

**THE POTENTIAL IMPACT OF THE CARA LEGISLATION  
(FOR GUAVA AS AN INVADER SPECIES)  
ON SELECTED DISADVANTAGED COMMUNITIES IN KWAZULU-NATAL**

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## ABSTRACT

The aim of the study was to find benefits derived from the natural propagation and the use of guava plants and fruit by people living in rural areas of KwaZulu-Natal, looking at guava as a source of food, income, medicinal uses, shade, a source of fuel and use for agricultural purposes like fencing; and also assessing Conservation of the Agricultural Resource Act (CARA), Act 43 of 1983 relating to guava plant as invasive species. The Act states that all alien invader species and weeds should be controlled or removed depending on the category.

CARA states that plants in category one are declared as alien invasive plants and are not allowed to grow on the land or appear on the water surface. Plants under this category may not be transported or allowed to disperse e.g. *Psidium x durbanensis* (Durban guava). Category two plants are invader species that have a potential value, plants that are used by the people as a source of income and food. These species can be retained if they grow in special areas demarcated for the purpose (an orchard). If these species are found outside demarcated areas they are to be removed e.g. *Psidium guava* (guava). Category three species are mostly plants with ornamental value which are not allowed to occur anywhere unless they were already in existence when the regulation came into effect e.g. *Psidium guineense* (brazilian guava) and *Psidium cattleianum* (strawberry guava).

The study focused on selected areas of KwaZulu-Natal,; Umgungundlovu district municipality (Richmond local municipality) and Uthungulu district municipality. Richmond represented the midlands areas and Uthungulu the coastal areas to reflect two different areas of KwaZulu-Natal. To investigate this study the researcher used telephonic interviews with 23 Extension officials, questionnaires to guide focus group discussions which were conducted with 28 community groups that were involved in guava usage. Informal observation surveys were also carried out with five markets (stall holders) selling guava and guava products. Informal observations in two supermarkets and two home industries were also conducted.

The results showed that people in rural areas still use this resource (guava) as a source of fuel (wood), medicine (especially the leaves and bark), fruit for own consumption (either

processed or raw) and income generation. The impact of the legislation on rural poor communities is negative as guavas sustain livelihoods and the costs of applying for permits are prohibitive. People are illiterate yet they have to apply for special permits to plant this useful species because the regulation stipulates that guava plants must be controlled if dispersed outside demarcated areas.

## DECLARATION

I .....Thoko Msomi..... declare that:

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## TABLE OF CONTENTS

|                   | Page |
|-------------------|------|
| Abstract          | i    |
| Declaration       | iii  |
| Acknowledgement   | iv   |
| Table of Contents | v    |
| List of Figures   | ix   |
| List of Tables    | ix   |
| Acronyms          | x    |

### CHAPTER 1: BACKGROUND TO THE RESEARCH

|                                |   |
|--------------------------------|---|
| 1.1 Introduction               | 1 |
| 1.2 Problem statement          | 3 |
| 1.3 Sub-problems               | 4 |
| 1.4 Objectives of the study    | 4 |
| 1.5 Study limits               | 4 |
| 1.6 Definition of terms        | 5 |
| 1.7 Assumptions of the study   | 6 |
| 1.8 Dissemination of findings  | 6 |
| 1.9 Description of study areas | 6 |
| 1.9.1 Methodology              | 8 |
| 1.10 Structure of the report   | 8 |

### CHAPTER 2: REVIEW OF LITERATURE

|  |    |
|--|----|
| 2.1 Introduction                           | 9  |
| 2.2 Description of the guava family        | 10 |
| 2.3 Nutritional value                      | 11 |
| 2.4 Fruit                                  | 13 |
| 2.4.1 Guava fruits available in KZN        | 14 |
| 2.5 Origin and distribution of guava trees | 15 |

|   |    |
|---|----|
| 2.6 Cultivation   | 16 |
| 2.7 Uses of parts of guava tree                             | 16 |
| 2.7.1 Fruit   | 16 |
| 2.7.2 Wood  | 17 |
| 2.7.3 Leaves  | 18 |
| 2.7.4 Medicinal uses  | 18 |
| 2.7.5 Contra indications                                    | 19 |
| 2.8 Storage   | 19 |
| 2.9 Processing  | 20 |
| 2.9.1 Dehydration or drying                                 | 20 |
| 2.9.2 Canning and bottling                                  | 21 |
| 2.9.3 Freezing  | 22 |
| 2.10 Examples of fruit and vegetable processing projects    | 22 |
| 2.11 Outcomes of fruit processing                           | 26 |
| 2.11.1 Processing for home consumption                      | 27 |
| 2.11.2 Processing for community consumption                 | 27 |
| 2.11.3 Processing for small -scale marketing                | 27 |
| 2.12 The potential for marketing guava products             | 27 |
| 2.12.1 Marketing Audit                                      | 27 |
| 2.12.2 Market Research                                      | 29 |
| 2.12.3 Marketing Mix  | 30 |
| 2.13 Invasive plants and their Impacts                      | 31 |
| 2.13.1 Where in KZN do Invasive Alien species occur?        | 32 |
| 2.13.2 Categorization of weeds available in KZN             | 32 |
| 2.13.3 Ways of controlling invasive Alien species           | 34 |
| 2.13.4 Implication of CARA legislation in relation to guava | 35 |
| 2.14 Expanded Public Works Programme (EPWP)                 | 35 |
| 2.15 The Urban Renewal Programme (URP)                      | 36 |
| 2.16 Summary  | 37 |

### **CHAPTER 3: DESCRIPTION OF THE STUDY AREAS**

|   |    |
|---|----|
| 3.1 Introduction  | 37 |
| 3.2 Umgungundlovu   | 37 |
| 3.3 Uthungulu   | 38 |
| 3.4 Poverty Indicators  | 41 |
| 3.4.1 Richmond  | 41 |
| 3.4.2 Uthungulu   | 43 |
| 3.5 Implications on statistics on poverty indicators for Richmond and Uthungulu | 45 |

### **CHAPTER 4: METHODOLOGY**

|                               |    |
|-------------------------------|----|
| 4.1 Introduction              | 47 |
| 4.2 Design of the study       | 47 |
| 4.3 Sampling                  | 48 |
| 4.4 Data collection           | 50 |
| 4.4.1 Questionnaires          | 50 |
| 4.4.2 Focus group discussions | 51 |
| 4.4.3 Informal interviews     | 51 |
| 4.4.4 Observations            | 52 |
| 4.5 Data analysis             | 53 |

### **CHAPTER 5: RESULTS AND DISCUSSION**

|   |    |
|---|----|
| 5.1 Introduction  | 54 |
| 5.2 Results from Extension Officers Survey                  | 54 |
| 5.3 Results from Focus Group discussions (Community Groups) | 57 |
| 5.3.1 Importance of Guava                                   | 57 |
| 5.4 Results from Markets                                    | 60 |
| 5.5 Results from formal Supermarkets                        | 65 |
| 5.6 Results from Home Industries                            | 65 |
| 5.7 Discussion of findings                                  | 65 |



## **CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS**

|  |    |
|--|----|
| 6.1 Conclusion                           | 69 |
| 6.2 Recommendations for Government       | 71 |
| 6.3 Recommendations to improve the study | 72 |
| 6.4 Recommendations for further Research | 72 |

|                   |    |
|-------------------|----|
| <b>REFERENCES</b> | 72 |
|-------------------|----|

## **APPENDICES**

|             |   |
|-------------|---|
| APPENDIX A: | RECIPES   |
| APPENDIX B: | QUESTIONNAIRE FOR EXTENSION OFFICERS                            |
| APPENDIX C: | QUESTIONNAIRE FOR FOCUS GROUP DISCUSSIONS                       |
| APPENDIX D: | QUESTIONNAIRE FOR STALL HOLDERS                                 |
| APPENDIX E: | AVAILABLE GUAVA PRODUCTS IN SUPERMARKETS AND<br>HOME INDUSTRIES |

## LIST OF FIGURES

|  | Page |
|--|------|
| 1.1 Map showing the study areas included in the study                | 7    |
| 2.1 Pink fleshed guava fruit, from Maphumulo District                | 14   |
| 2.2 White fleshed guava fruit, from Maphumulo                        | 14   |
| 2.3 Cherry or Chinese guava  | 15   |
| 2.4 Guava poles used for fencing at Mr Madiba's homestead, Umbumbulu | 18   |
| 2.5 Guava fruits mixed by Mr Magwaza when making guava juice         | 24   |
| 2.6 Guava juices processed by Mr Magwaza                             | 25   |
| 2.7 Bottled Marula Jam ready for the market                          | 26   |
| 2.8 Marula jams selling at Imbizo Hall                               | 26   |
| 3.1 Map of Umgungundlovu District Municipality                       | 40   |
| 3.2 Map of Uthungulu District Municipality                           | 41   |
| 4.1 Tourist outlet - Zamimpilo market                                | 52   |
| 5.1 Zamani Vending Stall (Ensingweni)                                | 61   |
| 5.2 Other fruits and craft selling at Zamani Vending Stall           | 62   |
| 5.3 Guava trees behind the market at Zamani                          | 62   |

## LIST OF TABLES

|   | Page |
|---|------|
| 2.1 Nutrition values for guava and guava products per 100g edible portion           | 12   |
| 2.2 Composition Chart: per 100g of raw fruit  | 13   |
| 4.1 Design of the study   | 47   |
| 4.2 Districts and focus group numbers participating in this study                   | 49   |
| 5.1 Fifty nine districts reported on by 23 Extension Officers                       | 55   |
| 5.2 Reported uses of guava according to Extension                                   | 55   |
| 5.3 Quantity of guavas sold according to Extension Officers                         | 56   |
| 5.4 District name and whether guavas were processed according to Extension Officers | 56   |
| 5.5 Importance of guava according to community groups- Focus group discussions      | 58   |
| 5.6 Availability of products from guava trees                                       | 58   |
| 5.7 Number of respondents from markets participating in the study                   | 63   |
| 5.8 Guava products available for sale   | 64   |

## ACRONYMS

|       |  |
|-------|--|
| AIDS  | - Acquired Immune Deficiency Syndrome                          |
| CARA  | - Conservation of Agricultural Resource Act 43 of 1983         |
| DoA   | - Department of Agriculture (National Department)              |
| DoAE  | - Department of Agriculture and Environmental Affairs (KZN)    |
| DWAF  | - Department of Water Affairs and Forestry                     |
| EIA   | - Environmental Impact Assessment                              |
| EPWP  | - Expanded Public Works Programme                              |
| GDS   | - Growth and Development Summit                                |
| HIV   | - Human Immune – Deficiency Virus                              |
| HSL   | - Household Subsistence Level                                  |
| IAPs  | - Invasive Alien Plants  |
| ISRDP | - Integrated Sustainable Rural Development Programme           |
| INR   | - Institute of Natural Resources (Pietermaritzburg)            |
| MLL   | - Minimum Living Level   |
| NTFPs | - Non- Timber Forest Products                                  |
| URP   | - Urban Renewal Programme                                      |
| WSSD  | - World Summit on Sustainable Development, 2002 (Johannesburg) |
| WfW   | - Working for Water  |
| KZN   | - KwaZulu - Natal  |

## **CHAPTER 1: BACKGROUND TO THE RESEARCH**

### **1.1 Introduction**

The Conservation of Agriculture Resources Act (CARA), Act 43 of 1983 is an act administered by the National Department of Agriculture. The regulations 15 and 16 dealing with the control of alien invader species and weeds were reviewed in 2001 and form part of the conservation of the natural agricultural resources of South Africa. This conservation is effected through maintaining the productive potential of land, combating and preventing erosion, preventing the reduction or destruction of water resources, protecting the vegetation and combating weeds and invader plants (Henderson, 2001; Klein, 2002).

