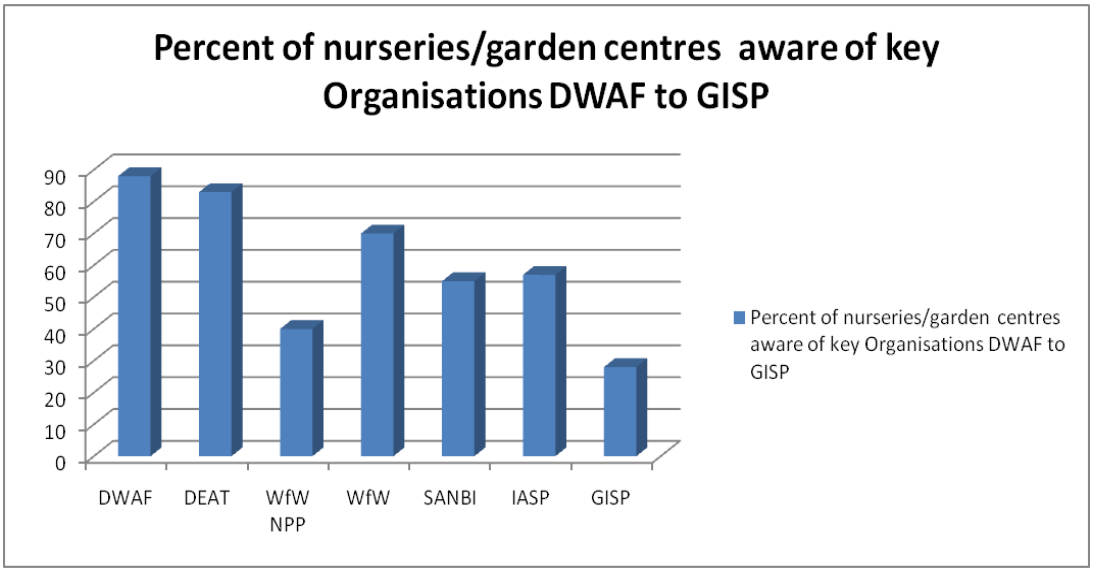

Figure 5.9: Percent of nurseries/garden centres aware of key organisations: DWAF to GISP.

The highest percentages of respondents' awareness of key governmental role-players, in the control and management of IAPs were:

- DWAF at 88.3%;
- DEAT 83.3%; and
- WfW 70%.

Figure 5.10 relates to whether businesses were affiliated to a Trade Association.

"Do you or your place of work/business belong to any Trade Association?" (Questions 9 &10: Appendix 2: Questionnaire)

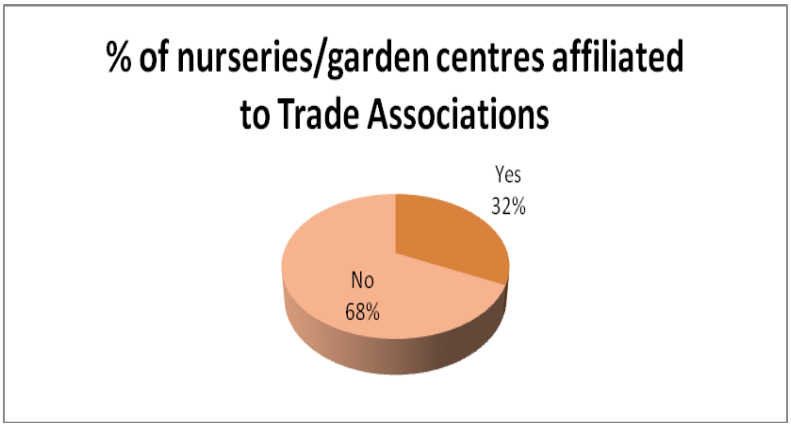

Figure 5.10: Percent of nurseries/garden centres affiliated to trade associations.

In terms of businesses affiliation to a Trade Association:

- 32% (19) Business's are affiliated to a Trade Association; and
- 68% (41) are not affiliated to a Trade Association.

Figure 5.11 relates to whether respondent's received formal training with regard to Invasive Plants.

"Have you received formal training with regard to Invasive Plants?" (Question 11: Appendix 2: Questionnaire)

Figure 5.11: Percent of respondents exposed to training in relation to IAPs.

In terms of whether respondent's received formal training with regard to IAPs:

- 70% respondent's answered "No";
- 27% answered "Yes"; and
- 3% did not answer the question.

Table 5.1 relates to which organization provided the formal training with regard to IAPs.

Where did you receive your training?

Table 5.1: Training Received

	Government workshops	Industry/Trade Associations	At Work	Other (please specify)	No Training
Number of Responses	4	2	4	Durban University of Technology 4 Europe 1	42

5.3 Inferential Statistical Results

Inferential statistical analysis is concerned with the testing of hypotheses and allows the researcher to draw conclusions about populations from sample data (Lind *et al*., 2001, p.459). For this study, primary and secondary data were collated and analysed and comments and concluding discussions were thereafter based on the results obtained.

The aim of this study is to assess the compliance of selected nurseries/garden centres, within KwaZulu-Natal EThekwini and uMsunduzi geographical regions, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983), CARA, under section 29 (15), and the National Environmental Management: Biodiversity Act 2004 (No. 10 of 2004), NEMBA, under section 70 (1b) and (3) and to investigate the associated communication between Government and the horticulture industry in this region.

The risk of non- compliance with the above-mentioned Acts were tested by testing each Independent Variable $X_1 – X_{10}$, listed in Table 5.2, against each Dependent Variable $Y_1 – Y_{17}$, listed in Table 5.3

Table 5.2: Independent Variables

Variable X_i	Name of variable	Corresponding Survey Questionnaire Item	Range of possible values
X_1	Experience	1	1-5
X_2	Qualification	2	1-4
X_3	Type of Business	3	1-2
X_4	Degree of customer attraction	4a	0-5
X_5	Awareness of Voluntary Codes of Conduct for Nurseries	5	1-2
X_6	Awareness of CARA	7	1-2
X_7	Awareness of NEMBA	7	1-2
X_8	Awareness of Organisations	8	0-7
X_9	Affiliation to Trade Associations	10	0-
X_{10}	Exposure to Training	11a	1-2

Table 5.3: Dependent Variables

Variable Y_j	Name of variable	Corresponding Survey Questionnaire Item	Range of possible values
Y_1	Stock CARA plants	15: ∑ CARA	0-10
Y_2	Stock NEMBA plants	15: ∑ NEMBA	0-11
Y_3	Stock Indigenous Alternative plants	15: ∑ Indig. plants	0-4
Y_4	Identify/know CARA plants	15: ∑CARA	0-10
Y_5	Identify/know NEMBA plants	15: ∑ NEMBA	0-11
Y_6	Identify/know Indigenous Alternative plants	15: ∑ Indig. plants	0-4
Y_7	Receive Government info/feedback	12.4 & 12.5	2-10

Y_8	CARA category knowledge	12.6	1-5
Y_9	NEMBA category knowledge	12.7	1-5
Y_{10}	Customer Q 1	13.1	1-5
Y_{11}	Customer Q 2	13.2	1-5
Y_{12}	Customer Q 3	13.3	1-5
Y_{13}	Customer Q 4	13.4	1-5
Y_{14}	Posters	14.1	1-5
Y_{15}	Pamphlets	14.2	1-5
Y_{16}	Opinion: invasive plants	14.3	1-5
Y_{17}	Opinion: potential invasive plants	14.4	1-5

A “GENLOG Poisson” model programme was carried out on all the data, examples for which are illustrated in the Appendix Tables 6.1 and 6.2. Many statistically significant results were obtained on the “GENLOG” analyses which are illustrated in Appendix Tables 6.3 to 6.19 of significant tests on each Y for each X. However, those tests that were significant only indicated that there were some or other significant differences between subgroups of data, but they did not indicate what the nature of the differences were.

Significant differences can occur, for example, due to differing “skewness” around the median. Another feature of the “GENLOG” analyses was that there sometimes was a sinusoidal pattern in the residuals around the “fitted line” (see for example Appendix 6.2). It would be preferable to have a “random scatter” about the “fitted line”. But the use of medians allows one to pin-point where the central tendencies were in the data, and whether subsets of data were significantly different from each other in regard to their medians.

In terms of the hypotheses of this mixed methods enquiry; it was important to know if the central tendencies (i.e. the medians) of the Y’s associated with each subgroup X (independent variable) were significantly different. Therefore, a median test was carried out on all the Y data to calculate the medians with their 95% CI's as shown in the tables for Y_1 on X_3, Y_2 on all the X's (excluding X_8) and Y_3 on all the X's (excluding X_8) (Question 15: ∑ of CARA, ∑ of NEMBA, ∑ of Indigenous plants; Appendix 2: Questionnaire).

The application of the “GENLOG” programme to the X_8 of each of the Yi ran into computational problems. In hindsight, X_8 should have been subdivided into individual organisations and then the programme would have run smoothly. This remains to be done in the future.

Table 5.4: Y_1 on X_3; Distribution of Number of CARA plant species found stocked at nurseries and garden centres

X_3: Type of Business	Y_1: Number of CARA plants stocked	Observed	
		Counts	%
Nursery	0	36	60
	1	2	3.3
	2	1	1.7
Garden Centre	0	21	35
	1	0	0
	2	0	0
Totals:		60	100

Conclusion: Although significant differences were found (using GENLOG analysis) with the distribution patterns for stocking CARA type plants according to Business Type, there were so few of them that no meaningful statistic will be shown. Basically, the nurseries/garden centres in this study stocked very few CARA plants. A total of 95% of all businesses (57 out of 60) stocked zero of the CARA plants shown.

Observations conducted during the administration of the questionnaire and the WfW NNP KZN-Nursery survey (Nurseries Partnership Education Programme, 2010), confirms the findings that nurseries/garden centres (in this study) in general do not stock or sell CARA listed plants. Therefore it can be concluded that they (nurseries/garden centres in this study) are compliant with CARA legislation.

Table 5.5: Y_2 on X_1; Summary of medians and related statistics for effect of X_1 (Level of Experience) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_1: Level of Experience	Sub-sample size: N	Median for Y_2	Ist Quartile	3rd Quartile	95% Confidence Interval (CI) for the Median
Less than 1 Year	1	- (only value was 4)	-	-	-
1 – 3 Years	9	4	2	4	1 - 5
4 – 5 Years	11	4	3	5	2 - 5
6 – 10 Years	7	3	3	5	0 - 5
More than 10 Years	32	4	2	5	2 - 5
Total Sample:	60	4	2	5	3 - 4

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there were no differences in their central tendencies (medians). The median number of types of NEMBA plants (out of 10 types) stocked by

nurseries and garden centres, irrespective of level of experience, was 4.

Observations conducted during the administration of the questionnaire and the WfW NNP KZN-Nursery survey (Nurseries Partnership Education Programme, 2010), confirms the findings that nurseries/garden centres (in this study) stock and sell NEMBA listed plants. The reason for this might be that NEMBA listed plants are not legislated against and selling these plants is not against the law. This assumption can be made for each independent variable X_1 to X_7 and X_9 to X_{10}, listed in Tables 5.5 to 5.13, against dependant variable Y_2.

Table 5.6: Y_2 on X_2; Summary of medians and related statistics for effect of X_2 (Qualification Level) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_2: Qualification Level	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Lower than Matric	8	4.5	3	5	2 - 5
Matric	20	4	1.5	5	1 - 5
Degree	26	4	3	5	3 - 5
Postgraduate	6	4	4	6	0 - 6
Total Sample:	60	4	2	5	3 - 4

Conclusion: There were no statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), nor were there differences in their central tendencies (medians). The median number of NEMBA plants out of 10 stocked by nurseries and garden centres, irrespective of level of qualification, were 4.

Table 5.7: Y_2 on X_3; Summary of medians and related statistics for effect of X_3 (Type of Business) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_3: Type of Business	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Nursery	39	4	3	5	3 - 5
Garden Centre	21	4	1	5	1 - 5
Total	60	4	2	5	3 - 4

Conclusion: There were no statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), nor was there a difference in their central tendencies

(medians). The median number of NEMBA plants out of 10 stocked by nurseries and garden centres were 4.

Table 5.8: Y_2 on X_4; Summary of medians and related statistics for effect of X_4 (Selection of Customer Attractants) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_4: Selection of Types of Customer Attractants	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
None	8	4	0.5	5	0 - 5
Coffee Shop/Restaurant	23	3	2	5	2 - 5
Children's Play Area	15	4	4	6	2 - 6
Total for all Attractants including minor ones not listed	60	4	2	5	3 - 4

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there were no differences in their central tendencies (medians). The median number of types of NEMBA plants stocked, out of 10, irrespective of presence or not of customer attractants, was 4.

Table 5.9: Y_2 on X_5; Summary of medians and related statistics for effect of X_5 (Awareness of Voluntary Codes of Conduct) and Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_5: Awareness of Voluntary Codes of Conduct	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not aware	50	4	2	5	3 - 5
Aware	10	4	2	5	2 - 5
Total	60	4	2	5	3 - 4

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no difference in their central tendencies (medians). The median number of types of NEMBA plants stocked out of 10, irrespective of awareness or not of Voluntary Codes of Conduct, was 4.

Table 5.10: Y_2 on X_6; Summary of medians and related statistics for effect of X_6 (Awareness of CARA) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_6: Awareness of CARA	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not aware	29	4	2	5	3 - 5
Aware	31	4	2	5	3 - 4
Total	60	4	2	5	3 - 4

Conclusion: There was no statistically significant difference in the distribution patterns between sub-groups (according to GENLOG analysis), nor was there a difference in their central tendencies (medians). The median number of types of NEMBA plants stocked out of 10, irrespective of awareness or not of CARA, was 4.

Table 5.11: Y_2 on X_7; Summary of medians and related statistics for effect of X_7 (Awareness of NEMBA) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_7: Awareness of NEMBA	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not aware	22	4.5	3	5	3 - 5
Aware	38	4	2	5	3 - 4
Total	60	4	2	5	3 - 4

Conclusion: There was no statistically significant difference in the distribution patterns between sub-groups (according to GENLOG analysis), nor was there a difference in their central tendencies (medians). The median number of types of NEMBA plants stocked out of 10, irrespective of awareness or not of NEMBA, was 4.

Table 5.12: Y_2 on X_9; Summary of medians and related statistics for effect of X_9 (Affiliation to Trade Associations) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_9: Affiliation to Trade Associations	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not affiliated	41	4	3	5	4 - 5
Affiliated	19	3	1	5	1-5
Total	60	4	2	5	3 - 4

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no significant difference in their central tendencies (medians), if 95% CI's are taken into account. The median number of types of NEMBA plants stocked out of 10, irrespective of affiliation or not to trade associations, was 4.

Table 5.13: Y_2 on X_{10}; Summary of medians and related statistics for effect of X_{10} (Exposure to Training) on Y_2 (Number of NEMBA plant species out of 10 that were stocked)

X_{10}: Exposure to Training	**Sub-sample size: N**	**Median for Y_2**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not exposed to Training	42	4	2	5	3 - 5
Exposed to Training	18	4	3	5	2 - 5
Total	60	4	2	5	3 - 4

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no significant difference in their central tendencies (medians). The median number of types of NEMBA plants stocked out of 10, irrespective of exposure or not to training, was 4.

Table 5.14: Y_3 on X_1; Summary of medians and related statistics for effect of X1 (Level of Experience) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_1: Level of Experience	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Less than 1 Year	1	(Only 1 respondent: stocked 2)	-	-	-
1 – 3 Years	9	3	3	3	0 - 4
4 – 5 Years	11	3	2	3	2 - 3
6 – 10 Years	7	3	2	3	0 - 4
More than 10 Years	32	3	2	3	2 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there were no differences in their central tendencies (medians). The median number of types of indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of level of experience, was 3.

Observations conducted during the administration of the questionnaire and the WfW NNP KZN-Nursery survey (Nurseries Partnership Education Programme, 2010), confirms the findings that nurseries/garden centres (in this study), stock and sell indigenous alternative plants. The reason for this might be changes in consumer buying trends, influenced by programmes such as the WFW "Water-Wise Plants" and the WfW NPP "Plant Me Instead" campaigns. This assumption can be made for each independent variable X_1 to X_7 and X_9 to X_{10}, listed in Table 5.14 to 5.22, against dependant variable Y_3.

Table 5.15: Y_3 on X_2; Summary of medians and related statistics for effect of X_2 (Level of Qualification) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_2: Level of Qualification	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Lower than Matric	8	3	1.5	3	0 - 3
Matric	20	3	2	3	2 - 3
Degree or equivalent	26	3	2	3	3 - 3
Postgraduate	6	2	2	3	1 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there were no differences in their central tendencies (medians). The median number of types of indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of level of qualification, was 3.

Table 5.16: Y_3 on X_3; Summary of medians and related statistics for effect of X_3 (Type of Business) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_3: Type of Business	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Nursery	39	3	2	3	3 - 3
Garden Centre	21	3	2	3	2 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: There was no statistically significant difference in the distribution patterns between sub-groups (according to GENLOG analysis), nor was there a difference in their central tendencies (medians). The median number of types of Indigenous alternative plants (out of 4 types) stocked by

nurseries and garden centres was 3.

Table 5.17: Y_3 on X_4; Summary of medians and related statistics for effect of X_4 (Selection of Customer Attractants) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_4: Selection of Customer Attractants	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
None specifically	8	3	1.5	3.5	0 - 4
Coffee Shop/Restaurant	23	3	2	3	2 - 3
Children's Play Area	15	3	2	3	1 - 3
Total Sample:	60 (including other minor Attractant types)	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there were no differences in their central tendencies (medians). The median number of types of Indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of presence or not of various types of customer attractants, was 3.

Table 5.18: Y_3 on X_5; Summary of medians and related statistics for effect of X_5 (Awareness of Voluntary Codes of Conduct) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_5: Awareness of Voluntary Codes of Conduct)	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not aware of	50	3	2	3	2 - 3
Aware of	10	3	1	3	0 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no difference in their central tendencies (medians). The median number of types of Indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of awareness or not of Voluntary Codes of Conduct, was 3.

Table 5.19: Y_3 on X_6; Summary of medians and related statistics for effect of X_6 (Awareness of CARA) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_6: Awareness of CARA	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not aware of	29	3	2	3	2 - 3
Aware of	31	3	2	3	2 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: There was no statistically significant difference in the distribution patterns between sub-groups (according to GENLOG analysis), nor was there a difference in their central tendencies (medians). The median number of types of Indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of awareness or not of CARA, was 3.

Table 5.20: Y_3 on X_7; Summary of medians and related statistics for effect of X_7 (Awareness of NEMBA) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_7: Awareness of NEMBA	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not aware of	22	3	2	3	2 - 3
Aware of	38	3	2	3	2 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no difference in their central tendencies (medians). The median number of types of Indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of awareness or not of NEMBA, was 3.

Table 5.21: Y_3 on X_9; Summary of medians and related statistics for effect of X_9 (Affiliation to Trade Associations) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_9: Affiliation to Trade Association	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not affiliated	41	3	2	3	2 - 3
Affiliated	19	3	1	3	1 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no difference in their central

tendencies (medians). The median number of types of indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of affiliation or not to trade associations, was 3.

Table 5.22: Y_3 on $X_{10;}$ Summary of medians and related statistics for effect of X_{10} (Exposure to Training) on Y_3 (Number of indigenous alternative plant types stocked out of 4)

X_{10}: Exposure to Training	**Sub-sample size: N**	**Median for Y_3**	**Ist Quartile**	**3rd Quartile**	**95% Confidence Interval (CI) for the Median**
Not exposed to	42	3	2	3	2 - 3
Exposed to	18	3	2	3	2 - 3
Total Sample:	60	3	2	3	2 - 3

Conclusion: Although there were statistically significant differences in the distribution patterns between sub-groups (according to GENLOG analysis), there was no difference in their central tendencies (medians). The median number of types of indigenous alternative plants (out of 4 types) stocked by nurseries and garden centres, irrespective of exposure or not to training, was 3.

The medians tested for each sub-group resulted in no statistically significant findings at the 5% level. None of the X's for a given Y was found to have contributed differently, viz., no significant differences in their effects. After examining the most frequent response for each X subgroup for each Y, it was found that there was very little difference in the most frequent response preference. It can be concluded that the median tests were unable to show significant differences on each sub-group. Therefore the Null Hypotheses relating to the effects of differences detailed in the various X's will not be rejected.

After careful analysis, the researcher found that nurseries and garden centres in the area of study tended to have similar practices and responses. A report on the Industry as a whole (in the area of the study) for each of the Y's (with 95% CI's) is illustrated in Table 5.23.

Table 5.23: Summary of medians on the whole sample (∑ of all nurseries and garden centres in the area of study) for the Y's from Y_1 to Y_{17}

Y:	**Nature of Y variable:**	**Total sample size:**	**Median Score:**	**95% Confidence Interval (CI) of Median Score:**
Y_1	Number of CARA plant species stocked out of 10	60	-	-
Y_2	Number of NEMBA plant species stocked out of 11	60	4	3 - 4
Y_3	Number of Alternative Indigenous plant species stocked out of 4	60	3	2 - 3
Y_4	Number of CARA plant species identified out of 10	60	7	6 - 8
Y_5	Number of NEMBA plant species identified out of 11	60	9	8 - 9
Y_6	Number of Alternative Indigenous plants identified out of 4	60	3	3 - 3
$Y_{7.1}$ Questionnaire item 12.1	Response on Receiving Government info/feedback	60	4 "Agree"	4 – 5 "Agree to Strongly Agree"
$Y_{7.2}$ Questionnaire item 12.2	Response on Receiving Trade Association info/feedback	60	4 "Agree"	4 – 4 'Agree"
$Y_{7.3}$ Questionnaire item 12.3	Response on Receiving Conservation Organization info/feedback	60	4 "Agree"	4 – 4 'Agree"
$Y_{7.4}$ Questionnaire item 12.4	Response on Receiving Government info/feedback	60	2 "Disagree"	2 – 3 "Disagree to Neutral"
$Y_{7.5}$ Questionnaire item 12.5	Response on Receiving Government info/feedback	60	2 "Disagree"	1 – 2 "Disagree to Strongly Disagree"
Y_8 Questionnaire item 12.6	Response on CARA category knowledge	60	4 "Agree"	3 – 4 "Agree to Neutral"

Y_9 Questionnaire item 12.7	Response on NEMBA category knowledge	60	2.5 "Midway between Disagree and Neutral"	2 – 3 "Disagree to Neutral"
Y_{10} Questionnaire item 13.1	Response on Customer Q 1	60	4 "Agree'	3 – 4 "Agree to Neutral"
Y_{11} Questionnaire item 13.2	Response on Customer Q 2	60	4 "Agree"	4 – 5 "Agree to Strongly Agree"
Y_{12} Questionnaire item 13.3	Response on Customer Q 3	60	3 "Neutral"	2 – 3 "Neutral to Disagree"
Y_{13} Questionnaire item 13.4	Response on Customer Q 4	60	4 "Agree"	4 – 5 "Agree to Strongly Agree"
Y_{14} Questionnaire item 14.1	Response on Posters	60	2 "Disagree"	2 – 2 "Disagree"
Y_{15} Questionnaire item 14.2	Response on Pamphlets	60	4 "Agree"	4 – 4 "Agree"
Y_{16} Questionnaire item 14.3	Response on Invasive Plants	60	3 "Neutral"	2 – 4 "Disagree to Agree"
Y_{17} Questionnaire item 14.4	Response on Potential Invasive Plants	59 (I not answered)	4 "Agree"	4 – 4 "Agree"

Y_1: There were very few CARA plant species being stocked and/or sold in the whole study area. Therefore, it is not relevant to determine the median (close to zero).

The research hypotheses for this mixed methods study predicted that the independent variables illustrated in Table 5.2 carried a risk of non–compliance with IAPs legislation (refer to 1.4).
Statistically, however, based on the evidence presented in this study, it was found that these independent variables had no significant influence on the dependant variables illustrated in Table 5.3. Therefore, this researcher can conclude that the Industry as a whole (within the area of study) had similar practices and responses.

The following is a summary of respondents' answers to Questionnaire Items 12 – 14. The aim of these questions is exemplified in section 4.3. The questions in bold type are an amalgamation of those questions (statements) featured in the questionnaire.

Who should make information available to nurseries/garden centres?

Question 12.1: Government

Question 12.2: Trade Associations

Question 12.3: Environmental and Conservation organisations

(Appendix 2: Questionnaire)

Eighty three percent of respondents “Agree” to “Strongly agree” that all the above should make IAPs information available to nurseries/garden centres. However, they feel that the responsibility lies stronger with Government and Trade Associations than with Environmental and Conservation organisations.

“I can easily obtain information regarding invasive plants from Government”, and “We receive (at least once a year) feedback/updates regarding Invasive plants from Government (Department of Agriculture/ Department of Environmental Affairs and Tourism)”.

(Questions 12.4 & 12.5; Appendix 2: Questionnaire)

Sixty four percent nurseries/garden centres “Disagree” to “Strongly disagree” with the above statements. Respondents feel that there are no communication between nurseries/garden centres and government.

“CARA; Category 1 and 3 plants may not be sold or propagated”, and “NEMBA; Category 5, Table X, are potentially invasive plants, many are ornamentals sold by nurseries/garden centres”.

(Questions 12.6 & 12.7; Appendix 2: Questionnaire)

Sixty percent nurseries/garden centres “Agree” to “Strongly agree” with the CARA statement, 41.6% “Agree” with the NEMBA statement and a further 46.6% choose “Neutral” with regard to NEMBA.

Responses to the above statements indicate significant levels of awareness around the specifics of the CARA legislation. However, responses around the specifics of NEMBA were almost equal between “Agree” and “Neutral”. It appears that with the awareness around the specifications of NEMBA, the respondents were much less sure of themselves.

Questionnaire Items 13.1 – 13.4 were aimed at establishing whether knowledge of legislation was being conveyed to clients and whether respondents would recommend indigenous or non-invasive alternative to IAPs.
(Questions 13.1 to 13.4; Appendix 2: Questionnaire)

Seventy eighth percent nurseries/garden centres indicated that they would and do tell customers that they do not stock IAPs if they request them, and also explain why they do not stock these plants. 83% would recommend an indigenous or non-invasive alternative to their clients. However, only 28% indicated that they would not sell IAPs, if requested, while 43% were "Neutral" with regard to selling IAPs.

"We have posters on display at our nursery/garden centre", and "pamphlets regarding invasive plants and/or plant alternatives to invasive plants are available at our nursery /garden centre".
(Questions 14.1 and 14.2; Appendix 2: Questionnaire)

The majority of nurseries and garden centres "Disagree" to "Strongly disagree" with the above statements. Respondents with 10 or more years experience indicated that their nurseries/garden centres had posters and pamphlets featuring IAPs years ago, but in recent years they were unable to obtain any. Observations conducted concurrently with the administering of the questionnaire confirmed that only seven nurseries/garden centres had visible posters and/or pamphlets on display and a further nine had literature with regards to IAPs available for staff reference.

"Nurseries/garden centres stock and sell invasive plants", and "nurseries/garden centres stock and sell potentially invasive plants".
(Questions 14.3 and 14.4; Appendix 2: Questionnaire)

The responses to Questionnaire Item 14.3, whether nurseries/garden centres where stocking and selling IAPs, 38% "Agree", 28% "Disagree" and 18% "Neutral". However, 52% "Agree" that they stock and sell potentially invasive plants. Observations conducted concurrently with administering of the questionnaire confirmed the findings that nurseries/garden centres do stock and sell potentially invasive plants. However, the findings of the observations were that nurseries/garden centres (within the area of study) in general do not stock and sell IAPs, in contradiction to the perception of 38% of responses.

5.4 Observations

Observations (refer to Appendix 4: Observation Checklist) in selected nurseries/garden centres were conducted, concurrently with administering the questionnaire, to verify responses to Questionnaire item 15 (Appendix 2: Questionnaire); did nurseries/garden centres stock and/or sold IAPs and to determine if nurseries/garden centres had visible and/or IAPs literature available within their businesses.

Due to the sensitive nature of this enquiry, this researcher anticipated resistance from some nurseries/garden centre owners/managers, but was pleasantly surprised to find that owners/ managers were positive and co-operative towards the enquiry. Permission to gain entry to research sites (refer to 3.7) were granted without hesitation.

The purposive random sampling method (refer to 3.6) was used to select a total of 30 nurseries/garden centres, where observations were conducted. The selected nurseries/garden centres were then divided into those affiliated to trade associations and those that are not affiliated to trade associations, as indicated in Table 5.25.

Table 5.24: Number of Trade Affiliated and Non-Trade Affiliated Nurseries/Garden Centres (as recorded by the researcher)

	NURSERY	GARDEN CENTRE
Trade Affiliated	5	3
Non-Trade Affiliated	14	8
TOTAL	30	

Objective 7 to 10 (refer to 1.4, Table 1.1)

Observations were conducted against Observation Items 4 - 23 on the Observation Checklist (refer to Appendix 4) to determine if nurseries/garden centres stocked and/or sold selected IAPs as listed in section 29(15) of the CARA regulations and potential IAPs as listed in section 70(1)(b), (3) and (5) of the draft NEMBA regulations (Table 5.25).