These regulations of the CARA divide the listed species and weeds into four categories, of which the first three consist of undesirable alien plants and the last category details the prevention of bush encroachment, i.e indigenous plants that require sound management practices to prevent them from being problematic. Different species of alien plants are found in the various geographic bio-climatic zones of the country (Henderson & Cilliers, 2002).

Plants in category 1 consist of declared weeds and alien invasive plant species that are prohibited and not allowed on land or water surface, and plants may not be transported or be allowed to disperse in either rural and urban areas. Reproduction or trading in seeds, cuttings or any other propagation materials is prohibited. The plants have characteristics that are harmful to humans, animals or environment. Most of the plants in this category are dispersed by wind and birds or have very efficient means of vegetative reproduction (Henderson, 2001; South African Government Information, undated).

Category 2 plant invaders (with commercial value) are those whose potential for becoming invasive has been scientifically determined, but have certain beneficial properties that support their continued presence in certain circumstances. Species can be retained only if they occur in special demarcated areas, but those occurring outside demarcated areas have to be controlled (Henderson & Cilliers, 2002).

Category 3 plant invaders (mostly of ornamental value) are also undesirable, but most of them are well-liked ornamentals or shade trees i.e. the famous Jacaranda trees found in most cities and town streets that will take a long time to replace. They are prolific seed producers that end up in the rivers. When the Jacaranda tree seeds germinate in the river banks, the river banks are destroyed, thereby rendering the farmer's irrigation systems from the river useless. It is for these reasons that category 3 plants are not allowed to occur anywhere unless they were already in existence when these regulations came into effect (Henderson, 2001; Versveld, *et al*, 1998).

The fourth category is referred to as bush encroachment and that is covered by Regulation 16 of the CARA. These are indigenous plants, which are closer to each other than three times the mean crown diameter. In the degraded areas due to mismanagement by overgrazing or uncontrolled fires, these plants tend to take over and overpopulate the area. Whilst the plants themselves are not invasive, when they become prolific in an area, they can be regarded as a symptom of poor land management practices. Therefore the law does not necessarily outlaw these plants but instead prescribes management practices aimed at preventing bush encroachment and combating this where it already exists (Klein, 2002; Henderson, 2001).

Some of these plants, such as guava are however used beneficially by people and therefore removing them from where they grow may disadvantage communities that use the products. The purpose of this study therefore, will be to assess the CARA legislation relating to guava plants as types of guava trees fall under categories 1-3 of the legislation. The study will also determine the socio-economic importance of guava plants like other non-timber forest products where people, especially in rural areas subsist through guava as a source of food, income, medicine, shade and fuel (Shackleton & Shackleton, 2004).

Diseases easily affect children when they have insufficient nutrients required by the body. During certain seasons food becomes scarce and children snack very well on wild fruits including guava. This provides an important source of vitamins, minerals, amino acids and trace elements. The contribution made by these wild resources helps in the maintenance of good health and prevents diseases (Williams & Worthington-Roberts, 1992). Levels of poverty, HIV and AIDS in the poorest communities living in rural areas are high. The high levels of poverty and diseases are due to lack of resources. Even if the resources are

provided e.g. clinics, people are unable to utilize them because they are unemployed. Sometimes clinics are too far from the residing areas of rural people and more money is required for transport than the amount of money required by the clinic. Women especially in rural areas are the most vulnerable group when it comes to ill health; this is due to the amount of work they do both at home and in the fields (Moser 1995). Rural women are expected to fetch and carry water and firewood for long distances, work in the fields producing food, prepare and cook food for their families and care for the aged members and children in the families. Women do heavy duties even if they are malnourished and anaemic. Some receive little financial support from their spouses who may be migrant workers and others may not receive any support (Moser, 1995) All these contribute to poverty in the rural areas.

Wild fruits such as guava and others can play an important role in the lives of people living in rural areas by providing basic food for survival and traditional herbal medicines for primary health care, poles for building houses and fencing as a source of firewood. Wild fruits also provide a significant source of nutrients that can form a barrier against diseases and illnesses caused by malnutrition and also contribute to the food security of rural livelihoods (World Food Summit, 1996).

## **1.2 Problem statement**

What is the potential impact of CARA legislation on people living in four rural areas in KZN relating to guava as an invader species in relation to food, income, medicinal and fuel usage. The publication of the regulation 15 and 16 prohibits the free natural propagation of certain guava cultivars, thereby impacting on the availability of guava as a source of food and income for those who have poor livelihoods.

On the other hand the invasion of guavas like other alien invasive species displaces indigenous plants and results in land degradation and excessive use of water. Nothing grows under certain guava species because of the deep root system of a guava tree (Working for Water Programme, 2005).

The World Summit on Sustainable Development (WSSD) held in Johannesburg during 2002 emphasized sustainability, the triple bottom line of the people, planet and prosperity

i.e. social, environmental and economic factors. The CARA legislation apparently considers the environmental factors to the exclusion of the socio- economic factors, which is in contrast to the WSSD philosophy.

### **1.3 Research Questions**

#### **Sub-problem 1.**

What is the importance of guava as a source of food to disadvantaged communities?

#### **Sub-problem 2.**

What contribution does guava make to income generation of women in four KZN rural communities?

#### **Sub-problem 3.**

To what extent do the KZN women have medicinal uses for guava?

#### **Sub-problem 4.**

To what extent are guava plants used as a source of fuel and building materials?

#### **Sub-problem 5.**

What potential impact does the legislation have on communities living in mid KwaZulu - Natal in terms of food, income, medicines and fuel?

### **1.4 Objectives of the study**

The primary objectives of the study are:-

- To find benefits derived from natural propagation and use of guava.
- To find out how many people use guava.
- To help policy makers review the legislation so that it does not disadvantage those who are benefiting from guava plants and their by-products.

### **1.5 Study limits**

Four types of guava species are named in literature. They are also described according to their scientific names and the researcher will limit the study to these specific guava species.

The study focuses on rural poor communities and their processing activities, not large commercial production enterprises.

Only selected Northern and Midlands areas of KZN were included in the study as these areas are where guava trees grow well.

Markets closest to the producing communities that sell fresh guavas were used in the study, rather than a comprehensive survey.

### **1.6 Definition of terms**

The Conservation of Agricultural Resource Act (CARA) is an act of the National Department of Agriculture which makes the provision for the conservation of natural agricultural resources of South Africa through the prevention of introduction, control or eradication of alien species which threaten ecosystems and habitats of the country. (Klein, 2002)

Invasive Alien Plants (IAPs) - are exotic plants that are out of control, taking almost 10% of land in the country. Invader plants have a tendency to grow fast and produce more seeds and have deep spreading root systems that are difficult to remove. In countries where they come from, they are welcomed because they are controlled naturally. In South Africa they have no natural enemies; thus they grow and multiply. This results in IAPs occupying more land than indigenous plants (Working for Water Programme, undated; Wildly, 2005).

A weed – is any plant that crowds out cultivated plants. A weed usually damages crops when growing in fields may poison domesticated animals when growing on pasture land. People usually perceive weeds in different ways i.e one may consider a plant as being beautiful and grow it in the garden whereas another may consider the same plant as a weed and pull it out of the garden, because of its growth in an unwanted area e.g. *crabgrass* *clover* *plantain* (Weedy Species, undated; Agricultural Research Council, undated).

Indigenous - having originated and being produced, growing or living naturally in a particular region or environment (Soanes, 2007).

Processing in this study refers to any modification to food (fruits) to improve the eating quality and prolong the shelf life.



### **1.7 Assumptions of the study**

The guava growing areas identified by Department of Agriculture KwaZulu-Natal Extension Officers are correct.

It is assumed that questionnaires are easy to understand and the language used in interviews is easily understood by the people (isiZulu).

It is assumed that all available markets in the areas that sell guava products will be included in the study (as identified by the communities).

It is assumed that removal of the trees will automatically remove the benefits derived from such trees.

### **1.8 Dissemination of findings**

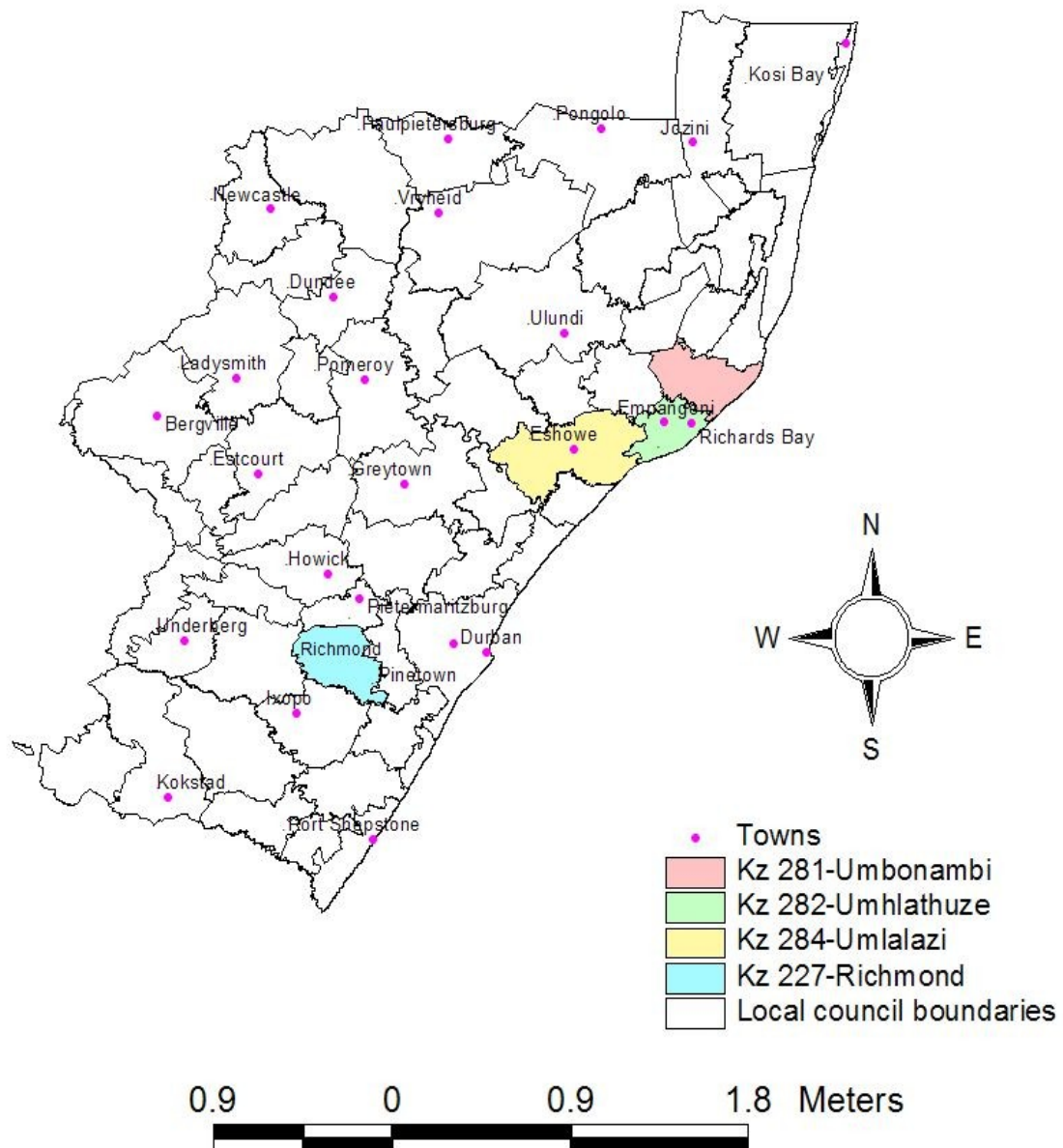
Research results will be disseminated to the Department of Agriculture at both District and Regional level. This will include Policy Makers in KwaZulu-Natal, Department of Agriculture and Environmental Affairs; University of KwaZulu-Natal; Department of Water Affairs and Forestry; National Department of Agriculture and the community groups.