Table 5.25: Number of nurseries/garden centres which stock and/or sell CARA and NEMBA plants (as recorded by the researcher)

			NURSERY		GARDEN CENTRE	
Species	**CARA Category**	**NEMBA Category**	**Trade Affiliated**	**Non-Trade Affiliated**	**Trade Affiliated**	**Non-Trade Affiliated**
Lantana camara – Tickberry/ Lantana	1	1b	0	0	0	0
Nerium oleander – Oleander	1	1b	0	0	0	0
Ardisa crenata – Coralberry	1	1b	0	1	0	0
Bauhinia purpurea – Butterfly Orchid tree	3	1b	0	0	0	0
Cestrum elegans – Crimson Cestrum	1	1b	0	0	0	0
Macfadyena unguis-cati - Cat's claw creeper	1	1b	0	0	0	0
Solanum seaforthianum – Potato creeper	1	1b	0	0	0	0
Pennistetum setaceum – Fountain grass		1b	0	1	0	0
Lantana motivedensis -'Sundancer'		1b	0	3	0	2
Murraya paniculata – Mock orange		1b	5	11	3	8
Duranta erecta – Forget-me-not-tree		3	0	0	0	0
Duranta reptans varigata		5	0	1	0	0
Syngonium podyphyllum – Goose foot		1b	2	7	1	4
Tradescantia zebrina - Wandering Jew		1b	0	2	0	0
Schefflera elegantissama- False Aralia		3	0	0	0	0
Schefflera aboricola variegata		3	4	8	3	7
Syzygium paniculatum – Brush cherry		5	4	10	3	7
Ligustrum sinense – Chinese privet	3	1b	0	0	0	0
Ligustrum vulgare – Privet	3	1b	0	0	0	0
Hedra helix – English Ivy		3	4	11	3	8

Of the 30 participating nurseries/garden centres, one Non-Trade Affiliated Nursery stocked (grew) one plant species *Ardisa crenata* CARA Category 1 listed in section 29(15) of the CARA regulations. Eleven Non-Trade Affiliated Nurseries, five Trade Affiliated Nurseries, eight Non-Trade Affiliated Garden Centres and three Trade Affiliated Garden Centres were observed to stock and sell potential IAPs as listed in section 70(1)(b), (3) and (5) of the draft NEMBA regulations.

Three Non-Trade Affiliated Nurseries and two Non-Trade Affiliated Garden Centres were observed to stock and sell *Lantana motivedensis* -'Sundancer' NEMBA Category 1b. According to the Southern African Plant Invader Atlas (2009), *Lantana motivedensis* -'Sundancer' and other "pure-yellow flowering" Lantanas, do, occasionally, produce seed and is, therefore, illegal in terms of CARA, to propagate or sell in South Africa. CARA regulations state that "All seed producing species or seed producing hybrids of Lantana that are non-indigenous to Africa" (South Africa Government Gazette No. 32090, April 3, 2009), are legislated against.

Plant species, listed as potential IAPs in section 70(1)(b), (3) and (5) of the draft NEMBA regulations, mostly observed in nurseries/garden centres are: *Murraya paniculata* – Mock orange; NEMBA Category 1b, *Schefflera aboricola variegata;* NEMBA Category 3 , *Syzygium paniculatum* – Brush cherry; NEMBA Category 5 and *Hedra helix* – English Ivy; NEMBA Category 3.

Objectives 1 and 2 (refer to 1.4, Table 1.1)

Observations were conducted against Observation Items 1, 2 and 3 on the Observation Checklist (refer to Appendix 4) to determine if nurseries/garden centres had any IAP literature visible and/or for sale in their businesses (Table 5.26).

Table 5.26: Number of nurseries/garden centres that had visible or saleable IAP literature within their businesses
(as recorded by the researcher)

	NURSERY		**GARDEN CENTRE**	
	Trade Affiliated	**Non-Trade Affiliated**	**Trade Affiliated**	**Non-Trade Affiliated**
Posters	2	2	0	0
Pamphlets	1	0	0	0
Books	0	0	0	2

Seven nurseries/garden centres had visible IAP literature on display and/or for sale in their businesses. A further nine indicated that they do have literature at their businesses, but that it is only available for staff reference and information.

Objective 3 and 4 (refer to 1.4, Table 1.1)

Observations were conducted against Observation Items 24 - 28 on the Observation Checklist (refer to Appendix 4) to determine if nurseries/garden centres stocked and/or sold selected indigenous plant alternatives to selected IAPs as listed in section 29(15) of the CARA regulations and potential IAPs as listed in section 70(1) (b) and (3) of the draft NEMBA regulations (Table 5.27).

Table 5.27: Selected Indigenous Plant Alternatives observed in participating nurseries/garden centres (as recorded by the researcher)

	NURSERY		**GARDEN CENTRE**	
Species	**Trade Affiliated**	**Non-Trade Affiliated**	**Trade Affiliated**	**Non-Trade Affiliated**
Polygala myrtifolia	4	12	3	6
Pavetta revolute	0	0	1	0
Senecio tamoides	1	8	1	3
Plumbago auriculata	3	13	3	8

Four Trade Affiliated Nurseries, thirteen Non-Trade Affiliated Nurseries, three Trade Affiliated Garden Centres and eight Non-Trade Affiliated Garden Centres were observed to stock and sell selected indigenous plant alternatives to selected IAPs in their business.

Table 5.28 appears to show that the Non-Trade Affiliated Nurseries and Garden Centres had adapted the practice of stocking indigenous plant alternatives better that Trade Affiliated Nurseries and Garden Centres. But considering the relative proportions within each group, 50:10 Non-Trade Affiliated Nurseries and Garden Centres to Trade Affiliated Nurseries and Garden Centres, the Trade Affiliated ones have adapted the practice better.

5.4.1 "Hybrid" and "Sterile" Plant Varieties

"Plant hybrids are the result of sexual reproduction between plants from two different taxa or species. Not all plant hybrids are sterile, but many are" (Veloz, 2009). Veloz (2009) further explained that "Sterility in plant hybrids is most often the result of polyploidy, which occurs because of

abnormal cell division" resulting in "uneven chromosomes". If a plant has uneven chromosomes they are unable to produce viable offspring's". Many "misconceptions" with regard to "Hybrid" and "Sterile" species (Southern African Plant Invader Atlas, 2009) related to plants listed in the "New Revised CARA" and Draft NEMBA regulations, exist among nursery men and the general public (Nurseries Partnership Education Programme Survey Report, 2010).

The ARC – Plant Protection Research Institute (in Southern African Plant Invader Atlas, 2009), explains the most "common misconceptions" as follows (Table 5.28):

Table 5.28: Common Misconceptions and Facts with regard to "Hybrid" and "Sterile" Plant Species

MISCONCECPTIONS	**FACT**
Plant hybrids are not invasive because they can only be reproduced by vegetative means, viz., cuttings, tissue culture etc.	Many hybrids, for example, variegated forms are able to reproduce by seed and their progeny reverts back to the original form.
"Sterile" plants do not reproduce seed and are, therefore, not invasive.	"Sterile" plants produce fertile pollen that can cross-pollinate the normal fertile plants. They also produce fertile embryo sacks that occasionally produce seed.
Plants with only one sex present in the country are not invasive because they cannot produce seed.	Many plants produce seed without pollination, this is known as "apomictic" reproduction.

Source: Adapted from ARC – Plant Protection Research Institute (in Southern African Plant Invader Atlas, 2010).

Table 5.28 elicits the fact that Variegated Hybrids can revert back to the original form and that "Sterile" plants produce seed occasionally. When Hybrids and "Sterile" species are closely related to known IAPs, then those specific Hybrids and "Sterile" species have the potential to become invasive and/or aid in the spread of their invasive relatives (Southern African Plant Invader Atlas, 2009). Hybrids and "Sterile" plants, which are related to plants listed in Section 70 of the draft NEMBA regulations, shown in Table 5.28, were observed in all participating nurseries/garden centres. Nursery men "believe they are entitled to sell" (Nurseries Partnership Education Programme Survey Report, 2010) these Hybrids as they are not listed as being invasive or potentially invasive.

Table 5.29 lists specific Hybrids and "Sterile" plants, related to plants listed in Section 70 of the draft NEMBA regulations, observed in participating nurseries/garden centres.

Table 5.29: Hybrids and "Sterile" plants, observed in participating nurseries/garden centres (as recorded by the researcher)

	NURSERY		GARDEN CENTRE	
"Hybrid"/ "Sterile' Species	**Trade Affiliated**	**Non-Trade Affiliated**	**Trade Affiliated**	**Non-Trade Affiliated**
Nerium oleander Dwarf	0	1	0	1
Lantana motivedensis Mauve	2	12	2	7
Lantana motivedensis White	1	10	1	6
Hedra helix species	5	14	2	8
Schefflera aboricola "Gold Capella"	4	13	3	6
Duranta erecta "Sheena's Gold"	4	12	3	7
Duranta erecta "Sapphire Shower"	2	10	2	5
Duranta erecta "Goldmine"	2	11	2	5
Duranta erecta "Auzie"	1	8	2	4

5.5 Thematic Analytical Results

Thematic analysis involves different types of strategies for the analysis of narrative data whereby resultant themes are identified (Teddlie & Tashakkori, 2009, p.344), by reading and re-reading the data. According to Fereday and Muir-Cochrane (2006), thematic analysis "is a form of pattern recognition within the data, where emerging themes become the categories for analysis".

The following section gives a detailed report on the analysis of the respondents' answers to the qualitative interview questions. In certain instances, it was necessary to paraphrase or quote the respondents' answers to accurately portray the respondents' views.

5.5.1 Interview Schedule Section A

The aim of this set of questions was to group participants into two categories; nurseries and garden centres and to determine if level of experience and type of business had any influence on the participants' views and perceptions with regard to the issues under investigation in Section B.

Responses to Interview item 5a, Section B (refer to Appendix 3: Interview Schedule) were then used to further subdivide nurseries and garden centres into Trade Affiliated and Non-Trade Affiliated

groups. Twenty interviews were conducted of which three were Trade Affiliated Nurseries, nine Non-Trade Affiliated Nurseries, three Trade Affiliated Garden Centres and five Non-Trade Affiliated Garden Centres.

5.5.2 Interview Schedule Section B

The aim of this set of questions was to assess the extent the local horticultural industry is playing a role combating the spread of IAPs and plant species that have the potential to become invasive. Moreover, questions were aimed to determine the extent to which government initiatives and awareness programmes against IAPs had impacted on local nurseries/garden centres with regard to their knowledge and understanding of the IAPs problem. To achieve these aims participants' responses to interview questions were analysed according to Creswell's (2009, p.184) recommendations, as explained in Figure 2.

Level of Awareness of IAPs Legislation

To determine the level of awareness of CARA legislation governing nurseries/garden centres as well as that of the Draft NEMBA regulations, respondents were asked the following questions:
(Interview Items 1.a and 1.b, Section B)

Where did you hear about:

a) The Conservation of Agricultural Resources Act (CARA); and
b) The National Environmental Management Biodiversity Act (NEMBA)?

Respondents from both the "nursery" and "garden centre" categories (refer to 3.8), that are affiliated to the trade association, SANA, "heard" about CARA and NEMBA from SANA.

The responses from nurseries and garden centres not affiliated to the trade associations (SANA) were varied. Three respondents, one garden centre and two nurseries, said they "heard" about CARA and NEMBA from websites featuring information about IAPs. Upon further enquiry, these respondents could not specify which websites they obtained the information from. One respondent, Non-Trade Affiliated Garden Centre, in business for over twenty years, said that she read about CARA in newspapers "years ago", but that she never "heard" about NEMBA. Another respondent, Non-Trade Affiliated Nursery, in business for less than three years, said that he is not aware of either CARA or NEMBA. The researcher observed that *Ardisa crenata* and *Schinus terebinthifolius*, both CARA Category 1 seedlings, were growing as stock plants in the nursery.

Other responses included answers as follows (verbatim):

- "*KZN Wildlife Society, WSSA*" (Non- Trade Affiliated Nursery);
- "*Department of Public Works*" (Non-Trade Affiliated Garden Centre);
- "*IAPs posters at Durban Botanical Gardens*" (Non-Trade Affiliated Nursery);
- "*Trade Journals, like, Landscape S.A*." (Non-Trade Affiliated Nursery);
- "*The Gardener Magazine*" (Non-Trade Affiliated Garden Centre);
- "*Parks Department workshop*" (Non-Trade Affiliated Garden Centre);
- "*A friend working for the local municipality*" (Non-Trade Affiliated Nursery); and
- "*Conversation with fellow nursery men*" (Non-Trade Affiliated Nursery).

Awareness of the Current Status of the NEMBA Regulations

Respondents were asked the following question:
(Interview Item 4, Section B)

What is the current status of the NEMBA regulations?

Responses from SANA affiliated nurseries and garden centres indicated that they know the current states of NEMBA, as they get regular updates via SANA's website and at SANA meetings.

One respondent (Non-Trade Affiliated Nursery), a member of a charity organisation, affiliated to the WfW Community Projects initiative, another respondent (Non-Trade Affiliated Nursery) and member of the Durban Metro Environmental Community Eradication of IAPs Programme and a respondent (Non-Trade Affiliated Garden Centre), who attended a Parks Department Workshop, were all aware of the current states of NEMBA. The rest of the nurseries and garden centres, that are not affiliated to SANA or any other organisation involved with IAPs eradication programmes, did not know the current states of NEMBA.

Reasons for Non- Membership to SANA

The South African Nursery Association, SANA is the major trade association representing retail nurseries and garden centres in the country. Le Cook (2004) found that the majority of KZN nurseries and garden centres are not members of SANA. To determine the reason why nurseries/garden centres choose not to be members of SANA, participants were asked the following question:
(Interview Item 5.b, Section B)

What are your reasons for not being a member of a Trade Association?

The main response to the above question was that nurseries/garden centres found that there is no "benefit" to them to be a member of SANA; high membership fees also play a factor in non-membership. Respondents who were more vocal about this issue stated their reasons as follows:

A respondent, who used to be a member for a number of years, became "despondent" with SANA and their "unfriendly regulations" and withdrew his membership. A previous SANA member of over twenty years said that SANA is "useless" since they (SANA) expect members to pay the membership fees and members get nothing in return. One respondent stated that "SANA is only interested in the "Big Guys", smaller nurseries like his, does not matter to them."

One nursery and two garden centres under new ownership, as well as one nursery in business for less than three years, indicated that they first need to "build-up" their respective businesses and might consider joining SANA at a later stage.

Communication

To assess the current situation on issues associated with communication between Government and local nurseries/garden centres, pertaining to IAPs, the following questions were asked:

(Interview Items 2 and 3, Section B)

Who in your opinion should inform nurseries/garden centres about issues pertaining to alien invasive plants (IAPs)?

a) Government
b) Environmental and Conservation organisations
c) Trade Associations
d) Other
   (Please explain)

Nurseries and garden centres want to be informed and kept up-to date and the majority of responses were that all the above-mentioned role players should inform them about issues pertaining to IAPs.

Response to a) Government:

Respondents also felt strongly that the responsibility to inform nurseries and garden centres should be with Government. One respondent (Non-Trade Affiliated Nursery) said that as "*Government is making the law, they should enforce the law and have the responsibility to inform people about the*

law". Another respondent (Non-Trade Affiliated Nursery) pointed out that, although he "thinks" that Government is primarily responsible to inform nurseries and garden centres, governmental departments are limited to their scope of work, liaising with nurseries and garden centres might not be within that scope.

Response to b) Environmental and Conservation organisations:

One respondent (Non-Trade Affiliated Garden Centre) said that although Environmental and Conservation organisations should not be responsible to keep nurseries and garden centres informed, they should include nurseries and garden centres in their awareness and training programmes.

Response to c) Trade Associations:

A respondent (Non-Trade Affiliated Nursery) said that Trade Associations (SANA) have a responsibility towards their members. The Trade Affiliated Nurseries and Garden Centres interviewed said that, as members, it is expected that SANA should keep them informed.

Response to d) Other:

Some respondents from the both the nursery and garden centre group felt that although, the responsibility to inform nurseries/garden centres is with Government, nurseries/garden centres should make an effort to obtain information regarding IAPs themselves.

Four respondents, three (Non-Trade Affiliated Nursery) and one (Non-Trade Affiliated Garden Centre), rely on their Suppliers (Wholesale Nurseries) to assist them with information regarding IAPs.

Respondents around Pietermaritzburg noted that academics from Cedara Agricultural College visits on a regular basis and assist in providing expertise regarding IAPs.

Have you ever received official notification from Government regarding IAPs legislation?

The main response was that "No official notification" or IAPs list were received from Government. Two respondents, one (Non-Trade Affiliated Nursery) and one (Non-Trade Affiliated Garden Centre), had lists that they received more than ten years ago.

A number of respondents mentioned that the only interest their business received from Government was the occasional visit from “Parks Board” to inspect their nursery/garden centre for rare and endangered plant species.

On further investigation regarding “Communication,” the researcher asked the following two questions:

Have you (nursery/garden centre owner/manager) ever tried to obtain information regarding IAPs from relevant Governmental Departments?

The main response was that they (nursery/garden centre owners/managers) never tried and that they don’t know which governmental departments to approach. One respondent (Non-Trade Affiliated Nursery) said that he gave up trying because he found the Department of Agriculture a “nightmare” to try and get help from.

In your opinion what would you like to see happening?

Response to this question was that it would make a difference if the following criteria are met:

- Nurseries/garden centres know which governmental departments to approach;
- Have all the relevant contact details;
- An email address to direct questions and queries too;
- A dedicated governmental department who can inform and update nurseries/garden centres on a regular basis;
- IAPs list with clear pictures, to help with identification; and
- IAPs list with control methods for individual species.

One respondent (Non-Trade Affiliated Nursery) summed up the situation by stating that, “It would be ideal if all the role-players, Government, Nurseries, Environmental and Conservation organisations, work together and form a central department or interest group, interacting with each other and where nurseries can direct their enquiries too”.

Education

Nurseries/garden centres are in a perfect position to act as platforms to create awareness among their customers, regarding IAPs. To achieve this, nursery/garden centre staff must be knowledgeable about IAPs.

To determine if nurseries/garden centres received any training regarding IAPs, the following questions were asked:
(Interview Items 9, 10, 11 and 12 Section B)
Did you or any of your staff receive official training regarding invasive alien plants?
If yes, who provided the training?
Two respondents, one (Non-Trade Affiliated Nursery) and one (Trade Affiliated Garden Centre) participated in a WFW- workshop on IAPs six years ago. One respondent (Non-Trade Affiliated Garden Centre) participated in a Parks Board workshop eight years ago.

Have you provided any in- house training regarding invasive alien plants to your staff?
The main response to this question was an emphatic "No." Only one respondent (Non-Trade Affiliated Garden Centre) invited a representative from the Conservancy to deliver an "IAPs talk" to staff and customers. Several respondents indicated that although they did not provide any in-house training to their staff, they do, however, have books and/or pamphlets and posters as source for staff reference and information.

Where can you obtain posters and pamphlets featuring IAPs?
Several respondents said that they had posters and pamphlets in the past, but the pamphlets were handed out to customers and posters became yellow, torn and faded. It is difficult to obtain new ones as they (respondents) do not know where to get them or who to contact. Others indicated that they never had any posters or pamphlets. Again these respondents did not know where to get posters or pamphlets from.
One respondent (Non-Trade Affiliated Nursery) requested posters from WfW more than a year ago, but, to date, still have not receive any. SANA members said that they can obtain posters and pamphlets from SANA. Despite their response only one (Trade Affiliated Nursery) had visible IAPs posters in the nursery.

Voluntary Codes of Conduct for Nursery Professionals and
Working for Water Nursery Partnership Programme (WfW NPP)

The Voluntary Codes of Conduct for Nursery Professionals were designed, with the aim of creating and promoting voluntary initiatives to prevent horticultural introductions of IAPs and forgoing sales of known invasive plants (Burt *et al*., 2006). They encourage self-regulation by the horticulture industry, are in conjunction with regulatory laws and designed to ensure compliance with legislation

(Bradshaw & Jones, 2005; Burt *et al*., 2006, p.920) (refer to 2.4).

The Working for Water Nursery Partnership Programme**,** WfW NPP, a partnership formed between Working for Water, WfW, the South African Nursery Association, SANA, and the National Department of Agriculture, NDA, are based on the Voluntary Codes of Conduct for Nursery Professionals (Richardson *et al.*, 2006, p.43) (refer to 2.4.2).

To assess the local nurseries/garden centres awareness about the "Codes" and the WfW NPP, and, therefore, the level of self-regulation, the following questions were asked:

(Interview Items 6, 7 and 8, Section B)

Have you ever heard of the:" Voluntary Codes of Conduct for Nursery Professionals?"

If yes, how are these "codes" relevant to your business?

Have you ever heard of the: "Working for Water Nursery Partnership Programme (WfW NPP)?"

All the respondents interviewed never "heard" or were aware of the "Codes." One respondent remarked that the "name" in itself sounds "official" and she would "guess" that it would have relevance to her business.

The WfW NPP conducted an "Education Programme Survey on KZN Nurseries" in the first quarter of 2010. Seven respondents indicated that the only reason they know about WfW NNP existence is because they participated in this survey. Further, similar to the rest of the respondents interviewed, they were not familiar or participated in any of WfW NNP's campaigns against IAPs.

Local Industries Perception of IAPs Legislation

The Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA was originally enacted to regulate IAPs that may have an impact on agricultural resources, but in the absence of alternate relevant legislation, CARA regulations have been applied to regulate IAPs that impacted on biodiversity, water resource management and fire management (Paterson, 2006, p.7). Plant species listed in section 29(15) of the CARA regulations, are legislated against and is, therefore, illegal to propagate or sell in South Africa (South Africa Government Gazette No. 32090, April 3, 2009).

The National Environmental Management: Biodiversity Act 2004, NEMBA, was promulgated in 2004 and deals directly with the prevention of unauthorised introduction, spread and eradication of IAPs (Gubb, *circa,* 2005; Paterson, 2006, p.32). NEMBA regulations are still pending (Paterson, 2006, p.33) and plant species listed in the Draft NEMBA regulations are not legislated against (Kay Montgomary, personal communication, September 14, 2009). Should the Draft NEMBA regulations become law, plant species under section 70 cannot be propagated, grown, bought or sold by nurseries/garden centres without a permit (South Africa Government Gazette No. 32090, April 3, 2009).

To assess the perceptions of local nurseries/garden centres with regards to IAPs legislation, the following questions were asked:
(Interview Item 13 and 14, Section B)

Would you like to comment on the Conservation of Agricultural Resources Act (CARA) and/or the National Environmental Management Biodiversity Act (NEMBA)?

Comments on CARA

Respondents felt that Government has not provided nurseries/garden centres with sufficient information regarding CARA. There is no pressure from Government to comply with CARA and no enforcement of legislation. Several respondents expressed strong feelings about the state of municipal land, infested with IAPs and stated that Government should first “clean-up their act” before “pointing fingers” at nurseries/garden centres. One respondent was outrage about the fact that IAPs from municipal land, bordering her property, infest her land and she repeatedly has to clear her property at her own cost.

Comments on NEMBA

There seems to be confusion over some plant species listed in the Draft NEMBA regulations. For example, *Murraya paniculata* (L.) Jack. (=*Murraya exotica* L.) is not regarded as being invasive (South Africa Government Gazette No. 32090, April 3, 2009).

Respondents believe that *Murraya paniculata* and *Murraya exotica* are two different species from one genus and that *Murraya exotica* is not invasive. However, two respondents indicated that when they planted *Murraya exotica* seeds, the plants (seedlings) displayed *Murraya paniculata* characteristics and growth habits.

Several respondents also feel that not all species listed in the Draft NEMBA regulation should be on the list. They feel that some proposed IAPs are area specific and invasiveness is restricted to geographical regions. If a specific species is invasive in, for example, the Western Cape and not in Natal, the local nurseries/garden centres should be "allowed" to stock and sell those particular plants.

Respondents also want to be kept updated regarding proposed IAPs including emerging species, as they don't what to be "caught with their pants down" as with the CARA legislation, having to remove and destroy stock valued to an undisclosed amount across Industry nationwide.

Do you have any information and/or comments that you would like to add?

Respondents feel that more education and awareness is needed. Government and other role players, like WfW, should include nurseries/garden centres in their initiatives and programmes against IAPs.
Two respondents (Trade Affiliated Garden Centres) said that it is against their company policy to stock and sell IAPs and, after receiving IAPs (CARA) list from SANA, they removed and destroyed listed IAPs from their sales floor. Another respondent (Trade Affiliated Nursery) said that, as far as possible they try not to stock plants that are listed in the Draft NEMBA regulations. In his opinion, nurseries/garden centres that still stock and sell IAPs do so through ignorance.

5.6 Integration or Mixing of Results

The following section compares and integrates (mixes) the "QUAN" results of this mixed methods study with the "qual" analysis of the findings (refer to Figure 3.1).
First of all, in terms of Table 1.1: in answer to research question 1, it was found that 57 out of the 60 nurseries/garden centres stocked and sold zero of the CARA plants shown. However, it was found that the median number of NEMBA plants (out of 10) stocked and sold by nurseries/garden centres was 4. Both the "QUAN" and "qual" results shows consistency with these findings i.e. that they stock/sell NEMBA plants.

In terms of research question 2, it was found that the characteristics/factors listed in 2.1 to 2.10 (refer to Table 1.1) were not associated with significant differences between the sub-groups in terms of their medians, as tested at the 5% level. But the medians for the whole sample (with 95% CI's) show

that no CARA plants were stocked or sold and a median of 4 out of 10 selected NEMBA plants were stocked and sold. Therefore nurseries/garden centres are currently compliant with CARA but not compliant with NEMBA as currently proposed.

In terms of research questions 3 and 4, it was found that the median number of indigenous non-invasive plants (out of 4) stocked/sold by nurseries/garden centres was 3. There were no significant differences for nurseries/garden centres on the basis of the characteristics/factors (4.1 to 4.10, Table 1.1). Both the "QUAN" and "qual" results show consistency with these findings, in that nurseries/garden centres do stock and sell indigenous non-invasive plants. Therefore it can be assumed that public awareness programmes, such as the WfW "Water-Wise-Plant" and the WfW NPP "Plant Me Instead" campaigns, may have an influence on consumer buying trends, and that nurseries/garden centres are responding to customer demands.

In terms of research questions 5 and 6, it was found that were no significant differences between nurseries/garden centres in terms of the characteristics/factors (listed as 6.1 to 6.10, Table 1.1). Both the "QUAN" and "qual" results shows consistency with these findings, in that there was no or little communication between relevant governmental departments and nurseries/garden centres with regard to issues pertaining to IAPs.

In terms of research questions 7 and 8, it was found that the median number of CARA plants (out of 10) identified by nurseries/garden centres was 6 and the median number of NEMBA plants (out of 10) identified by nurseries/garden centres was 8. There were no significant differences between nurseries/garden centres based on the characteristics/factors (9.1 to 9.10, Table 1.1). Both the "QUAN" and "qual" results shows consistency with these findings, in that being able to identify CARA listed plants does contribute in nurseries/garden centres advising customers on responsible plant choices. However, being able to identify a median of 8 out of 10 selected NEMBA plants, made no difference in the nurseries/garden centres advising their customers on responsible plant choices. This may be because NEMBA regulations are still pending and selling listed plants is currently not an offence.

In terms of research questions 9 and 10, it was found that the median number of indigenous non-invasive plants (out of 4) identified by nurseries/garden centres was 3. There were no significant differences between nurseries/garden centres based on the characteristics/factors (10.1 to 10.10, Table 1.1). Both the "QUAN" and "qual" results shows consistency with these findings, in that being

able to identify indigenous non-invasive plants did contribute in nurseries/garden centres advising customers on responsible plant choices, refer to section 5.3; Questionnaire Items 13.1 to 13.4.

5.7 Concluding Remarks

Descriptive statistical and inferential statistical analyses used to generate the quantitative results for this study and thematic analysis for the qualitative results in chapter 4 formed the basis for the results and discussions of this chapter. The “mixing” of the two data sources occurred during the discussion of survey and interview results at the interpretation stage of the research process. A comparative approach was used to compare the quantitative results and analysis questionnaire and observations with the findings of the interviews. This comparative approach in this chapter forms the basis for conclusions and recommendations in chapter 6.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

A careful analysis of the respondents' answers to the questionnaire and interview questions indicates serious shortcoming with regard to; communication between nurseries/garden centres and Government; IAPs training within Industry; and awareness of the "Codes of Conduct for Nursery Professionals". However, based on the findings of this research, these shortcomings appear not to pose an obstacle in the compliance of legislation.

6.2 Summation

The Industry, as a whole (within the area of study), is compliant with CARA legislation, although it appears, from the evidence presented in this research, that there is currently no pressure from Government to comply and, subsequently, no enforcement of the law. NEMBA regulations, on the other hand, are still pending and selling plants that are listed is not an offence. The horticultural industry is a competitive Industry and needs to sell plants that are in demand. Since NEMBA is not finalized yet, findings of this research confirm the literature review (Nursery Partnership Education Programme, 2010), that nurseries and garden centres are, currently, stocking and selling listed plants. It appears that Industry responds to laws on the one hand, and to customer demands/requests, on the other.

Industry, however, is anxious to be kept informed about changes and developments in legislation, but has a negative attitude to what it perceives as deterioration in the interactions between itself and Government. Evidence presented in this research points to little communication between Government and Industry. Visits by officials from relevant governmental departments to nurseries/garden centres have apparently become less frequent in the past years. The occasional visits from these officials were only to inspect businesses for rare and endangered plant species, with no apparent interest in IAPs.

According to nurseries/garden centres (within the area of study), no official notification nor IAP lists were received (between 2004, when NEMBA was promulgated, and 2011, when this study was conducted) from Government. At the same time, evident in this study, nurseries/garden centres had done little on their part to initiate contact with Government. Nevertheless, findings of this research confirm the literature review (Le Cook, 2004 and Nursery Partnership Education Programme, 2010) that high levels of awareness of the CARA regulations exist within Industry.