### **1.9 Description of study areas**

The map showing KwaZulu-Natal Province, district municipalities and local municipalities involved in the study is shown in Figure 1.1.

Research was conducted in four areas of KwaZulu-Natal: Umgungundlovu District Municipality (Richmond Local Municipality) where guava trees grow in the households and forests, Uthungulu District Municipality including Mbonambi, Umhlathuze and Umlalazi Local municipalities where guava is available in the households, forests, near the rivers and on the outskirts of the wetlands. People in agricultural projects use guava for processing and marketing.

# Locality of Study Area



**Fig 1.1: Map showing the study areas included in the research (DoAE 2005).**

### **1.9.1 Methodology**

In order to investigate the research problem the researcher conducted telephonic interviews with Extension agents, used questionnaires to guide focus group discussions with groups from the communities, informal observation survey for markets selling guava, and informal observations in supermarkets and home industries shops.

Data was collected using focus group discussions that assisted the researcher to gain insights into people's shared understandings about guava. Questionnaires were used as a tool for data collection to determine the number of people benefitting from guava as a medicinal herb, fruit for own consumption, a source of wood and income generation.

An informal observation survey of market places selling fresh raw guava and processed guava products was conducted to access amount, price and seasons of guava sales. A brief study of guava products in formal supermarkets was conducted to determine the scope of processed guava products available.

### **1.10 Structure of the report**

The report is divided into six chapters in the following sequence:-

Chapter one includes the introduction, the main problem, sub-problems, objectives of the study, study limits and the methodology. Chapter two focuses on exploring the literature related to the research under the following topics:- Origin and distribution of guava trees, the nutritional value of guava, uses of parts of guava tree, storage, processing and marketing, invasive plants and their impacts and ways of controlling the invasive alien species. Chapter three describes the study areas where research was conducted in relation to their agricultural potential, geographic position and socio-economic status while Chapter four deals with the methodology of surveys, interviews and informal observations. Chapter five describes the people participating in the study, and presents the results and discussions from data collected and analyzed. Chapter six includes the summary of research, conclusions and recommendations.

## CHAPTER 2: REVIEW OF LITERATURE

### 2.1 Introduction

High levels of unemployment and poverty have economic and social implications. From the economic point of view, the overall unemployment rate remains one of the key measures of economic performance and a key variable in alleviating poverty (Frye, 2006). Poverty is manifested among 14 million South Africans out of a population of 45 million. The section of the population regarded as poor is food insecure and the most vulnerable groups are women, children and the elderly. The majority are children, and 70% are from the rural areas. Women are also the most vulnerable as they are required to perform other responsibilities, looking after children, cleaning houses, fetching water, collecting firewood, cooking and washing clothes (Moser, 1995).

The country has adopted a best cocktail of natural resource management environmental frameworks in the form of policy and legislation. Among these are the National Environmental Management Act 108 of 1997, Biodiversity Act of 1995 and of course the old Conservation of Agricultural Resource Act 43 of 1983 (CARA), which regulates the alien and invasive plant species of which guava (*psidium guajava*) is one of them.

The CARA sub-legislation categorises four species for guava to be regulated; Category one invader plants are declared weeds that must be controlled or removed by the land users. The plants may no longer be planted or propagated. The seeds, cuttings and other propagation materials may no longer be sold. Category two are declared invaders (plants with commercial value)- plants that create a threat to the environment , but others can be used for timber, fruits, fuel wood, medicinal plants, animal fodder or as building material. These species are only allowed to occur in demarcated areas, and if they are used for commercial purposes, land users have to obtain a water license as water will be consumed in larger volumes by these plants. Where plants occur outside demarcated areas they have to be removed e.g. guava which is easily spread by birds and monkeys, the question is- what can be done to prevent birds from eating and spreading guava? Koejawel /guava (*Psidium guajava*) is an invader which falls under category two.

The third category are declared invaders (plants with ornamental value) whereby in terms of regulation 15 of CARA these plants will not be allowed to occur anywhere except in biologically controlled reserves unless they were already existing when the regulation came into effect which was before the 30<sup>th</sup> of March 2001 i.e. older plants may not be removed but be kept under control with no new plantations initiated and the plants may no longer be sold (Henderson, *et al*, 1999). Strawberry guava or Brazillian guava (*Psidium cattleianum*) are the types of guava plant invaders which fall under the third category.

The guava fruit has the potential to supply some of the nutrient requirements of the food insecure South Africans and even food secured groups as nutrients are required by every human being to enable the body to function properly and help to prevent diseases. Food security does not necessarily mean food as such, but food can be sold for cash to buy other necessities for the home like soap and tea (Food Security Concept paper, 2006). This could work properly if coupled with the creation of enterprises and job creation from the rural poor among whom the guava trees grow profusely. The creation of jobs links up with the government policy on the Expanded Public Works Programme (EPWP) which aims to create more jobs by promoting job intensive enterprises e.g. an intensive guava production or processing enterprise aimed at addressing unemployment. The implementation of EPWP will then be focusing on the infrastructural, environmental, social and economic sectors. Policies can be mainstreamed into the government programmes especially in the determined development nodes i.e. Urban Renewal Programme (URP) for urban areas and the Integrated Sustainable Rural Development Programme (ISRDP) of which 21 nodes have been identified as pilots, in KwaZulu-Natal being Inanda, Ntuzuma and Kwa-Mashu (INK) for urban areas; and in Ugu, Umzinyathi, Umkhanyakude, and Zululand for rural areas. The identified nodes are where the poorest of the poor are found and the government is focussing and co-ordinating these programmes in order to achieve maximum outputs and efficiency. Poor households are identified as those who lack a wage income, resulting from unemployment or low-paying jobs little and access to basic needs such as electricity, sanitation and water (South African Government Information, undated). Literature illustrating such environmental policies and their impact on the poor were investigated.

## **2.2 Description of the guava family**

Guava falls under Myrtaceae family which is a woody family of the subtropics and tropical areas. Guava tree is a shallow rooted plant which can either grow as a shrub or small tree

of three to eight metres high. The plant branches close to the ground and suckers are often produced from the roots. Guava plants are found growing wild where the soil has been disturbed. The leaves are evergreen, opposite, oblong, elliptic, hairy beneath with a very strong aroma when crushed. The leaves are evergreen but in spring the deeply veined leaves may drop. The fruit has many seeded berries, green turning yellow, with white or pink flesh and a musky penetrating odour. The fruit is eaten by a wide range of birds, animals and human beings resulting in the dissemination of seeds which assists with the spread of the invaders (Cull and Lindsay, 1995; Henderson, 2001).

### **2.3 Nutritional value**

Guava is a good source of Vitamin C, niacin, thiamine, riboflavin, calcium, iron, phosphorus and dietary fibre with very few calories from cholesterol and saturated fats. There is a very low risk of cancer among people who eat more fruit and vegetables rich in dietary fibre, carotenoids and Vitamin C. Coronary heart disease risk is reduced because of the low of saturated fat and cholesterol in guava (Culinary Skills, undated; Go for guava, 2004).

Dietary fibre moves waste through the colon thus preventing constipation and possible colon cancer. People of all ages are therefore advised to consume more food with high dietary fibre as it may prevent cancer, diabetes, heart disease and obesity. Guava is also a good source of pectin which aids in digestion (Guava, *psidium guajava*, undated).

Vitamin C (ascorbic acid) is essential for the production of intercellular material which holds cells together. Vitamin C is also important in the formation of collagen, a protein that gives structure to bones, cartilage, muscle and blood vessels. Vitamin C also aids in the absorption of iron and helps to maintain capillaries, bones and teeth (Williams & Worthington-Roberts, 1992). Iron is an essential nutrient for growth and development of babies; therefore it is essential for mothers who are expecting babies to include fruits such as guava in their diets (Healthy Eating, undated). Guava, because of its high Vitamin C content is a natural flu-fighting remedy. When enough Vitamin C is available, the body becomes resistant to anemia and wounds heal faster. Anemia is a deficiency caused by the shortage of iron in the body (Mediclinic, 2006).

**Table 2.1: Nutritional values for guavas and guava products per 100g edible portion (Kruger *et al*, 1998)**

|                         | Guava, raw peeled | Guava stewed without sugar | Guava canned in syrup | Guava roll dried |
|-------------------------|-------------------|----------------------------|-----------------------|------------------|
| <b>Macro Nutrients</b>  |                   |                            |                       |                  |
| Moisture (g)            | 82.7              | 82.7                       | 78                    | 9                |
| Energy (KJ)             | 290               | 290                        | 367                   | 1539             |
| Protein (g)             | 0.8               | 0.8                        | 0.4                   | 1.1              |
| Fat (g)                 | 0.3               | 0.3                        | trace                 | 0.8              |
| Carbohydrate (g)        | 7.7               | 7.7                        | 16.3                  | 69.3             |
| Added sugar (g)         | 0                 | 0                          | 6.9                   | 13.9             |
| Glucose (g)             | 3.3               | 3.3                        | 3.2                   | 24.1             |
| Fructose (g)            | 3.6               | 3.6                        | 5.6                   | 26.4             |
| Sucrose (g)             | 0.7               | 0.7                        | 6.7                   | 17.8             |
| Total dietary fibre (g) | 7.9               | 7.9                        | 4.9                   | 18.4             |

**Table 2.1a Minerals**

|                       |            |            |            |            |
|-----------------------|------------|------------|------------|------------|
| Iron (mg)             | 0.4        | 0.4        | 0.5        | 0.4        |
| Magnesium (mg)        | 10         | 10         | 6          | 13         |
| Calcium (mg)          | 8          | 7          | 8          | 27         |
| Phosphorus (mg)       | 23         | 23         | 11         | 34         |
| <b>Potassium (mg)</b> | <b>264</b> | <b>238</b> | <b>120</b> | <b>381</b> |
| Sodium (mg)           | 1          | 1          | 7          | 4          |
| Chloride (mg)         | 5          | 5          | 10         | 6          |
| Zinc (mg)             | 0.15       | 0.15       | 0.4        | 0.31       |
| Copper (mg)           | 0.15       | 0.14       | 0.1        | 0.14       |
| Manganese (µg)        | 180        | 180        | 70         | 193        |

**Table 2.1.b Vitamins**

|                                   |            |            |            |            |
|-----------------------------------|------------|------------|------------|------------|
| Vitamin A (µgRE)                  | 10         | 7          | trace      | 50         |
| Vitamin E (mg)                    | 0.14       | 0.14       | 0.55       | 1.5        |
| Thiamine (mg)                     | 0.05       | 0.04       | 0.02       | 0.05       |
| Riboflavin (mg)                   | 0.02       | 0.02       | 0.02       | 0.06       |
| Niacin (mg)                       | 1.2        | 1.1        | 0.6        | 1.4        |
| Vitamin B 6 (mg)                  | 0.075      | 0.068      | 0.09       | 0.173      |
| Folate (µg)                       | 19         | 10         | 3          | 9          |
| Panthothenic acid (mg)            | 0.36       | 0.29       | 0.09       | 0.16       |
| Biotin (µg)                       | 3.5        | 2.8        |            |            |
| <b>Vitamin C (mg)<sup>1</sup></b> | <b>347</b> | <b>243</b> | <b>198</b> | <b>724</b> |

<sup>1</sup> The items in bold reflect the high nutritive value of these nutrients.