The “Beautiful But Dangerous” poster range, featuring listed CARA plants and indigenous alternatives to IAPs, was made available by Government (Parks Department) in 2000. It appears that these posters had a positive influence of the awareness of CARA, especially respondents with 10 or more years experience in Industry. Unfortunately, since the release of this poster range, in 2000, neither updated CARA posters nor posters featuring NEMBA plants are available.

Respondents were able to identify listed NEMBA plants shown to them. This researcher, however, is of the impression that this was because the plants shown were routinely sold as a matter of course and not because of any special information received via the NEMBA Act. Many respondents feel that not all NEMBA listed species should be on the list, and that the horticultural industry should be able to challenge the Government designation of specific plants. Several respondents are also of the opinion that they should be allowed to stock and sell species that are, for example, invasive in the Western Cape and not in Natal. This perception of these individuals elicits the need for training around IAPs, as the spread of IAPs are not always restricted by geographical regions.

In general, respondents would like more information about IAPs lists and want to be kept updated about emerging IAPs. They feel that more education and awareness, especially aimed at junior sales staff, is needed and that nurseries and garden centres should be included in Governmental and other initiatives against IAPs.

The participants of this study appeared to display an obvious and genuine concern about the environment and are willing to help with increasing public awareness. The majority of respondents, however, highlighted the fact that they do not know which governmental departments and organisations to contact to obtain the latest IAP information. However, it is evident in this study that the same respondents are aware of organisations, viz., WfW and DEAT who are involved in the control and management of IAPs.

Various internet sources that offer information on IAPs are readily available. Unfortunately, due to the diverse nature of the day-to-day working operations of a nursery/garden centre business, it appears that managers and sales staff have neither the time nor resources to do extra research concerning IAPs.

Organisations, viz., DEAT, DWAF and others have their own initiatives and management programmes to manage and control IAPs. It appears that each of these organisations is caught-up with their own mandates and challenges in their fight against IAPs. Subsequently, little interaction exists between them. Liaising with nurseries and garden centres might be the last item on their agendas.

The WfW NPP plays a significant role in the fight against IAPs and embarked on nationwide awareness campaigns and Industry training workshops concerning IAPs, in November, 2004 and February, 2006 and conducted two KZN Nursery surveys against IAPs in 2002 and 2010. It appears, however, that these initiatives had little impact on the local Industry (within the area of study), as it is evident from the findings of this study that the majority of nurseries and garden centres are not aware of the WfW NPP existence nor participated in any of their programmes.

The EDRR programme, funded by WfW and under the directorship of SANBI, aims to control the spread of IAPs by “early intervention and managing of emerging invasions”. The EDRR, however, have only three staff members in KZN and they appear to be focusing on managing one invasive species at a time. Their main aim is to raise awareness among private home – owners and the public in general.

The main objective of the EThekwini Environmental Management Department, (EEDM), is to form a co-operative partnership with all relevant stakeholders in local and national government as well as with NGOs and non-governmental role-players, viz., nurseries and garden centres. Including nurseries/garden centres into this initiative might prove to be problematic, as the local horticulture industry is fragmented with a high turnover in names and owners. Many businesses have closed down in recent years or are in the process of closing down. Further, nurseries and garden centres are not required to register with any governing body. Therefore, a census of all nurseries and garden centres is not possible.

SANA is a major role-player in creating awareness around IAPs; especially in keeping their members informed about legislative developments and would be the ideal body to act as the Industry representative on the EEMD forum. However, evidence presented in this research, elicits the fact that the majority of local nurseries/garden centres are not members of SANA, nor do they have any intention of becoming members.

6.3 Recommendations

On the basis of the data analyses and the discussion of the findings (vide chapters 4 and 5); the following recommendations are made with regard to the compliance of nurseries and garden centres with invasive alien plant legislation:

A IAPs Advisory Committee should be instituted under the directorship of the DEA (Department of Environmental Affairs). This pro-active Committee can be independent or it can be incorporated into either the WfW NPP or EDRR programmes as these organisations already have managing systems and structures in place. Modelled on the EEMD concept, this Committee should form a co-operative partnership with all relevant stakeholders, but dedicated to keeping nurseries/garden centres informed and updated concerning IAPs.

Objectives of the (proposed) IAPs Advisory Committee:

- To liaise between interests groups, instrumental in the management and control of IAPs, and nurseries/garden centres;

- To compile an “IAPs Information Guide” for Nurseries, featuring:

    - Invasive alien plant lists;
    - Names and contact details of relevant organisations dealing with IAPs; and
    - List of internet sources offering information containing IAPs.

- To play the role of an IAPs information centre where nurseries/garden centres can direct their questions and queries too; and

- To compile a directory of all nurseries and garden centres and updating the list on a regular basis.

The main aim of the (proposed) IAPs Advisory Committee should be to train Horticulture graduates as IAPs Consultants, adding a new and interesting career to Industry as well as creating more jobs within Industry.

The functions of these Consultants should be as follows:

- To offer training concerning IAPs to Industry as a whole [Government could use this training as a tax incentive which would allow nurseries/garden centres to claim against the Skills Levy];

- To present awareness programmes and talks around IAPs to nursery/garden centre customers [A spin – off from these programmes is that it have the potential to increase sales of indigenous and non – invasive exotic plant alternatives to IAPs]; and

- To pay nurseries/garden centres a courtesy visit at least twice a year, not to police them, but to act in an advisory capacity.

6.4 Conclusion

The participants of this study appeared to display an obvious and genuine concern about the environment and were willing to help with increasing public awareness concerning IAPs. Industry were also anxious to be kept informed about changes and developments in legislation, but had a negative attitude to what they perceived as a deterioration in the interactions between themselves and Government.

The evidence found in this study showed that very few CARA plants were being stocked (nurseries/garden centres may not stock CARA listed plants by law). But, although there was evidence for knowledge of the issues surrounding NEMBA plants, nurseries/garden centres were still stocking listed plants (may be due to no current legal requirement on the one hand, and ability to make sales on the other). NEMBA regulations are still pending and selling plants that are listed is not an offence. It is speculated that the horticultural industry might respond to laws, on the one hand, and customer demands/requests, on the other.

It is recommended that, a IAPs Advisory Committee should be instituted under the directorship of DEA. This Committee could be pro-active in the following ways: liaising between interests groups involved in the management and control of IAPs; playing the role of a IAPs information centre where

nurseries/garden centres can direct their questions and queries to; and to offer training concerning IAPs to Industry as a whole.

The aim and objectives of the study have been met by conducting a literature review; establishing a suitable theoretical framework; adopting appropriate research methods for the collection, analyses and interpretation of sources of data; and addressing issues around validity and reliability.

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Kay Montgomery (September, 14, 2009). Project Leader: Working for Water Nurseries Partnership Programme.

Reshnee Lala (August, 12, 2010). Early Detection and Rapid Response Programme.

Jo-Anne Hilliar (September, 21, 2009). Landscape Design Consultant.

Peter Rowels (September, 16, 2009). Retired Nursery man (Dunrobin Nursery).

Plates

Plate 1: *Lantana camara* – Tickberry/ Lantana. “Beautiful But Dangerous” Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 2: *Nerium oleander* – Oleander. ‘‘Beautiful But Dangerous” Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 3: *Ardisa crenata* – Coralberry. “Beautiful But Dangerous” Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 4: *Bauhinia purpurea* – Butterfly Orchid tree. ‘‘Beautiful But Dangerous” Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 5: *Cestrum elegans* – Crimson Cestrum. ‘‘Beautiful But Dangerous” Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 6: *Macfadyena unguis-cati* - Cat’s claw creeper. “Beautiful But Dangerous” Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 7: *Ligustrum vulgare* – Privet, (*circa,* 2007). [Online] Available at: http://www.invasive.org/Images/768x512/2307074.jpg [Accessed 10 June 2010].

Plate 8: *Ligustrum sinense* – Chinese privet, (*circa,* 2007). [Online] Available at: http://www.invasive.org/browse/detail.cfm?imgnum=5078032 [Accessed 10 June 2010].

Plate 9: *Solanum seaforthianum* – Potato creeper. "Beautiful But Dangerous" Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 10: *Pennistetum sectaceum* – Fountain grass. Beautiful But Dangerous Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 11: *Lantana montivedensis* – 'Sundancer,' (*circa,* 2008). [Online] Available at: http://davesgarden.com/guides/pf/showimage/49661 [Accessed 10 June 2010].

Plate 12: *Murraya paniculata* – Mock orange, (*circa,* 2009). [Online] Available at: http://www.hear.org/starr/ [Accessed 10 June 2010].

Plate 13: *Duranta erecta* – Forget-me-not-tree. "Beautiful But Dangerous" Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 14: *Duranta reptans varigata.* "Beautiful But Dangerous" Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 15: *Syngonium podyphyllum* – Goose foot, (*circa,* 2007). [Online] Available at: http://aggie-horticulture.tumu.edu/interiorscape/syngonium.html [Accessed 10 June 2010].

Plate 16: *Schefflera elegantissama*- False Aralia, (*circa, 2008*). [Online] Available at: http:/davesgarden.com/members/mosc0022/ [Accessed 10 June 2010].

Plate 17: *Schefflera aboricola variegata. "*Beautiful But Dangerous" Invasive Alien Plants of Durban and the Eastern, Sub-tropical Region of South Africa with some Indigenous Alternatives, (*circa,* 2000). Durban Unicity Environmental Management Branch and Parks Department, the Wildlife and Environment Society of SA, and the Botanical Society of SA.

Plate 18: *Syzygium paniculatum* – Brush cherry, (*circa,* 2009). [Online] Available at: http://www.exot-nutz-zier.de/ [Accessed 10 June 2010].

Plate 19: *Hedra helix* – English Ivy, (*circa,*2009). [Online] Available at: http://www.meditiflora.com/flora/hederea [Accessed 10 June 2010].

Plate 20: *Tradescantia zebrina* - Wandering Jew, (*circa,* 2008). [Online] Available at: http://www.henriettesherbal.com/pictures/ [Accessed 10 June 2010].

Plate 21: *Plumbago auriculata - Plumbago*, (*circa, 2008*). [Online] Available at: http://www.la-jardineria.net/ [Accessed 10 June 2010].

Plate 22: *Polygala myrtifolia- Blou Kappie,* (*circa, 2009*). [Online] Available at: http://www.isaisons.free.fr/polygala%20myrtifolia.jp [Accessed 10 June 2010].

Plate 23: *Pavetta revolute* – Dune Bride's Bush*,* (*circa,* 2009). [Online] Available at: http://www.africanbulbs.com [Accessed 10 June 2010].

Plate 24: *Senecio tamoides*- Canary Creeper, (*circa,* 2009). [Online] Available at: http://www.zimbabweflora.co.zw/ [Accessed 10 June 2010].

APPENDIXES

Appendix 1: Informed Consent Letter

Title of Study:
An investigation into the compliance of selected Nurseries and Garden Centres, within the EThekwini and uMsunduzi regions of KwaZulu-Natal, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983) CARA and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004) NEMBA.

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Background:
You are being invited to take part in a research study. It is important that you understand why the research is being done and what it will involve. Please take the time to read the following information carefully. Feel free to ask the researcher if there is anything that is not clear or if you need more information.

The Aim of this Study
The aim of this study is to assess the compliance of selected nurseries/garden centres, within KwaZulu-Natal EThekwini and uMsunduzi geographical regions, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983), CARA, under section 29 (15) and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA, under section 70 (1b) and (3) and to investigate the associated communication between Government and the horticulture industry in this region.

Abstract

This dissertation examines the compliance of Nurseries and Garden centres with Invasive Alien Plant (IAPs) legislation.

South Africa has a major problem with invasive alien plants IAPs. Studies have shown that IAPs impact negatively on biodiversity, natural resources and agricultural systems. Despite governmental legislation and programmes like Working for Water and the Wildlife and Environment Society of South Africa, there still seems to be a of lack public awareness regarding the extent of the problem. This poses an obstacle to the effective implementation and management of control systems. Most South Africans see invasive alien plants as an environmental issue that does not affect them directly, not realising the economic impact that it might have on every citizen. The cost to clear alien plant invasions is estimated to be around R12 billion or roughly R6000 million per year for the estimated 20 years that it will take to deal with the problem.

Nurseries and Garden centres are well positioned to inform customers regarding plant choices, such as indigenous and non invasive exotic alternatives to IAPs. Therefore they can play a significant role in increasing public awareness regarding IAPs amongst the general public. However, Nurseries/garden centres are thought to maybe aid the spread of IAPs, by selling these plants to their customers. Government regulation of Nurseries/garden centres seems to be inadequate, especially laws addressing the introductions of IAPs and potentially invasive species via the horticultural industry.

This study will address the extent to which the local Horticulture industry is playing a role in combating the spread of Invasive Alien Plants and Plants that have the potential to become invasive. It also address as to what extent Government and Horticultural Industry initiatives have impacted on local Nurseries/garden centres with regard to their knowledge and understanding of the IAPs problem.

Study Procedure:
Your expected time commitment for this study is: 30 min

You are required to complete a survey questionnaire and then either email or fax it to the contact numbers provided.
It is important for research purpose to answer every question. If you have any difficulty with any question please contact the researcher:

Astrid Badenhorst
Phone: 031 373 5105
Fax: 086 6740213
Email: astridb@dut.ac.za

Risk:
The risks of this study are minimal. These risks are similar to those you experience when disclosing work-related information to others. The research topic may upset some respondents. You may terminate your involvement in this research at any time you choose.

Benefits:
There will be no direct benefit to you for your participation in this study. However, the researcher hopes that the information obtained from this study may:

- Create awareness about the current status of IAPs regulations and IAPs in the Horticultural Industry.
- Form a basis for better communication between Government Agencies, Trade Associations, Nurseries and Garden Centres.

Confidentiality:

- All responses will be anonymous. Please do not write any identifying information on your questionnaire.
- All data to be collected is part of the research and only information relevant to the study will be collected.
- The researcher and supervisors will review the data collected. Information from this research will be used solely for the purpose of this study and any publications that may result from this study.
- Research procedures like Data coding and Data encryption will be used to protect the confidentiality of the research participants and Nurseries/garden centres.
- No personal information of research participants and names of Nurseries/garden centres will be disclosed.
- All data collected will be kept in a locked file cabinet in the personal possession of the researcher **;** linkage to Nurseries/garden centres will be destroyed once thesis has been marked.

Voluntary Participation:
Your precipitation in this study is voluntary. If you decide to take part in this study, you will be asked to sign a consent form. However, you are free to withdraw at any time and without giving a reason.

Cost to Participants:
There are no costs to you for participating in this study.

Compensation:
There is no monetary compensation to you for your participation in this study.

Consent:

By signing this consent form, I confirm that I have read and understood the information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Signature…… Date……

(Informed Consent Letter adapted from: www.uvu.edu/irb/lib/includes/Sample%20Consent%20Form.pdf. *circa*, 2009)

Appendix 2: Survey Questionnaire

Project**:** An investigation into the compliance of selected Nurseries and Garden Centres, within the EThekwini and uMsunduzi regions of KwaZulu-Natal, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983) CARA and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004) NEMBA.

Date:

Place:

Your response is COMPLETELY ANONYMOUS. All information collected is part of the research and only information relevant to the study will be collected. No personal information of research participants and names of nurseries will be disclosed.

Background

South Africa is currently rated the third most biological diverse country in the world, however, this rich biodiversity is one of the most threatened worldwide and the rapid spread of Invasive Alien Plants (IAPs) pose one of the greatest threats. Government has identified the removal of IAPs as priority and has enacted eleven national and various provincial laws which contain mechanisms for regulating the different threats posed by IAPs.

Despite these regulatory laws, eradication and control methods, IAPs continue to invade valuable land at an alarming rate.

The horticulture industry has been identified as a major pathway for introductions of IAPs into the natural environment. This is a significant issue for the industry and therefore Nurseries/garden centres have an important role to play in promoting responsible plant choices, garden management practices and to increase public awareness regarding IAPs to their customers, the general public, also to prevent the propagation, sale and/or movement of IAPs. To achieve these roles Nurseries/garden centres need to be working with the appropriate authorities and have to be compliant with governmental legislation. Principle among these legislations is the Conservation of Agricultural Resources Act 1983

(Act NThe aim of this study is to assess anonymously the current compliance of Nurseries and Garden Centres, with the Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA, under section 29 (15) and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA, under section 70 (b) and (3), and to investigate the associated communication between government and the green industry in this region. Please answer as truthfully as you can to help in establishing the current state of affairs.

Please Note: It is important for research purpose to answer every question. If you have any difficulty with any question please contact the researcher:

(Contact details):-
Astrid Badenhorst
Tel: 031 373 5105 (office)
Cell: 084 7826001
Email: astridb@dut.ac.za

1. How many years are you working in the Nursery trade?

Less than 1 year	1 – 3 years	4 – 5 years	6 – 10 years	More than 10 years

2. What is your highest educational qualification?

Lower than Matric	Matric	Degree	Postgraduate	Other qualification

3. In your opinion, is your place of work/business a:

Nursery	Garden Centre

4.a. Does your place of work/business have the following? (You may choose as many as applicable):

Coffee Shop/ Restaurant	Petting Zoo	Children's Play Area	Gift Shop/ Décor Shop	Pet Shop/ Aquarium (Kio-fish shop)

4.b. Does your place of work/business buy plants in plugs and grow it into sellable size plants?

Yes	No

5. Have you ever heard of the:" Voluntary Codes of Conduct for Nursery Professionals?"

Yes	No

6. If yes, do you think these Voluntary Codes are relevant to your Nursery / Garden Centre?

Yes	No

7. Have you ever heard of the: (Mark which Act you are familiar with.)

Conservation of Agricultural Resources Act (CARA)	National Environmental Management Biodiversity Act (NEMBA)

8. Have you ever heard of the following organisations? (You may choose as many as applicable):

DWAF: Department of Water Affairs and Forestry.	DEAT: Department of Environmental Affairs and Tourism.	WfW NPP: Working for Water Nursery Partnership Programme.	WfW: Working for Water	SANBI: South African Biodiversity Institute.	IASP: Invasive Alien Species Programme	GISP: The Global Invasive Species Program

9. Do you or your place of work/business belong to any Trade Associations?

Yes	No

10. If yes:
Please name the Trade Association/s you are a member off.

11. a. Have you received formal training with regard to Invasive Plants?

Yes	No

11. b. If yes, where did you get the training from?

Government workshops	Industry/ Trade Associations	At Work	Other (please specify)

For each statement please indicate which response most accurately reflects your understanding of that statement. Indicate only <u>One</u> response per statement.	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
12.1. It is the responsibility of Government to inform Nurseries/garden centres regarding invasive alien plants.					
12.2. Trade Associations (like the South African Nursery Association, SANA) should make information regarding alien invasive plants available to Nurseries/garden centres.					
12.3. Environmental and Conservation organisations (like Working for Water or the Wildlife and Environment Society of South Africa) should make information regarding alien invasive plants available to Nurseries / Garden Centers.					
12.4. I can easily obtain information regarding invasive plants from Government.					
12.5. We receive (at least once a year) feedback/ updates regarding Invasive plants from government (Department of Agriculture/ Department of Environmental Affairs and Tourism)					
12.6. CARA; Category 1 and 3 plants may not be sold or propagated?					
12.7. NEMBA; Category 5, Table X, are potentially invasive plants, many are ornamentals sold by Nurseries/garden centres.					
<u>A client requests a plant that you think you are not permitted to sell.</u> For each of the following statements below, based on experience, please indicate which response most accurately reflects what you would do. Indicate only <u>One</u> response per statement.	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
13.1. I would tell them that we do not stock the plant					
13.2. I would say that we do not stock the plant and explain why.					
13.3.. I would take one from stock and sell the plant					
13.4. I would recommend an indigenous or non-invasive alternative.					
In your opinion, rate the following statements. Indicate only <u>One</u> response per statement.	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
14.1. We have posters featuring invasive plants and/ or plant alternatives to invasive plants on display at our Nursery / Garden Centre.					
14.2. Pamphlets regarding invasive plants and/or plant alternatives to invasive plants are available at our nursery /Garden Centres.					
14.3. Nurseries/garden centres stock and sell invasive plants					
14.4. Nurseries/garden centres stock and sell plants that are potentially invasive.					

15. **Can you identify and name any of the following plants? Does your** Nursery / Garden Centre stock any of these plants?

15.1

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.2

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.3

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.4

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.5

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.6

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.7

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.8

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.9

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.10

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.11

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.12

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.13

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.14

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.15

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.16

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.17

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.18

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.19

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.20

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.21

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.22

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.23

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

15.24

Identify	Stock
Yes / No	Yes / No
/	/
Name:	

THANK YOU FOR COMPLETING THE SURVEY

Appendix 3: Interview Schedule

Project: TITLE: An investigation into the compliance of selected Nurseries and Garden Centres, within the EThekwini and uMsunduzi regions of KwaZulu-Natal, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983) CARA and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004) NEMBA.

Date: Place:

Your response is COMPLETELY ANONYMOUS. All information collected is part of the research and only information relevant to the study will be collected. No personal information of research participants and names of nurseries will be disclosed.

Background

South Africa is currently rated the third most biological diverse country in the world, however, this rich biodiversity is one of the most threatened worldwide and the rapid spread of Invasive Alien Plants (IAPs) pose one of the greatest threats. Government has identified the removal of IAPs as priority and has enacted eleven national and various provincial laws which contain mechanisms for regulating the different threats posed by IAPs.
Despite these regulatory laws, eradication and control methods, IAPs continue to invade valuable land at an alarming rate. The Horticulture industry has been identified as a major pathway for introductions of IAPs into the natural environment. This is a significant issue for the Industry and therefore Nurseries/garden centres have an important role to play in promoting responsible plant choices, garden management practices and to increase public awareness regarding IAPs to their customers, the general public, also to prevent the propagation, sale and/or movement of IAPs. To achieve these roles Nurseries/garden centres need to be working with the appropriate authorities and have to be compliant with governmental legislation.

The aim of this study is to assess anonymously the current compliance of Nurseries and Garden Centres, with the Conservation of Agricultural Resources Act 1983 (Act No. 43 of 1983), CARA, under section 29 (15) and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA, under section 70 (b) and (3), and to investigate the associated communication between Government and the Horticulture industry in this region. Please answer as truthfully as you can to help in establishing the current state of affairs.

Questions: Section A

1. How many years are you working in the Nursery trade?

Less than 1 year	1 – 3 years	4 – 5 years	6 – 10 years	More than 10 years

2. In your opinion, is your place of work/business a:

Nursery	Garden Centre

3.a. Does your place of work/business have the following? (You may choose as many as applicable):

Coffee Shop/ Restaurant	Petting Zoo	Children's Play Area	Gift Shop/ Décor Shop	Pet Shop/ Aquarium (Kio-fish shop)

3.b. Does your place of work/business buy plants in plugs and grow it into sellable size plants?

Yes	No

Questions: Section B

1. Where did you hear about:
   a) The Conservation of Agricultural Resources Act (CARA) and
   ……
   ……..
   b) The National Environmental Management Biodiversity Act (NEMBA)?
   ……
   ……

2. Who in your opinion should inform Nurseries/garden centres about issues pertaining to Alien Invasive plants (IAPs)?
   a) Government

b) Environmental and Conservation organisations

c) Trade Associations

d) Other
(Please explain)……..
……..

3. Have you ever received official notification from Government regarding IAPs legislation?
……
……
……
4. What are the current states of the NEMBA regulations?
……
……
……
5. a) Do you or your place of work belong to any Trade Association?
……
b) If no, what are your reasons for not being a member of a Trade Association?
……
……..
……..
……
6. Have you ever heard of the:" Voluntary Codes of Conduct for Nursery Professionals?"
……..
7. If yes, how are these "codes" relevant to your business?
……..
……..
……..

8. Did you or any of your staff received official training regarding Invasive Alien Plants?

If yes, who provided the training?

……

……

9. Have you ever heard of the: “Working for Water Nursery Partnership Programme (WfW NPP)”?

……

10 Have you provided any in- house training regarding Invasive Alien Plants to your staff?

……

If yes, who provided the training?

……

……

……

11 Have you provided any in- house training regarding Invasive Alien Plants to your staff?

……

……

12 Where can you obtain posters and pamphlets featuring AIPs?

……

……

……

13 Would you like to comment on the Conservation of Agricultural Resources Act (CARA) and/or the National Environmental Management Biodiversity Act (NEMBA)?

……..

……..

……..

14 Do you have any information and/or comments that you would like to add?

……..

……...

……

THANK YOU FOR YOUR PARTICIPATION IN THIS INTERVIEW

Appendix 4: Observation Checklist

The aim of this study is to assess the compliance of selected Nurseries/garden centres, within KwaZulu-Natal EThekwini and uMsunduzi geographical regions, with the Conservation of Agricultural Resources Act 1983 (Act. No. 43 of 1983), CARA, under section 29 (15) and the National Environmental Management: Biodiversity Act 2004 (Act No. 10 of 2004), NEMBA, 70(1) (b) and (3) and to investigate the associated communication between government and the green industry in this region.

Time of Observation:

Date: Place:

	YES	NO	COMMENTS……
1. Posters featuring IAPs and/ or plant alternatives are displayed at the nursery / Garden Centre.			
2. Pamphlets regarding IAPs and/ or plant alternatives are available at the nursery/ garden centre.			
3. Books featuring IAPs are for sale at the nursery / Garden Centre			
4. *Lantana camara* – Tickberry/ Lantana			
5. *Nerium oleander* – Oleander			
6. *Ardisa crenata* – Coralberry			
7. *Bauhinia purpurea* – Butterfly Orchid tree			
8. *Cestrum elegans* – Crimson Cestrum			
9. *Macfadyena unguis-cati* - Cat's claw creeper			
10. *Solanum seaforthianum* – Potato creeper			
11. *Pennistetum setaceum* – Fountain grass			
12. *Lantana motivedensis* -'Sundancer'			
13. *Murraya paniculata* – Mock orange			
14. *Duranta erecta* – Forget-me-not-tree			
15. *Duranta reptans varigata*			

16. *Syngonium podyphyllum* – Goose foot			
17. *Tradescantia zebrina* – Wandering Jew			
18. *Schefflera elegantissama* – False Aralia			
19. *Schefflera aboricola variegata*			
20. *Syzygium paniculatum* – Brush cherry			
21. *Ligustrum sinense* – Chinese privet			
22. *Ligustrum vulgare* – Privet			
23. *Hedra helix* – English Ivy			
24. *Polygala myrtifolia* – September Bush			
25. *Pavetta revolute* – Dune Bride's Bush			
26. *Senecio tamoides* – Canary Creeper			
27. *Plumbago auriculata* – Plumbago			

Appendix 5: Language Practitioner

Flat 1211
Kensington
311 North Ridge Road
Morningside
4001

Tel.: 0822673192

31 January 2010

TO WHOM IT MAY CONCERN

PROOFREADING OF MASTER OF SCIENCE DISSERTATION OF ASTRID BADENHORST

TITLE OF DISSERTATION: AN INVESTIGATION INTO THE COMPLIANCE OF SELECTED NURSERIES AND GARDEN CENTRES WITHIN KWAZULU-NATAL-ETHEKWINI AND THE uMSUNDUZI GEOGRAPHICAL REGIONS, WITH THE CONSERVATION OF AGRICULTURAL RESOURCES ACT 1983 (ACT NO. 43 OF 1983) CARA AND THE NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT 2004 (ACT NO. 10 OF 2004) NEMBA

This is to certify that I, Dr H.L. Garbharran, have proofread the dissertation of the aforementioned student. I declare that this dissertation is, to the best of my knowledge, free of errors.