This table reflects the nutrient availability to those who consume and process these guava products. Composition of vitamin content and nutrient value of guava compared with other fruits available in KwaZulu-Natal is shown in Table 2.2

**Table 2.2: Composition Chart: per 100g of raw unpeeled fruit (Nutritional Facts, undated)**

|               | Guava | Orange | Apple | Avocado | Pineapple | Peach | Pear | Banana | Papaya |
|---------------|-------|--------|-------|---------|-----------|-------|------|--------|--------|
| Calories      | 62    | 49     | 58    | 167     | 52        | 38    | 61   | 85     | 39     |
| Protein       | 0.8   | 1.0    | 0.2   | 2.1     | 0.4       | 0.6   | 0.7  | 1.1    | 0.6    |
| Fat           | 0.6   | 0.2    | 0.6   | 16.4    | 0.2       | 0.1   | 0.4  | 0.2    | 0.1    |
| Carbohydrates | 15.0  | 12.2   | 14.5  | 6.3     | 13.7      | 9.7   | 15.3 | 22.2   | 10.0   |
| Fiber         | 5.6   | 0.5    | 1.0   | 1.6     | 0.4       | 0.6   | 1.4  | 0.5    | 0.9    |
| Ash           | 0.6   | 0.6    | 0.3   | 1.2     | 0.4       | 0.5   | 0.4  | 0.8    | 0.6    |
| Calcium       | 23    | 41     | 7     | 10      | 17        | 9     | 8    | 8      | 20     |
| Phosphorus    | 42    | 20     | 10    | 42      | 8         | 19    | 11   | 26     | 16     |
| Iron          | 0.9   | 0.4    | 0.3   | 0.6     | 0.5       | 0.5   | 0.3  | 0.7    | 0.3    |
| Sodium        | 4     | 1      | 1     | 4       | 1         | 1     | 2    | 1      | 3      |
| Potassium     | 289   | 200    | 110   | 604     | 146       | 202   | 130  | 370    | 234    |
| Vitamin A     | 280   | 200    | 90    | 290     | 70        | 1330  | 20   | 190    | 1750   |
| Thiamin       | 0.05  | 0.10   | 0.03  | 0.11    | 0.09      | 0.02  | 0.02 | 0.05   | 0.04   |
| Riboflavin    | 0.05  | 0.04   | 0.02  | 0.20    | 0.03      | 0.05  | 0.04 | 0.06   | 0.04   |
| Niacin        | 1.2   | 0.4    | 0.1   | 1.6     | 0.2       | 1.0   | 0.1  | 0.7    | 0.3    |
| Vitamin C     | 242   | 50     | 4     | 14      | 17        | 7     | 4    | 10     | 56     |

## 2.4 Fruit

Under favourable conditions of a tropical environment, the fruit may grow larger than the size of a tennis ball ranging from 3-10 cm in diameter but up 12cm in some selected cultivars and may occur throughout the year (Anon, 1996). From five to seven weeks after flowering, fruits reach mature stage and are available throughout the summer months (Cull & Lindsay, 1995). In subtropical areas, the fruit matures mid - summer until mid - winter. During harvest each tree can be picked more than 35 times as fruits do not ripen uniformly and most of Vitamin C is found in or close to the rind, so it is advisable not to peel guava during consumption (Wikipedia, 2008).

The fruit may have a round, oval or pear shape with a strong, sweet and musky odour when ripe. Fruits are a good source of vitamin A and C and pectin which is an enzyme used in making jam (Anon, 1996). The fruit is 5 to 10 centimeters long with 4 or 5 floral sepals at the apex. The skin is thin and light yellow in colour which is blushed with a pink colour, depending on the variety of fruit. Some have an astringent skin which is high in tannin and inedible (Cull & Lindsay, 1995). The seeds are found in the central pulp of the fruit. Seeds are generally very hard to chew but some varieties have soft seeds which are chewable. The hard seeds survive passage through the digestive tract and help to make guava invasive.



#### **2.4.1 Guava fruit available in KZN**

In KZN, the most common guava fruit are the pink, white fleshed fruits and Cherry or Chinese guava with a red coloured skin on the outside.(See figures 2.1, 2.2 and 2.3).



**Figure 2.1 Pink fleshed guava fruit, from Maphumulo District**



**Figure 2.2 White fleshed guava fruit, from Maphumulo District**



**Figure 2.3 Cherry or Chinese guava (Karkloof)**

## **2.5 Origin and distribution of guava trees**

Guava originated from the central and Southern America. The English name guava originated from the Hawaiian name, guajaba. The explorers from Spain took the guava to the Philippines and from there it was distributed by the Portuguese to India. In India, guava trees are cultivated in temple gardens because of the status they have as being sacred trees (du Preez, 1996).

In South Africa the first guavas were brought by Jan van Riebeeck from Madeira. This type was planted as it was the only variety that could be found at that time. Between 1830 and 1835 different types of guavas were introduced into the Cape through natural hybridization. Demonstrations were given to find the best hybrids and later only the best were selected and cultivated. Guava names such as Malherbe, Rousseau, du Preez, van Zyl and van Retief were the names of the farmers who were involved in the selection of the best hybrids (du Preez, 1996).

Guava is easily distributed by people, birds and other four- footed animals like monkeys. For this reason it is found growing wild in pastures, fields and road sides. Guava is often found along rivers, streams and brooks where it can thrive even where there is water - logging or unfavourable soil physical and chemical conditions. Large numbers of seeds grow easily and reach a mature age very quickly. This results in many species like

Strawberry guava or Brazilian guava, Koejavel /guava (*Psidium guajava*) being classified as invader plants and Durban guavas as weeds. Generally more water is required by such fast growing plants. Invading plants use the same amount of water in rainy as in dry seasons; the soil becomes dry and more nutrients are utilized (Marais, 2004).

## **2.6 Cultivation**

Guava grows well in hot areas where there is no frost and winters that are not too cold. Any soil type is suitable for the growth of guava but preferably a well drained soil (where water does not remain in the soil for long after rain) and guava tolerates areas with hot summers and cold winters. When guavas are cultivated for commercial purposes, it is better to plant trees on fairly well -drained loam soils because this type of soil is well aerated, the pores are open and the roots will be safe from root diseases. Through distribution on a wide variety of soil types, other species like Durban guava are regarded as weeds. Although guavas can adapt well to shallow rocky soils and drought conditions, these can reduce production. Guavas can be grown in soils that are not suitable for the production of most other subtropical fruit trees (Henderson, 2001).

## **2.7 Uses of parts of guava tree**

Many parts of the guava tree are used for the variety of situations. The following uses for parts of the tree will be discussed, fruits, wood, leaves and medicinal uses.

### **2.7.1 Fruit**

Guavas are often found growing wild or in people's gardens. During harvesting time each tree can be picked more than 35 times as ripening does not happen uniformly. Fruit can be eaten fresh picked from the tree, like in rural areas where guava is found growing wild. Most of Vitamin C in guava is found on the rind of the fruit, therefore it is advisable not to peel guava during consumption (Caribbean Food Emporium, Uncommon Tropical Fruit, undated). Guava can be seeded and eaten raw, sliced and eaten as a dessert or mixed with other fruits when making salads. Guava can also be included in a number of recipes in pies, cakes, puddings, ice creams, jam, butter, marmalade, chutney, dried guava, powder, guava rolls and relishes (Fellows &.Hampton, 1992).

Guava can be processed and produce a variety of value-added products such as guava juice or concentrate which can either be frozen or aseptically stored, purees and guava rolls, canned or bottled fruit, guava paste, cheese and guava jelly, guava nectar, guava syrup guava jam, guava chutney and guava powder. See Appendix A for recipes. When value is added to fruits they provide convenience to the consumer and increase the shelf life of the product, resulting in fruit being utilized when they are out of season and offer a potential for income generation (Enachescu, 1995).

When processing is carried out with the intention of marketing the product, value is added resulting in the sales price increasing through this processing and packaging. Through packaging, the eyes of the consumers are attracted by the packets (Markley & Hilchey., undated).

### **2.7.2 Wood**

The triple role of women includes reproductive work: child bearing and domestic tasks, i.e. cooking, fetching water and firewood, caring and maintenance of husband and children (Moser, 1995). Because guava seeds are easily dispersed by birds and animals, guava trees often grow close to the households. These trees being so near can save time and energy when used as a source of fuel and charcoal to overburdened women living in rural areas. The wood is also used in carpentry and turned for making planks but not durable when wet. Guava wood is used in cattle paddocks for fencing and occasional areas around villages and a good source of firewood (Allergy Advisor, 1998).

Guava wood is tough and light in texture therefore provides a grip when used for bird perches. Birds enjoy chewing guava wood when used as perches because it is non-toxic and safe for birds. Guava wood is strong; therefore it is also used in making tool handles, beams, toys, swings, planks and agricultural instruments (Morton, 1987).



**Figure 2.4 Guava poles used for fencing at Mr Madiba's homestead - Umbumbulu**

### **2.7.3 Leaves**

Leaves play an important role in the manufacture of medicines especially in India and West Indies where they are used for treating digestive disorders. Essential oils which are useful in the manufacture of medicines are also extracted from the guava leaves (Natural Remedies, 2005). The bark is rich in tannin which is used in making a black colour or dye when making mats or dyeing cotton and silk.

### **2.7.4 Medicinal uses**

Traditional medicines are produced by combining different types of medicinal plants, animal and mineral based medicines, spiritual therapies and mutual techniques. Therefore traditional medicine is referred to as health practices, knowledge and beliefs used to treat, diagnose and prevent illnesses or maintain people's well-being (WHO Traditional Medicine, 2003).

Medicinal plants have been used by people for thousands of years because of the healing powers they apparently have and being inexpensive and easy to produce. Traditional medicines are also important to people especially those who are living in rural areas for medical and economic reasons. These include roots, bark, leaves, branches, stems and fruits, flowers of trees, shrubs and climbers. Over 6 million people in South Africa are estimated to be living with HIV and AIDS and 150 babies are born with HIV every day.

One percent of the sufferers can afford conventional drugs, the rest rely on traditional medicines for treating the symptoms of HIV and AIDS. Indigenous methods of treatment against illnesses are thus acknowledged as guava roots, bark, leaves and immature fruits. These are commonly employed to halt gastroenteritis, diarrhoea and dysentery because of their astringency (Isis Press Release, 2004).

At Ngwelezane Hospital in the Northern KZN, *Psidium guajava* (guava) has been used as an oral and topical traditional medicine prescribed to combat the primary symptoms of HIV and AIDS such as diarrhoea. Two crushed leaves with plenty of clean water are given to patients as an oral medicine and one has to discontinue using when symptoms stop. Infants and children under the age of 2 years are given a cup of guava juice daily to stop diarrhoea (Isis Press Release, 2004).