.....
DR H.L. GARBHARRAN
(B.A., HONS., M.P.A., D.P.A)

Appendix 6: Appendix Tables

Appendix Table 6.1: Y_2 X_5

Data Set Y_2 X_5 is an example of the type of analysis done on all the data using the **General Loglinear; GENLOG /MODEL=POISSON.**

```
GENLOG Y2 X5
  /MODEL=POISSON
```

Data Information

		N
Cases	Valid	60
	Missing	0
	Weighted Valid	60
Cells	Defined Cells	18
	Structural Zeros	0
	Sampling Zeros	4
Categories	Stock NEMBA plants	9
	Awareness of Voluntary Codes of conduct for Nurseries	2

Convergence Information[b,c]

Maximum Number of Iterations	20
Converge Tolerance	.00100
Final Maximum Absolute Difference	2.81216E-6[a]
Final Maximum Relative Difference	1.59496
Number of Iterations	6

a. The iteration converged because the maximum absolute changes of parameter estimates is less than the specified convergence criterion.
b. Model: Poisson
c. Design: Constant + Y2

Goodness-of-Fit Tests[a,b]

	Value	df	Sig.
Likelihood Ratio	37.647	9	<0.0005
Pearson Chi-Square	30.269	9	<0.0005

a. Model: Poisson

Cell Counts and Residuals[a,b]

Stock NEMBA plants: Y2	Awareness of Voluntary Codes of conduct for Nurseries : X5		Observed		Expected	
			Count	%	Count	%
dimension0	0	dimension1 Yes	0	.0%	3.500	5.8%
		dimension1 No	7	11.7%	3.500	5.8%
	1	dimension1 Yes	1	1.7%	2.000	3.3%
		dimension1 No	3	5.0%	2.000	3.3%
	2	dimension1 Yes	2	3.3%	2.500	4.2%
		dimension1 No	3	5.0%	2.500	4.2%
	3	dimension1 Yes	0	.0%	3.500	5.8%
		dimension1 No	7	11.7%	3.500	5.8%
	4	dimension1 Yes	4	6.7%	7.500	12.5%
		dimension1 No	11	18.3%	7.500	12.5%
	5	dimension1 Yes	2	3.3%	6.500	10.8%
		dimension1 No	11	18.3%	6.500	10.8%
	6	dimension1 Yes	1	1.7%	3.500	5.8%
		dimension1 No	6	10.0%	3.500	5.8%
	7	dimension1 Yes	0	.0%	.500	.8%
		dimension1 No	1	1.7%	.500	.8%
	10	dimension1 Yes	0	.0%	.500	.8%
		dimension1 No	1	1.7%	.500	.8%

a. Model: Poisson

b. Design: Constant + Y2

b. Design: Constant + Y2

Cell Counts and Residuals[a,b]

Stock NEMBA plants		Awareness of Voluntary Codes of conduct for Nurseries		Residual	Standardized Residual
dimension0	0	dimension1	Yes	-3.500	-1.871
			No	3.500	1.871
	1	dimension1	Yes	-1.000	-.707
			No	1.000	.707
	2	dimension1	Yes	-.500	-.316
			No	.500	.316
	3	dimension1	Yes	-3.500	-1.871
			No	3.500	1.871
	4	dimension1	Yes	-3.500	-1.278
			No	3.500	1.278
	5	dimension1	Yes	-4.500	-1.765
			No	4.500	1.765
	6	dimension1	Yes	-2.500	-1.336
			No	2.500	1.336
	7	dimension1	Yes	-.500	-.707
			No	.500	.707
	10	dimension1	Yes	-.500	-.707
			No	.500	.707

a. Model: Poisson

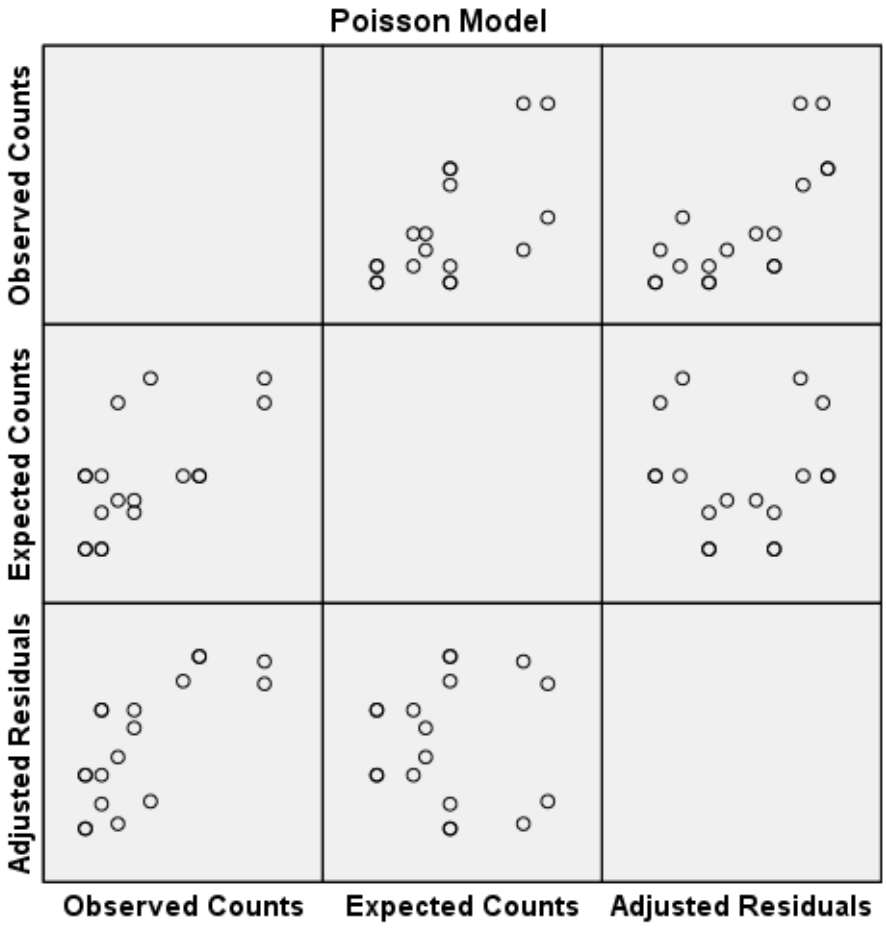
b. Design: Constant + Y2

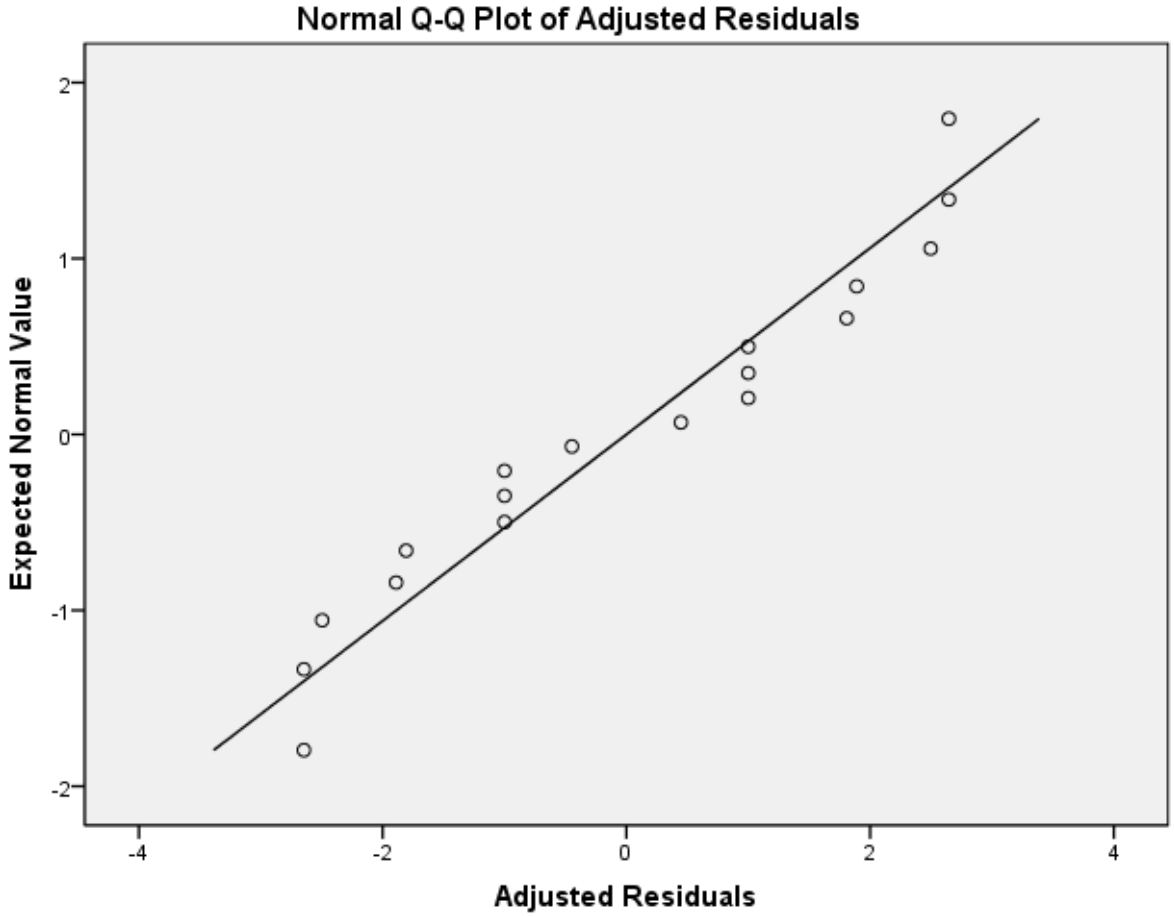
Cell Counts and Residuals[a,b]

Stock NEMBA plants		Awareness of Voluntary Codes of conduct for Nurseries		Adjusted Residual	Deviance
dimension0	0	dimension1	Yes	-2.646	-1.871
			No	2.646	1.644
	1	dimension1	Yes	-1.000	-.783
			No	1.000	.658
	2	dimension1	Yes	-.447	-.328
			No	.447	.306
	3	dimension1	Yes	-2.646	-1.871
			No	2.646	1.644
	4	dimension1	Yes	-1.807	-1.404
			No	1.807	1.194
	5	dimension1	Yes	-2.496	-2.070
			No	2.496	1.604
	6	dimension1	Yes	-1.890	-1.579
			No	1.890	1.212
	7	dimension1	Yes	-1.000	-.707
			No	1.000	.622
	10	dimension1	Yes	-1.000	-.707
			No	1.000	.622

a. Model: Poisson

b. Design: Constant + Y2


Poisson Model
Observed Counts
Expected Counts
Adjusted Residuals
Observed Counts
Expected Counts
Adjusted Residuals


Normal Q-Q Plot of Adjusted Residuals
Expected Normal Value
2
1
0
-1
-2
-4
-2
0
2
4
Adjusted Residuals

Appendix Table 6.2: Y_2 X_6

Data Set Y_2 X_6 is an example of the type of analysis done on all the data using the **General Loglinear; GENLOG /MODEL=POISSON.**

GENLOG Y2 X6
/MODEL=POISSON

Data Information

		N
Cases	Valid	60
	Missing	0
	Weighted Valid	60
Cells	Defined Cells	18
	Structural Zeros	0
	Sampling Zeros	2
Categories	Stock NEMBA plants	9
	Awareness of CARA	2

Convergence Information[b,c]

Maximum Number of Iterations	20
Converge Tolerance	.00100
Final Maximum Absolute Difference	2.81216E-6[a]
Final Maximum Relative Difference	1.59496
Number of Iterations	6

a. The iteration converged because the maximum absolute changes of parameter estimates is less than the specified convergence criterion.
b. Model: Poisson
c. Design: Constant + Y2

Goodness-of-Fit Tests[a,b]

	Value	df	Sig.
Likelihood Ratio	6.938	9	.644
Pearson Chi-Square	6.064	9	.734

a. Model: Poisson

b. Design: Constant + Y2

Cell Counts and Residuals[a,b]

Stock NEMBA plants: Y2		Awareness of CARA: X6		Observed		Expected	
				Count	%	Count	%
dimension 0	0	dimension 1	No	4	6.7%	3.500	5.8%
			Yes	3	5.0%	3.500	5.8%
	1	dimension 1	No	1	1.7%	2.000	3.3%
			Yes	3	5.0%	2.000	3.3%
	2	dimension 1	No	3	5.0%	2.500	4.2%
			Yes	2	3.3%	2.500	4.2%
	3	dimension 1	No	2	3.3%	3.500	5.8%
			Yes	5	8.3%	3.500	5.8%
	4	dimension 1	No	6	10.0%	7.500	12.5%
			Yes	9	15.0%	7.500	12.5%
	5	dimension 1	No	8	13.3%	6.500	10.8%
			Yes	5	8.3%	6.500	10.8%
	6	dimension 1	No	4	6.7%	3.500	5.8%
			Yes	3	5.0%	3.500	5.8%
	7	dimension 1	No	1	1.7%	.500	.8%
			Yes	0	.0%	.500	.8%
	10	dimension 1	No	0	.0%	.500	.8%
			Yes	1	1.7%	.500	.8%