A mixture made from leaves or bark is used by many tribes for diarrhoea and dysentery. In India the concoction is used for sore throat, vomiting, stomach upsets, vertigo and used to regulate menstrual periods. The leaf concoction is used for mouth sores, a douche for vaginal discharge and to tighten and tone vaginal walls after childbirth. A combined concoction of leaves and bark is used to expel the placenta after childbirth. Tender leaves are chewed for bleeding gums, bad breath and tooth ache (Morton, 1987 updated on the 24<sup>th</sup> March 1999). Chewing guava leaves before drinking alcohol prevents hangovers. For painful eyes, mashed flowers are used. Powdered roots are used to treat scabies, a disease caused by insufficient intake of vitamin C (Tropical Plant Database, undated).

### **2.7.5 Contra Indications**

Guava concoctions should be used with caution by those who are on heart medications because guava has demonstrated a cardiac depressant activity. Guava fruit lowers blood sugar levels and should be avoided by people with hypoglycaemia. Guava acidity found in the fruit may affect the enamel of the teeth (Tropical Plant Database, undated).

## **2.8 Storage**

Perishable commodities such as fruits and vegetables need a long term keeping quality when in storage and temperature plays an important role. When the temperature is too high

the produce will be damaged and therefore it is important to lower the temperature to an appropriate level.

Fully ripe guava fruit has a thin skin which bruises easily and needs to be used within two days after harvesting. Ripe guava fruit can be refrigerated but not for more than two days because the flesh becomes leathery (Whole Health, undated). To hasten ripening of guava fruit, store in a brown paper bag with a banana and a ripe apple. Banana contains an enzyme called polyphenol oxidase or tyrosinase which reacts with oxygen and iron containing phenols. Banana also has internally produced ethylene. Apples do not show an increased internal ethylene concentration before ripening, but when the ripening process starts, a large amount of ethylene is produced to promote the ripening process. Mature green guava fruit can be stored between the temperatures of 46° and 50°C and humidity of 85-95% for a period of two to five weeks (Reports of the FAO seminar, 2004).

## **2.9 Processing**

Food processing is any change that is made to food to improve the eating quality and prolong the shelf life (Food Processing, undated). Processing includes preservation of food which aims to prevent the development of micro organisms resulting in food spoilage during storage. When food is preserved properly, it should remain unchanged in terms of colour, flavour and aroma and be safely consumed within a certain period of time. Therefore food preservation comprises a set of treatment processes that are performed to prolong the life of foods at the same time retaining the characteristics that determine their quality, colour, texture and flavour (Dauthy, 1995; Fellows & Hampton 1992). In food processing, food is preserved by incorporating the application of scientific principles to lower the natural processes of decay. Food preservation techniques in small scale industrial systems include dehydration, canning, concentration (in the form of juice) and freezing. Guava can be processed by different methods such as dehydration or drying, canning and bottling, freezing, preserving using high sugar content and reduction of oxidation by use of vacuum and antioxidants.

### **2.9.1 Dehydration or drying**

Drying is the removal of water from the surface of the product by combining the effects of three elements i.e. temperature, humidity and air flow. Drying is an appropriate method of



preservation that is widely used in rural areas. Drying is a traditional method that is understood by the people and uses very low-cost equipment. Fruits can be dried directly in the sun or in a drier. Some fruits e.g. banana and apple usually turn brown when cut as oxygen in the air reacts with enzymes and other chemicals. The reaction can be reduced by exposing the product to sulphur dioxide in special rooms where sulphur is burned or using commercial lemon juice that is itself preserved with sulphur dioxide (Mashilo 2003). The traditional methods of preventing oxidation reaction are by heating or cooking the product, or by adding lemon juice on the surface of cut fruits (Holdsworth, 1983). Fruits can be heated in sugar syrup to extract moisture before drying in the air i.e. osmotic drying and crystallization. The drying process must be handled with great care to obtain a good quality product. Drying should take place in the shade to preserve sensory qualities of colour, texture and aroma. See Appendix A for instructions relating to guava rolls.

### **2.9.2 Canning and bottling**

Canning and bottling are the processing methods used to preserve a variety of fruit products. Canning and bottling are similar processes (though canning is mostly used commercially). Firm ripe guava fruit is peeled and immersed in 2.5% boiling sodium hydroxide solution for 15 seconds and rinsed with water and then dipped in 0.5% citric acid solution to neutralize alkalinity that might remain. The fruit is then cut into quarters and cored to obtain the flesh. The flesh is dipped in 2 percent calcium chloride solution for 1 hour to firm the texture and rinsed. The fruit is put into cans or jars, syrup is added and air is removed by subjecting the container to a steam exhaust treatment and sealed soon after the temperature reaches 79°C. The cans are then processed in boiling water for 25 minutes and cooled in a water bath to 40°C and air dried (Somogyi, Barret & Huiy, 1996). Examples of canning are the production of guava jelly, guava jam and canned guava that are used in desserts. See Appendix A for detailed processes and recipes.

### **2.9.3 Freezing**

There are three methods that are used to pack fruits for freezing i.e. sugar pack, syrup pack and unsweetened pack. The flavour is retained better when sugar is added than using fruits with the original sweetness. In the sugar-pack method, a required amount of sugar is sprinkled over the fruit and stirred until all the pieces are coated with sugar and fruit juice. For the sugar syrup method, a required amount of sugar is dissolved in cold water and the solution is allowed to stand until clear.



Freezing costs more than canning and drying. However, if freezing is done properly, more nutrients and flavour are preserved. When freezing guava, use firm ripe guava, wash and peel thinly and cut into half. The seeds should be scooped out using a teaspoon. The soft pulp is packed into moisture vapour-proof containers and covered with two parts sugar to one part water. Do not heat sugar as sugar will dissolve if stirred, seal the containers and freeze. Lime juice can be added if the guava is too sweet. Guava will stay for 8 months to 1 year at 0 °F and can be used as desserts during hot days in summer (Schafer & Munson, 1990). See Appendix A for instructions for freezing fruit like guava.

## **2.10 Examples of fruit and vegetable processing projects**

Most fruits and vegetables are seasonal; processed food can therefore be used to maintain the health of the family, and ensure availability of food throughout the year (food security). Government structures are now promoting small-scale processing enterprises as they create job opportunities for the unemployed. During processing, products that can substitute for imported foods or have export potential are produced and thus help to reduce balance of payment problems and improve the overall prosperity of the country. In developed countries where most of the people work outside their homes, they find processed foods more convenient to use in terms of time and labour as these foods are ready for use (FAO, 1992). Examples of such projects are discussed below, such as making jams, wine and juice.

### **• Case study 1: Forest Fruit Processing**

The Kelahan Education Foundation in the Philippines on the Island of Luzon is an organization set up by tribal elders, as an income generation project. A food processing centre has been built where processed fruits such as wild guava, wild grapes, passion fruit and tamarind are processed into jams, fruit butters and jellies. Over 25% of the 540 families living in the area bring forest fruits to the factory where they are paid significant cash. After processing, the products are packed into glass jars bought from a large town nearby. Wastes from the fruits are fed to pigs and other waste is converted to biogas which fuels the factory. The factory produces 40 000 jars of product per year and sells 85% to supermarkets in Malina. Customers are professional people who prefer to use good quality

products. Members of the organization also export products to Europe through the Fair Trade organization (Fellows & Hampton 2002).

- **Case study 2: Ubusulu` - Palm Wine Project**

Ubusulu – Palm Wine Project is located in the north eastern part of KwaZulu-Natal in the area of KwaNgwanase (Umhlabuyalingana Local Municipality) and Umkhanyakude District Municipality. The palm trees grow wild along the Phongolo River. From the sap of palms, a nutritious and good tasting wine is made locally known as injemane or ubusulu. The Council for Science and Research and Maputaland Development and information Centre are managing the project with a shareholding structure of 24 palm cutters, local youth and women's organizations thereby providing the local community with a good source of income. Kick-start funding has been received from the Department of Science and Technology for processing and bottling palm wine. Local people also use the palm leaves as a weaving material for traditional articles like baskets, and eat the fruit (Agritourism KwaZulu-Natal, Dept of Agriculture, undated; Baskets of Africa, undated).

- **Case Study 3: Marula Natural Products Pty Ltd**

The project is situated in Bushbuckridge near Kruger National Park, Limpopo Province, South Africa. A Community Liaison Officer, Felicia Chiloane started the project by establishing committees in 42 villages. The committees were selected by the women in the village to represent them. The communities harvest the marula fruit from the forest as they grow profusely. Through the committees, the fruits are taken to Marula Natural Products for sale. The committees are also responsible for taking the nuts of marula fruit back to the women where the nuts are cracked to produce kernels from which the magical marula oil is produced which is traditionally used for cooking and as a preservative for meat. The oil promotes healing of burns and reduces scars, inflammation and itch from allergic reactions like mosquito bites. Marula oil is also used as a moisturizer for cracked dry skin and hair and for leather care (Extra Virgin Marula Oil, Undated). Marula. Natural Products then purchase the products from these women again thereby supporting 2,400 women from the 42 villages. The tribal authorities are also active supporters of the project through fining people who cut Marula trees down in their jurisdiction (Marula Natural Products - communities, undated).

- **Case study 4: Maphumulo (Okhalweni ward, KZN) guava juice project**

The project is located at Maphumulo district, Ilembe Local Municipality, Okhalweni ward. Mr Mkhombisi Magwaza collects guava fruits from the wild when they are in season, and processes the fruits using a domestic blender to make guava juice. Mr Magwaza also blends other fruits with guava such as oranges and naartjies. At present juices are sold at local pension pay points at R2.50 per 250 ml bottle. The DoA Maphumulo district has agreed to assist the project by purchasing bigger equipment for processing and storage facilities (freezer) so as to enable the project to function when fruit is out of season. (Ngema, 2007).



**Figure 2.5: Guava fruits mixed by Mr Magwaza when making guava juice**



**Figure 2.6: Guava juices processed by Mr Magwaza (Maphumulo)**

- **Case Study 5: Isulethu Project (Marula Jam Making Project)**

The project is situated at Umkhanyakude District Municipality, Umhlabuyalingana Local Municipality, in the Kosi Bay area. The project has 12 members comprising youth, adults, males and females. Marula fruit is collected from the trees growing naturally in the wild forests and stored in cool rooms. The group was funded by the Department of Economic Development and trained by representatives from the Institute of Natural Resources (INR), Pietermaritzburg on fruit processing methods (jam making). Jam is sold to the local community of Umhlabuyalingana at R12-00 per bottle of 270g. At present the group is experiencing problems in marketing the product and the Dept of Agriculture KZN will be looking strategies for assisting the group (Jikijela, 2007).

All fruits mentioned in the case studies are picked from the wild trees so as guava, this indicates that bigger projects out of guava fruits and parts of guava tree can also be established.



**Figure 2.7: Bottled Marula Jam ready for the market**



**Figure 2.8: Marula Jam selling at Imbizo Hall - Empangeni**

## **2.11 Outcomes of fruit processing**

Processed fruits and vegetables have a variety of outcomes for production i.e. self-consumption, community consumption, small-scale marketing and marketing at regional and National level, depending upon the objectives of the projects.

### **2.11.1 Processing for home-consumption**

Processed fruits and vegetables can be used for home consumption where the levels of production are very low and to supply other local families. This process can help to address the problem of food security within the households. An appropriate storage system is required to allow products to last longer so that they can be used out of season. The examples are bottled preserves, juices and pulps, jams, sauces and dried products. Extension officers have an important role to play in upgrading the facilities and hygiene levels during preparation. Many preserved products must be consumed within nine months after preservation as they change sensory qualities if they are kept for a long period. At this stage, processors need training on quality control and proper packaging methods so that products can compete effectively with products that are produced by larger commercial processors and to assist processors to move from self-consumption to the next level of income generation (Barrett, undated).



### **2.11.2 Processing for community consumption**

In this approach, production includes a number of activities where members of different families make their own contributions like the supply of raw materials; others are responsible for transportation, supply of raw materials and goods, the production of processed products or selling. The costs and proceeds from finished products are shared among the members but the costs to each individual are evaluated for appropriate and fair balance between the members of the system (FAO, 1992).

### **2.11.3 Processing for small- scale marketing**

The products are sold to nearby communities or in small markets of neighboring towns. Tourists and residents of more developed communities find the products more attractive because they do not have time to do any processing even if they have raw materials. The producers are therefore expected to make good quality products to suit the needs of the consumers. The product should meet hygienic quality standards whether the system is based on family or community consumption. This can be achieved by testing the product through competent institutions and certifying it as being free from contamination to avoid making mistakes that might hinder the products hygiene standards (Dauthy, 1995; FAO1997).

## **2.12 The potential for marketing guava products**

Marketing is the concept of exchange where people give up something to receive something, normally money as a medium of exchange. Exchange does not necessarily require money but items and services may be bartered or traded, like giving fresh produce for manufactured goods (Millard, 1992; Klopper *et al*, 2006).

Marketing is not only selling and advertising but there are many activities involved in the process, some of them will be discussed below:-

**2.12.1 Marketing Audit:** Marketing audit is the process in marketing that is conducted in order to analyse the current position and opportunities faced by the business taking into consideration both internal and external influences on market planning and review of the plan (Klopper *et al*, 2006). Market analysis, segmentation and marketing strategy will be discussed as the tools of a marketing audit.

- **Market Analysis:**

According to Aaker (2001) the objective of market analysis are determine the appearance of the market to existing and potential participants and understanding of the dynamics of market factors, trends, threats, opportunities and strategic doubts that can guide information gathering and analysis.

- **Market Segmentation:**

Market segmentation is the classification of portions of the market that are different from one another in order to understand and satisfy the needs of potential customers better than the competitors. Different customers have different needs, therefore homogenous group of customers need to be treated in a similar way. Market segmentation is divided according to customer characteristics i.e. geographic, demographic, psycho-graphic and behaviouristic basis (Waterschoot & Van den Bulte, 1992). For guava products, housewives who are responsible for supplying food needs may supply school cafeterias, spaza shops and restaurants

Geographic segmentation: People living in the same country or neighbourhood are likely to have same needs and requirements. The size of the population also determines the needs of the customers and enables the marketer to stock a sufficient quantity of goods for the customers. Climate is another example of geographic segmentation as the weather patterns vary according to different geographic regions (Hawkins *et al*, 2001). Urban and rural areas may form geographic segments or demographic segments.

Demographic segmentation: According to Hawkins *et al*, (2001), the variables included in the demographic segmentation include age, gender, family size and lifecycle, income, occupation, education, ethnicity, nationality, religion and social class. These variables have standard categories for their ethics e.g. religion- it is likely that people living in the same area also believe in same religion, if they have a belief that pork is not good to be included in their meals it is therefore useless to sell pork as few or no customers will be buying the product; there may be fetishes relating to guava.

Psychographic segmentation: Customers with the same lifestyle, activities, interests, opinions, attitudes and values are grouped together in psychographic segmentation (Wilkie,1994) e.g. customers in the same soccer team are likely to have the same needs - if

blonde hair helps them to recognize one another easily when playing, blond hair dye will be a high requirement; so the same may apply to guava eaten by school children after they have been taught by their teachers that guava is a good source of Vitamin C.

Behaviouristic segmentation: Behavioural segmentation uses variables that are closely associated to the product itself e.g. usage rate, brand loyalty, whether the product is used during holidays, or special events that stimulate purchases like buying a turkey during Christmas time and guava when it is in season.

- **Marketing Strategy:**

Marketing strategy is the way of understanding customers and their needs in order to build customer loyalty and increase sales. The marketing strategy also assists the owner of the business to evaluate how successful the business is in meeting the needs of the customers, the changes that are taking place and the opportunities and threats that are coming up (Practical advice for business, undated). Finding out whether customers like raw guava or processed guava products.

### **2.12.2 Market Research**

Marketing research refers to the scientific practice used to gather information which can either be in existence or new information or the way of understanding the behaviors, preferences of consumers in a market based economy. Usually questions that are asked are related to competitors, market structure, government regulations, economic trends, technological advances and other factors that contribute to the make up of the business environment (Hawkins *et al*, 2001).

- **Quantitative analysis:** Quantitative marketing research is commonly used to describe conclusions and tests a specific hypothesis based on statistical analysis. Usually random sampling techniques are used with a large number of respondents and the examples are surveys and questionnaires.
- **Qualitative analysis:** In qualitative marketing research a small number of respondents is used, usually for exploratory purposes, examples are focus groups, in-depth interviews and projective techniques (Hawkins *et al*, 2001).



- **Consumer Tests:** These are most commonly used in the food industry but can also be used to enable customers to taste the products, tasting guava jam (Piggot,1988).

### 2.12. 3 Marketing Mix:

This is a tool used in defining the marketing strategy which is usually known as the 4 P's of marketing i.e. product, price, place and promotion (Waterschoot & van den Bulte, 1992). The marketing mix can be changed on a regular basis to meet the changing needs of the target group and other dynamics coupled with the marketing environment; can either be internal or external constraints.

**Product:** Product is a service that is produced on a large scale with a specific volume of units (Marketing mix, undated). The business has to produce a product that is required by the customers i.e. products that people want to buy depending on the market segment targeted by the business. A product needs to have a certain difference from what is offered by other businesses so that people can be convinced to try the product (Kotler, 2000). Examples of product decisions that can be made to differentiate the product from others are:-brand name, functionality, styling, quality, safety, packaging, repairs and support, warranty, and services. Value added guava products can be packaged and labelled differently to differentiate them from other products

**Price:** The price is the amount the customer pays for the product which is determined by factors including competition, market share and product identity. The price must be marked correctly to cover the costs and make a profit but low enough to attract customers (The 4P's of Marketing; The Marketing Mix, undated). Price can play an important role in the success or failure of a particular product (Hawkins *et al*, 2001).

**Place:** Place is a location or distribution channel where a product can be purchased. Place must be convenient, well structured and suitable for customers and any supplier (Wilkie, 1994). Marketers need to constantly study where consumers shop for their product in order create to proper and effective distribution strategies. Selling guava fruits and processed guava products in markets and market stalls which are usually built along the roads.

**Promotion** The role of promotion is the marketing mix used to encourage and inform customers about the purchase of the product (Wilkie, 1994). Promotion includes all the

communications that the marketer uses in the marketplace to inform customers about products and services thereby influencing their purchasing decisions (Lamb *et al*, 2000). The four elements of promotion are advertising, public relations, word of mouth and point of sale. Advertising is communication that can be paid for such as radio, television commercials and internet adverts. Public relations are where the communication is not directly paid by the marketer e.g. press releases, sponsorship deals, exhibitions, trade fares, conferences, seminars and events. Word of mouth is informal communication about the product, which can be done by an individual or people using that particular product (Hawkins *et al*, 2001). For guava in rural areas, word of mouth will be a suitable promotion element as the product is at present produced at a local level.

The role played by the informal commercial sector is an important aspect for policy consideration for making food available at all times to low income urban areas and income generation for poor families. In both developed and developing countries, the policy has now been accepted that the informal sector of the economy should be encouraged in order to assist in the alleviation of problems of poverty and unemployment (Watson & Dewar, 1990). Resource poor rural communities cannot afford costly inputs required by modern agriculture in order to obtain high crop yields, because of the problems of unemployment, escalating cost of living in the country and rapid population growth. Many of the people therefore rely on their natural resources, either flora or fauna. These can be used for home consumption or for sale to earn extra income for purchase of other basic household items like salt, tea, soap and education of children.

In rural areas, guava is marketed informally which means selling without any plans of future progress or success of business. Informal marketing has a potential role both in providing employment and contributing to a reorientation of the economy. When guava is processed for medicinal uses there is no formal marketing system for traditional medicines in South Africa, people usually consult the traditional practitioner in his dwelling place or make their own concoction for household usage (Ashforth, 2005).

### **2.13 Invasive plants and their impacts**

Invasive alien plants (IAPs) are plants that have been brought to the country (South Africa) from other countries for ornamental, economic and ecological purposes. The National

Environmental Management: Biodiversity Act (Act 10 of 2004) defines an alien species as a species that is not indigenous or native (plant species that occurred in the area for thousands of years) (Government Gazette, 2004). The plants entered the country through a number of different channels like ships, aeroplanes, shoes or by birds and animals. The problem caused by alien invader plants threatens the indigenous vegetation because of high consumption of valuable water resources (Invasive Alien Species Programme, Undated; Declared Weeds and Invader Plants, 1999).

IAPs compete with the agricultural environment as most of the invasive alien plants are large trees and dense shrubs which cover the soil, thereby depriving agricultural plants of sunlight, thus causing them to decline. IAPs have negative impacts on the biodiversity and economy of South Africa, these plants consume more water than indigenous plants. Some alien trees are easily ripped out e floods which results in soil erosion. They also increase the severity of fire (South Africa's National Biodiversity Strategy and Action Plan, 2005). IAPs spread faster, mature earlier ad produce many seeds within a shorter period than indigenous plants.

#### **2.13.1 Where in KZN do Invasive Alien species occur?**

Invasive alien species occur throughout KZN depending on the environment for the species to adapt. About 8% or 10 million hectares of land in KZN have been declared invader polluted (Invasive Alien Species Programme, undated). There are 117 invasive alien plants that are identified as major invaders. Major invaders are those that have established themselves well in the country and already have substantial impact. About 84 species of invasive alien plants are identified as emerging, meaning that they have less impact but have attributes of being invasive (Invasive Alien Species Programme, undated).

#### **2.13.2 Catagorisation of weeds available in KZN**

##### **Declared Weeds – Category 1**

As defined by the act, the following weeds must be removed or destroyed because of the negative impact they have on the environment.

- 3 Lantana
- 4 Bugweed
- 5 Azolla
- 6 Hydrilla

- 7 Redwater fern
- 8 Pompom weed
- 9 Pickerel weed
- 10 Queen of the night cactus
- 11 Pampas grass
- 12 Cat's claw creeper
- 13 **Durban guava**
- 14 Yellow oleander

### **Declared Invaders - Category 2**

According to CARA legislation invaders under category 2 are invaders with commercial value, may be grown under controlled conditions by people with special permission to grow them. If they are found outside demarcated areas, they must be destroyed.

- 15 Black wattle
- 16 Patula pine
- 17 Sisal
- 18 Rooikrans
- 19 Grey poplar
- 20 Watercress
- 21 Port Jackson willow
- 22 **Guava**
- 23 Mulberry
- 24 Gum tree
- 25 Cluster pine
- 26 Honey locust
- 27 Weeping willow

### **Declared invaders – Category 3**

Invaders under this category have an ornamental value, but they need not to be replanted again; instead they must be watched carefully not to multiply.

- 28 Jacaranda
- 29 Syringa
- 30 Australian silky oak
- 31 Formosa lily

- 32    Sword fern
- 33    Tipuana tree
- 34    New Zealand Christmas tree
- 35    **Strawberry guava / Cherry guava and Brazillian guava**

### **2.13.3 Ways of Controlling Invasive Alien species**

IAPs cause great damage to natural resources, impair ecosystem services (flora and fauna) and the cost of removal is high when the species are well established. The methods of removal will be discussed as follows:-

Mechanical method: - involves damaging of alien invader plants using physical felling or uprooting of plants. Felled trees can be burned, but when fire is used, it can be applied together with physical control such as fell, burn and follow up with hand weeding.