a. Model: Poisson

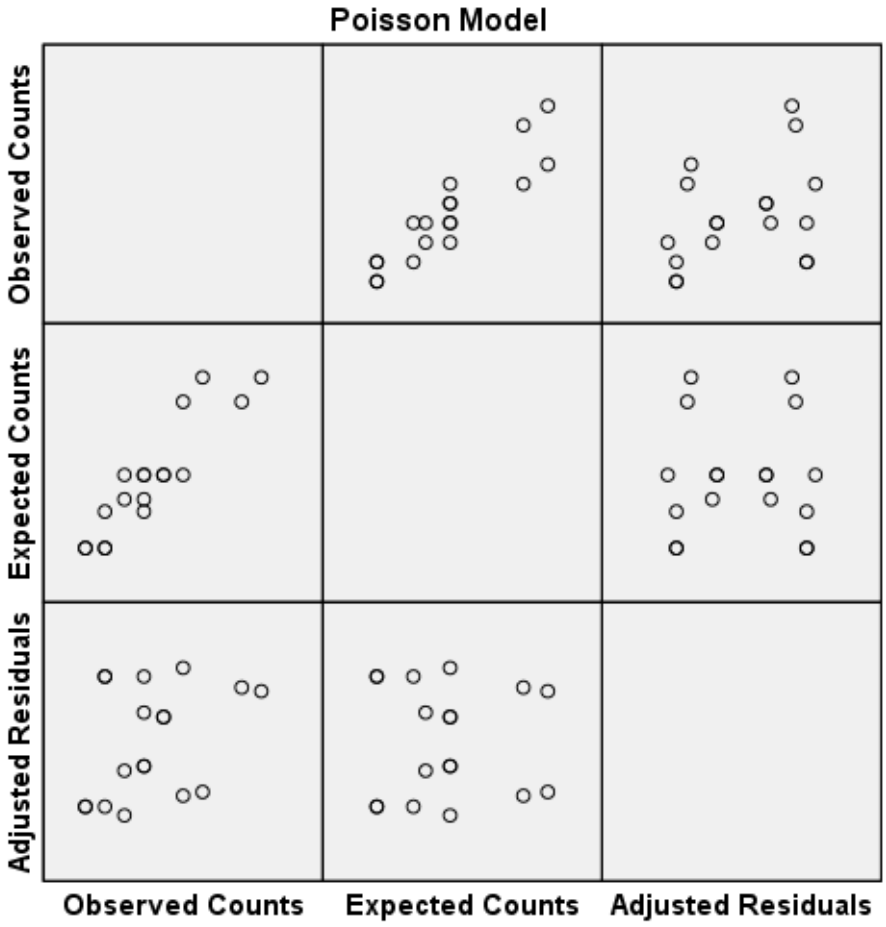
b. Design: Constant + Y2

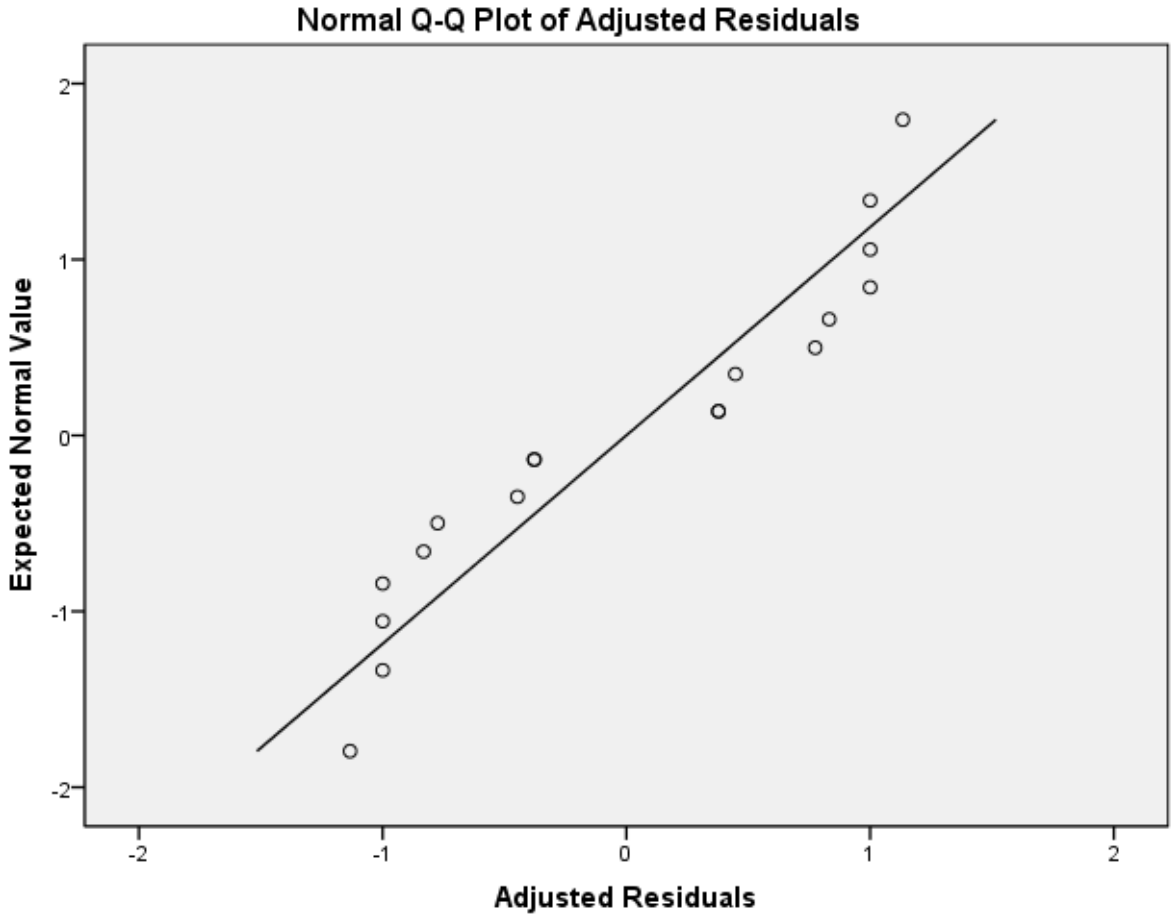
Cell Counts and Residuals[a,b]

Stock NEMBA plants		Awareness of CARA		Residual	Standardized Residual	Adjusted Residual	Deviance
dimension 0	0	dimension 1	No	.500	.267	.378	.261
			Yes	-.500	-.267	-.378	-.274
	1	dimension 1	No	-1.000	-.707	-1.000	-.783
			Yes	1.000	.707	1.000	.658
	2	dimension 1	No	.500	.316	.447	.306
			Yes	-.500	-.316	-.447	-.328
	3	dimension 1	No	-1.500	-.802	-1.134	-.873
			Yes	1.500	.802	1.134	.753
	4	dimension 1	No	-1.500	-.548	-.775	-.568
			Yes	1.500	.548	.775	.531
	5	dimension 1	No	1.500	.588	.832	.568
			Yes	-1.500	-.588	-.832	-.613
	6	dimension 1	No	.500	.267	.378	.261
			Yes	-.500	-.267	-.378	-.274
	7	dimension 1	No	.500	.707	1.000	.622
			Yes	-.500	-.707	-1.000	-.707
	10	dimension 1	No	-.500	-.707	-1.000	-.707
			Yes	.500	.707	1.000	.622

a. Model: Poisson

b. Design: Constant + Y2


Poisson Model
Observed Counts
Expected Counts
Adjusted Residuals
Observed Counts
Expected Counts
Adjusted Residuals


Normal Q-Q Plot of Adjusted Residuals
Expected Normal Value
Adjusted Residuals
2
1
0
-1
-2
-2
-1
0
1
2

Appendix Table 6.3: Table of Significance – Stocking CARA Plants

Table 6.3: Relationship between respondents stocking CARA plants (Dependent Variable Y_1) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 1 Y_1 - X_1 to X_{10}	Y_1 X_1	Likelihood Ratio LR					x
		Chi-square					X
	Y_1 X_2	Likelihood Ratio LR					X
		Chi-square					X
	Y_1 X_3	Likelihood Ratio LR					X
		Chi-square					X
	Y_1 X_4	Likelihood Ratio LR					X
		Chi-square					X
	Y_1 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_1 X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_1 X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_1 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_1 X_9	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_1 X_{10}	Likelihood Ratio LR		X			
		Chi-square		X			

Appendix Table 6.4: Table of Significance – Stocking NEMBA Plants

Table 6.4: Relationship between respondents stocking NEMBA plants (Dependent Variable Y_2) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 2 Y_2 - X_1 to X_{10}	Y_2 X_1	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_2 X_2	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_2 X_3	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_2 X_4	Likelihood Ratio LR			X		
		Chi-square		X			
	Y_2 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_2 X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_2 X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_2 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_2 X_9	Likelihood Ratio LR				X	
		Chi-square			X		
	Y_2 X_{10}	Likelihood Ratio LR			X		
		Chi-square			X		

Appendix Table 6.5: Table of Significance – Stocking Indigenous Alternative Plants

Table 6.5: Relationship between respondents stocking Indigenous alternative plants (Dependent Variable Y_3) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 3 Y_3 - X_1 to X_{10}	Y_3 X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_3 X_2	Likelihood Ratio LR				X	
		Chi-square			X		
	Y_3 X_3	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_3 X_4	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_3 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_3 X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_3 X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_3 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_3 X_9	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_3 X_{10}	Likelihood Ratio LR			X		
		Chi-square			X		

Appendix Table 6.6: Table of Significance – Identifying CARA Plants

Table 6.6: Relationship between respondents identifying or knowing CARA plants (Dependent Variable Y_4) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 4 Y_4 – X_1 to X_{10}	Y_4 X_1	Likelihood Ratio LR					X
		Chi-square				X	
	Y_4 X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_4 X_3	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_4 X_4	Likelihood Ratio LR					X
		Chi-square				X	
	Y_4 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_4 X_6	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_4 X_7	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_4 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_4 X_9	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_4 X_{10}	Likelihood Ratio LR	X				
		Chi-square	X				

Appendix Table 6.7: Table of Significance – Identifying NEMBA Plants

Table 6.7: Relationship between respondents identifying or knowing NEMBA plants (Dependent Variable Y_5) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly) significant P < 0.01	*** Very highly significant P < 0.001
Doc. 5 Y_5 - X_1 to X_{10}	Y_5 X_1	Likelihood Ratio LR					
		Chi-square					
	Y_5 X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_5 X_3	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_5 X_4	Likelihood Ratio LR		X			
		Chi-square			X		
	Y_5 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_5 X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_5 X_7	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_5 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_5 X_9	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_5 X_{10}	Likelihood Ratio LR			X		
		Chi-square		X			

Appendix Table 6.8: Table of Significance – Identifying Indigenous Alternative Plants

Table 6.8: Relationship between respondents identifying or knowing Indigenous alternative plants (Dependent Variable Y_6) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 6 Y_6 - X_1 to X_{10}	Y_6 X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_6 X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_6 X_3	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_6 X_4	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_6 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_6 X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_6 X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_6 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_6 X_9	Likelihood Ratio LR			X		
		Chi-square		X			
	Y_6 X_{10}	Likelihood Ratio LR	X				
		Chi-square	X				

Appendix Table 6.9: Table of Significance – Receiving Government Information/Feedback

Table 6.9: Relationship between respondents receiving Government information/feedback (Dependent Variable Y_7) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 7 Y_7 - X_1 to X_{10}	Y_7 X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_7 X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_7 X_3	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_7 X_4	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_7 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_7 X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_7 X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_7 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_7 X_9	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_7 X_{10}	Likelihood Ratio LR				X	
		Chi-square				X	

Appendix Table 6.10: Table of Significance – CARA Category Knowledge

Table 6.10: Relationship between respondents having CARA category knowledge (Dependent Variable Y_8) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 8 Y_8 - X_1 to X_{10}	Y_8 X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_8 X_2	Likelihood Ratio LR				X	
		Chi-square					X
	Y_8 X_3	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_8 X_4	Likelihood Ratio LR					X
		Chi-square					X
	Y_8 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_8 X_6	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_8 X_7	Likelihood Ratio LR					X
		Chi-square					X
	Y_8 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_8 X_9	Likelihood Ratio LR					X
		Chi-square					X
	Y_8 X_{10}	Likelihood Ratio LR			X		
		Chi-square			X		

Appendix Table 6.11: Table of Significance – NEMBA Category Knowledge

Table 6.11: Relationship between respondents having NEMBA category knowledge (Dependent Variable Y_9) and the Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 9 Y_9 - X_1 to X_{10}	Y_9 X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_9 X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_9 X_3	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_9 X_4	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_9 X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_9 X_6	Likelihood Ratio LR			X		
		Chi-square		X			
	Y_9 X_7	Likelihood Ratio LR					X
		Chi-square					X
	Y_9 X_8	Likelihood Ratio LR					
		Chi-square					
	Y_9 X_9	Likelihood Ratio LR				X	
		Chi-square			X		
	Y_9 X_{10}	Likelihood Ratio LR			X		
		Chi-square		X			

Appendix Table 6.12: Table of Significance – Answers to Customer Question 13.1

Table 6.12: Answers to Customer Question Q1 (Dependent Variable Y_{10}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 10 Y_{10} - X_1 to X_{10}	Y_{10} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{10} X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_{10} X_3	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_{10} X_4	Likelihood Ratio LR					X
		Chi-square					X
	Y_{10} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{10} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{10} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{10} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{10} X_9	Likelihood Ratio LR					X
		Chi-square					X
	Y_{10} X_{10}	Likelihood Ratio LR				X	
		Chi-square				X	

Appendix Table 6.13: Table of Significance – Answers to Customer Question 13.2

Table 6.13: Answers to Customer Question Q2 (Dependent Variable Y_{11}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 11 Y_{11} - X_1 to X_{10}	Y_{11} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{11} X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_{11} X_3	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{11} X_4	Likelihood Ratio LR					X
		Chi-square					X
	Y_{11} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{11} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{11} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{11} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{11} X_9	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{11} X_{10}	Likelihood Ratio LR					X
		Chi-square				X	

Appendix Table 6.14: Table of Significance – Answers to Customer Question 13.3

Table 6.14: Answers to Customer Question Q3 (Dependent Variable Y_{12}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 12 Y_{12} - X_1 to X_{10}	Y_{12} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{12} X_2	Likelihood Ratio LR			X		
		Chi-square		X			
	Y_{12} X_3	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{12} X_4	Likelihood Ratio LR					X
		Chi-square					X
	Y_{12} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{12} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{12} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{12} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{12} X_9	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_{12} X_{10}	Likelihood Ratio LR			X		
		Chi-square			X		

Appendix Table 6.15: Table of Significance – Answers to Customer Question 13.4

Table 6.15: Answers to Customer Question Q4 (Dependent Variable Y_{13}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 13 Y_{13} - X_1 to X_{10}	Y_{13} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{13} X_2	Likelihood Ratio LR			X		
		Chi-square		X			
	Y_{13} X_3	Likelihood Ratio LR			X		
		Chi-square		X			
	Y_{13} X_4	Likelihood Ratio LR					X
		Chi-square				X	
	Y_{13} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{13} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{13} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{13} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{13} X_9	Likelihood Ratio LR					X
		Chi-square				X	
	Y_{13} X_{10}	Likelihood Ratio LR			X		
		Chi-square			X		

Appendix Table 6.16: Table of Significance – Responses to "Posters" Question 14.4

Table 6.16: Responses to "Posters" question (Dependent Variable Y_{14}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 14 Y_{14} - X_1 to X_{10}	Y_{14} X_1	Likelihood Ratio LR					
		Chi-square					
	Y_{14} X_2	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{14} X_3	Likelihood Ratio LR		X			
		Chi-square		X			
	Y_{14} X_4	Likelihood Ratio LR					X
		Chi-square					X
	Y_{14} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{14} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{14} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{14} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{14} X_9	Likelihood Ratio LR					X
		Chi-square					X
	Y_{14} X_{10}	Likelihood Ratio LR					X
		Chi-square					X

Appendix Table 6.17: Table of Significance – Responses to "Pamphlets" Question 14.5

Table 6.17: Responses to "Pamphlets" question (Dependent Variable Y_{15}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 15 Y_{15} - X_1 to X_{10}	Y_{15} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{15} X_2	Likelihood Ratio LR					X
		Chi-square					X
	Y_{15} X_3	Likelihood Ratio LR		X			
		Chi-square	X				
	Y_{15} X_4	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{15} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{15} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{15} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{15} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{15} X_9	Likelihood Ratio LR					X
		Chi-square				X	
	Y_{15} X_{10}	Likelihood Ratio LR				X	
		Chi-square				X	

Appendix Table 6.18: Table of Significance – "Opinion on Invasive Plants"

Table 6.18: Responses to "Opinion on Invasive Plants" question (Dependent Variable Y_{16}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 16 Y_{16} - X_1 to X_{10}	Y_{16} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{16} X_2	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{16} X_3	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{16} X_4	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{16} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{16} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{16} X_7	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{16} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{16} X_9	Likelihood Ratio LR					X
		Chi-square				X	
	Y_{16} X_{10}	Likelihood Ratio LR					X
		Chi-square				X	

Appendix Table 6.19: Table of Significance – "Opinion on Potential Invasive Plants"

Table 6.19: Responses to "Opinion on Potential Invasive Plants" question (Dependent Variable Y_{17}) in terms of Independent Variables X_1 to X_{10}

Word Pad File name	Y_i X_j	Statistical Test	Not significant P > 0.08	Not significant, but nearly significant P 0.06 – 0.08	* Significant, P < 0.05	** Highly significant P < 0.01	*** Very highly significant P < 0.001
Doc. 17 Y_{17} - X_1 to X_{10}	Y_{17} X_1	Likelihood Ratio LR					X
		Chi-square					X
	Y_{17} X_2	Likelihood Ratio LR			X		
		Chi-square			X		
	Y_{17} X_3	Likelihood Ratio LR		X	X		
		Chi-square					X
	Y_{17} X_4	Likelihood Ratio LR				X	
		Chi-square					X
	Y_{17} X_5	Likelihood Ratio LR					X
		Chi-square					X
	Y_{17} X_6	Likelihood Ratio LR	X				
		Chi-square	X				
	Y_{17} X_7	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{17} X_8	Likelihood Ratio LR					
		Chi-square					
	Y_{17} X_9	Likelihood Ratio LR				X	
		Chi-square				X	
	Y_{17} X_{10}	Likelihood Ratio LR					X
		Chi-square				X	