Chemical control: - this method involves the use of registered herbicides to prevent sprouting of cut stumps or to kill seedlings after felling or burning.

Biological control: - host-specific natural enemies (insect or other invertebrates) and diseases from the alien plant's region of origin are used as a control measure for alien invader plants (Henderson L, & Cilliers C.J, 2002).

Indirect control: - are the methods that are not primarily aimed at killing invader plants but contribute towards their control, like ploughing and the use of fire (Agricultural Research Council, undated).

### **2.13.4 Implications of CARA legislation in relation to guava**

The argument is about nutritional, medical and economic benefits of guava for poor households versus the CARA legislation which demands that wild guava trees be removed and planted only in limited designated areas. Outlined is the processing of guava to increase its shelf life, availability and other uses such as medicinal, income generation and health benefits, all of which may contribute towards food security and poverty alleviation.

Linked with these are Government programmes such as Expanded Public Works Programme (EPWP) and the Urban Renewal Programme which provide opportunities for job creation and poverty alleviation thereby uplifting poor communities.

## **2.14 Expanded Public Works Programme (EPWP)**

The critical problem faced by society today is unemployment; people cannot find jobs and earn an income in order to support themselves and their families. The rate of unemployment increases every year as youth leave school. Because of a shortage of funds to further their studies, they end up looking for work which is not available. The reason for the unemployment problem is that the economy does not grow fast enough to create new jobs for the unemployed and school leavers. Many people are retrenched e.g. the clothing industry. Many people especially black adults are illiterate and may have low levels of skills because of the past when poor quality education was delivered. (The Expanded Public Works Programme, undated).

In 2003, all government departments convened a Growth and Development Summit (GDS) where different social partners came together to address problems of unemployment. The EPWP was one of two programmes used to address the problem. When looking at some past experiences by other departments, temporary jobs were created for thousands of people living in rural areas, which created temporary relief but did not reach great enough numbers of unemployed people. Many government departments had programmes for the EPWP, e.g. Department of Water Affairs and Forestry (DWAF), Local Government and Public Works department where people build houses, schools through Community Based Public Works Programme, for example Kwazulu Natal Department of Transport, Zibambele Programme where people in rural areas maintained roads (The Expanded Public Works Programme, undated).

Two strategies were adopted by the cabinet in November 2003, making it possible for the people to earn an income after learning through the EPWP either by finding a job or starting a business by:

- Giving unemployed people work experience and providing education and skills development programmes to people while they are on EPWP.
- Helping workers with exit opportunities beyond the EPWP.

All government departments and state owned enterprises would create productive employment by using labour intensive methods for all government funded infrastructure

projects; meaning that people must be employed instead of machines, and using government procurement to help small enterprise leadership and support programmes.

### **2.15 The Urban Renewal Programme (URP)**

The Urban Renewal Programme (URP, linked with the Integrated Sustainable Rural Development Strategy (IRSDS) focus on poverty alleviation and crime prevention in urban and rural areas. Eight nodal zones have been target in the province to serve as pilots for the development of the National Urban Renewal Strategy that can be applied in all urban areas, (Inanda Ntuzuma and KwaMashu for KZN) known as INK (Hindson, undated; Rauch, 2002).

### **2.16 Summary**

The history of the introduction of guava to South Africa and its propagation has been described in chapter 2. This led to its declaration as an alien invasive species or invasive weeds depending on the category that the species falls under. The aim is to reduce the negative effects of the presence of guava as guava trees use a lot of water, reducing river flow. The legislation controlling its propagation may have potentially negative effects on the potential benefits derived from guava.

From literature, guava is valuable and useful, not only from KZN where the study was done, but in other countries in the world (California Rare Fruit Growers,1996). The legislation is limiting resource-poor people who use guava, especially those in rural areas as they can potentially eat guava and use leaves and bark for medicine uses and wood as firewood.

In order to determine the impact of the CARA it was necessary to investigate the benefits of guava in rural KwaZulu-Natal so that it could be understood what might be lost to poor communities if CARA legislation was implemented. The next chapter will discuss the description of study areas where research was conducted.

## **CHAPTER 3: DESCRIPTION OF STUDY AREAS**

### **3.1 Introduction**

This chapter describes four areas where research was conducted. The four study areas, parts of KwaZulu-Natal, were Uthungulu District Municipality (Mbonambi, Umhlathuze and Umlalazi Local Municipalities) and Umgungundlovu District Municipality (Richmond Local Municipality) and were chosen because of the availability of guava. At Uthungulu guava trees grow naturally within the homesteads, local forests, next to river streams and wetlands. Wetlands are areas which are water-logged year round and vary because of local differences in soils, topography, climate, hydrology, chemistry, vegetation, and other factors, including human disturbance (Anon, 2005).

Local communities refer to guava trees as being indigenous because they grew naturally when guava trees were available in local forests. At Richmond, most of the guava trees grow within the homesteads and some are available near the river streams and local wetlands. At Kwa Mbonambi, Umhlathuze and Umlalazi, guava trees grow wild near wetlands, rivers and streams. These were chosen to represent Uthungulu in KwaZulu-Natal as the climate i.e. temperature differs from Richmond's. These areas were also chosen to show that guava as an invader species can grow well in a variety of soil types especially well drained soils. Richmond represents areas that are part of the midlands (KZN inland) near the Drakensberg Mountains and Uthungulu representing all areas in the low lying areas next to the coastal land and within a subtropical climate.

### **3.2 Umgungundlovu**

This research was conducted in Richmond, one of the seven Local Municipalities under Umgungundlovu District Municipality. Richmond is approximately 50km from Pietermaritzburg and falls under bioclimatic region 3 which is the moist midlands mist belt (Figure3.1). The vegetation type is moist coast hinterland and mostly dominated by ngongoni veld. Soils are moderately to well-drained. The weather is cool and moist with an average rainfall of 911 mm per year which is a high rainfall area. Mean annual temperatures are 17.5°C, mean maximum temperatures are 23.5°C and mean minimum temperatures are 11.4°C. The Agricultural sector in commercial farming is mainly



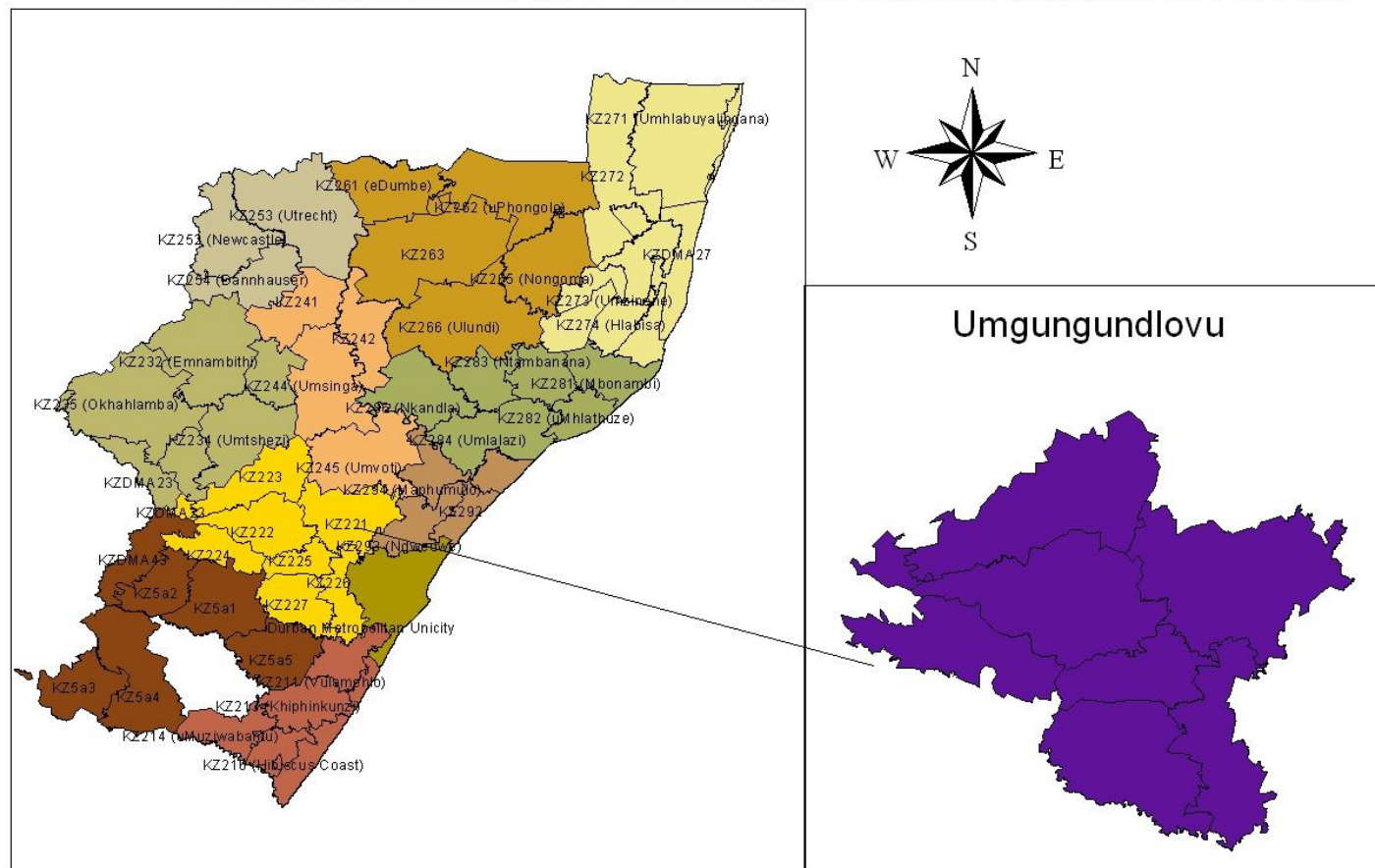
dominated by sugar cane, animal products and forestry. The emerging farmers subsist on field crops fruits and vegetables (Bioresource Unit Inventory Programme, 2004).

### **3.3 Uthungulu**

Research was conducted in three local municipalities namely Mbonambi, Umhlathuze and Umlalazi which are part of the six local municipalities that form Uthungulu ce municipality. Uthungulu district is located in the north eastern regions of KwaZulu-Natal province, including the flat coastal region comprising of the Natal Coastal Belt and Zululand Coastal Plain (Figure3.2). Uthungulu district has the third highest population of 762791 people in the province. There are low levels of urbanization in that approximately 80 percent of the people that characterize the municipality live in rural environments (KwaZulu-Natal Municipal Portfolio, undated).

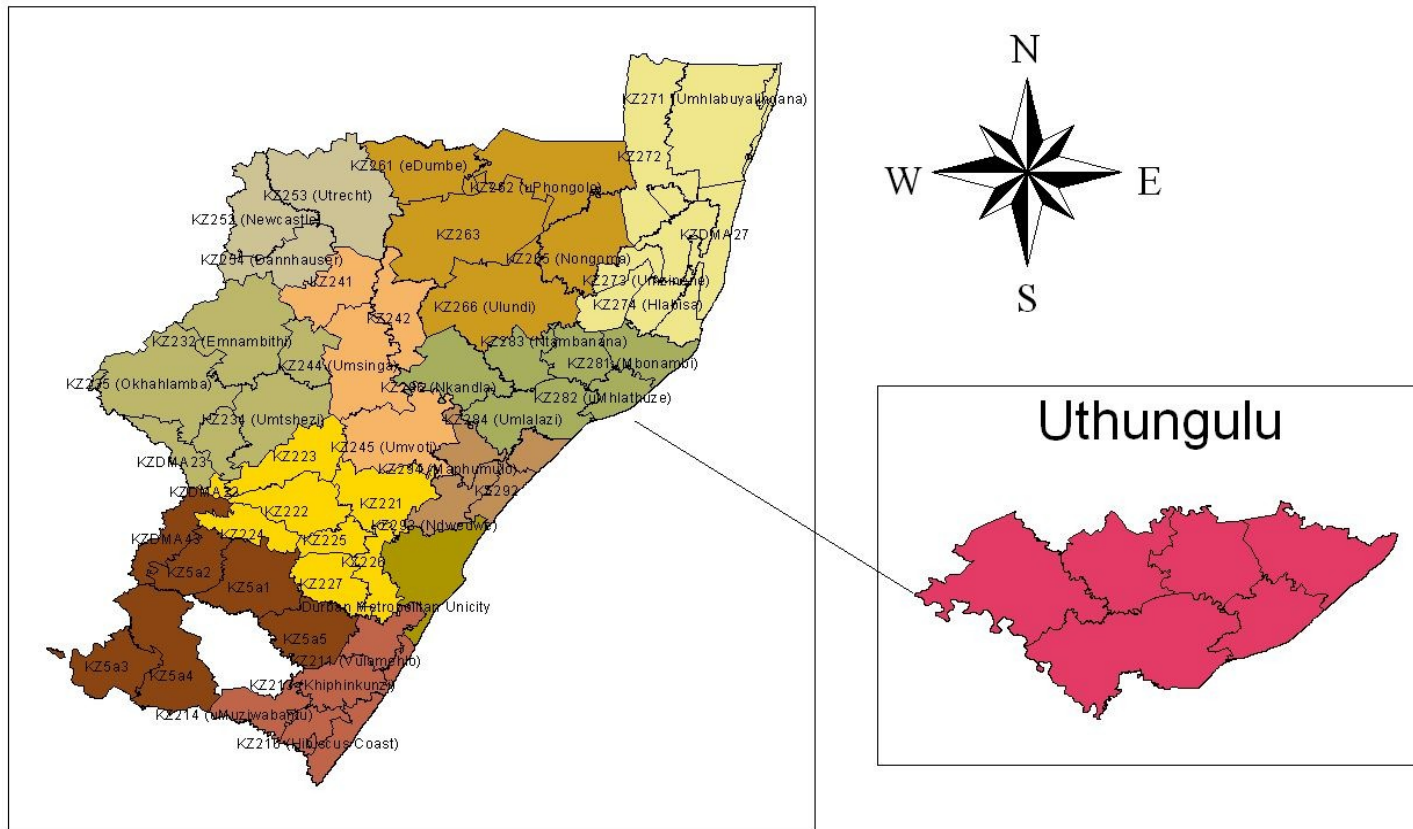
The district is also well endowed with natural resources, with a good climate that opens up avenues for commercial agriculture like the production of sugar cane and tourism development. There are a number of wetlands namely Lake Cubhu and the Greater Mhlathuze Wetland System which are located to the South of Richards Bay at Esikhawini. The Mhlathuze River supplies water through irrigation systems for commercial agriculture e.g. sugarcane, cotton, citrus, subtropical fruits and vegetables (KwaZulu-Natal Municipal Portfolio, undated).

## ORIENTATION MAP SHOWING UMGUNGUNDLOVU DM



3.1: Map of Umgungundlovu District Municipality (DoAE 2005)

## ORIENTATION MAP SHOWING UTHUNGULU DM



3.2 Map of Uthungulu District Municipality (DoAE 2005)

### **3.4 Poverty Indicators**

Poverty indicators for Richmond and Uthungulu District municipalities will be discussed in this section to show the extent of poverty within the two municipalities. According to Hanmer *et al.*, 2000, poverty can be divided into a number of dimensions - where people are unable to meet their basic needs through poor infrastructure and a lack of income to provide sustainable livelihoods or a sense of well being.

#### **3.4.1 Richmond**

According to Statistics South Africa Census (2001), the total population of people living in Richmond local municipality is 63 215 including males and females of all ages and 46 percent of the population being children from 0-19 years. The age group that starts from 20-59 years regarded as an economically active age group is 47% of the population. From age 60-80 years and over are the pensioners who form 7 percent of the population.

- **Education**

A third (31%) of the people did not receive any education (no schooling) followed by (25%) who received some primary education and (24%) with secondary education. About (14%) of the people obtained Grade 10 and received higher education (tertiary education) whereas (7%) received primary education. Compared to the group that did not receive education 4 percent is capable of being employed after completing tertiary education making a very little contribution to combat overall poverty.

- **Energy for Cooking**

Half of the households (50%) in Richmond use wood as a source of energy for cooking. A third (28%) of the households use electricity for cooking whereas 17 percent use paraffin and 3 percent use gas. About 2 percent of the households use other methods of energy for cooking such as coal, animal dung and other. These statistics show that most of the people in Richmond use wood as a source of fuel and as guava grows nearer to the households it can be used as firewood.

- **Energy for Heating**

A very high percentage of (62%) use wood for heating whereas 25 percent of the households use electricity for heating, 9 percent use paraffin and 4 percent use other methods of energy for heating.

- **Energy for Lighting**

About half of the households (56%) use electricity for lighting and almost as many (42%) still use candles for lighting whereas 2 percent use other methods which are paraffin and solar energy. This indicates that not all the people in Richmond have access to electricity.

- **Household Income**

Poverty is measured according to poverty datum lines. The two commonly used poverty lines are the Household Subsistence Level (HSL) and the Minimum Living Level (MLL). The HSL describes the poverty line as the percentage of households that earn below R19, 200 per annum (Nodal Economic Profiling Project Business Trust & DPLG, 2007). According to Martin (2005) the MLL measures the minimum financial requirements of family members to satisfy the basic needs which are food, clothing and shelter but the minimum level vary according to the size, age structure and gender composition within the family. Eighty four percent of households in Richmond fall below the HSL poverty line. Within this dimension, sixty one percent have insufficient income and 23 percent of these homes have no income at all. Only 16 percent of household incomes are above the poverty line. This indicates that a larger percentage of people in Richmond are below the poverty line and are poor (Statistics SA, 2001).

- **Mode of Transport**

More than half (52%) of the people in Richmond do not use any mode of transport which is probably mostly children or very old people whereas 35 percent are on foot as a mode of transport; 5 percent of the people use car as passenger and as a driver. About seven percent of the people use other methods of transport such as taxi, bus, train and motorcycle. The percentage of people who walk or do not move at all is very high which means that they do not go to town very often.

- **Occupation**

The percentage of the people who are senior officials is 0.6% and 3.3 percent are skilled agricultural workers (farm workers), 7.5 percent doing elementary work (cleaners) and 1.9 percent are plant operators. Very few people are skilled and employed

- **Personal Income**

A high percentage (73%) does not earn an income whereas 27% are earning from R1-R204 801 or more per annum. The percentage of people with no income is very high (73.0%); more people therefore are poor.

- **Water**

About 28 percent of the households have access to piped water, and almost a quarter (21%) have no access to piped water; 13% use water from the river/ stream – water that is not purified and can cause health problems; 12% use water from the local school, 9% use water from a spring and 8% from a borehole; 7% use water from rain tanks and dams whereas 2% use other forms of water supply.

### **3.4.2 Uthungulu**

Three local municipalities under Uthungulu district municipality were involved in the study i.e. Mbonambi, Umhlathuze and Umlalazi out of the six district municipalities but the statistics for these local municipalities could not be found and data from Uthungulu district municipality which will give an overall picture of the local municipalities.

The total population for Uthungulu district municipality is 885 913 people. Children from 0-19 years are 51% of the population, the active working group that ranges from 20-59 years being 43% and 60-80 years and above being 6 percent. The population at Uthungulu comprises a high proportion of children when compared to the active working group 20-59 years (43%).

- **Education**

About 32 percent of the people at Uthungulu have no schooling meaning that they are unable to read and write, 23 percent received secondary education, 18% received some primary education and 17 percent have passed Grade 12. About 6% of the people receive tertiary education and 5% completed primary education. The percentage of

people who did not receive education is very high compared to the educated group which is 5 percent.

- **Energy for cooking**

At Uthungulu 42 percent of the households use electricity for cooking and 40 percent of the households still use wood as energy for cooking. There is only a slight difference between the number of households who use electricity compared with those who use wood as energy for cooking, meaning that wood still plays an important role in this area. About 19 percent of the households use other methods such as gas, paraffin, animal dung and other.

- **Energy for heating**

Almost half of the households (42.5%) use wood as energy for heating and 41.6% use electricity as energy for heating with few households (6.3%) that use paraffin. Again electricity and wood use at Uthungulu is similar. The remainder (8%) use coal, animal dung, solar and other heating fuels.

- **Energy for lighting**

About half of the households (55.2%) use electricity for lighting. Almost as many (41.7%) still use candles for lighting. Remaining sources of energy for lighting include some solar, gas, paraffin and other. Although electricity is available at Uthungulu, some of the households do not have access to electricity.

- **Household income**

Most of the households (74%) earn less than R19 200 with 35.3 percent having no income. A quarter (26%) earn from R19 201- R153 601 per annum. An exception is an income of more than R2457 601 per annum, earned by 232 households who were probably not part of the research group (.001%). Most of the households at Uthungulu earn at most R1 600 per month.

- **Mode of transport**

Almost half of the people (51.3%) do not use any mode of transport which may either be children or very old people; followed by 38.2 percent of the people who travel on foot. Few people (3.34%) use cars as passengers and 2.4 percent use cars as drivers meaning that very few people own cars at Uthungulu compared to the percentage (51.3%) of people who do not move at all.

- **Occupation**

About 3.76 percent of the people are doing elementary work followed by 1.35 percent of people who are plant operators and 0.6 percent who are skilled agricultural workers. Very few people (0.54%) are senior officials. These statistics shows that at Uthungulu very few people are skilled and are capable of earning a good income.

- **Personal Income**

A high percentage (78.1%) people at Uthungulu do not have an income and 9.41 percent earn between R801-R1600 per month followed by 2.8 percent who earn R1601-R3200 per month and very few people earn R204 801 per month. There is a very high percentage (78.1%) of people who do not earn income which indicates that most of the people are poor.

- **Water**

About half of the households (41.3%) at Uthungulu do not have access to piped water. Almost (27.2%) of the households use water from the river or stream and 24.5 percent have piped water in the yards. Few households (11.3%) use water from the borehole and very few households (4.5%) use water from a spring.

### **3.5 Implications of statistics on poverty indicators for Richmond and Uthungulu**

When comparing data collected from statistics of the two areas selected it shows that in both areas people are still poor though some of them have access to basic infrastructure like water and electricity, but not all of them are able to afford these. This may either be caused by the level of income they earn as individuals or households, level of education and lack of skills. Most of the people still use wood as a source of energy for, cooking and heating and fetch water from the rivers and streams and these are all the duties that are performed mostly by women and girl children living in rural areas. People living in these rural areas hardly go to town as a large percentage indicate that foot is used a mode of transport, very few people own vehicles.



The evidence derived from the statistics shows that there is an urgent need for poverty alleviation. An Interdepartmental Comprehensive Response Approach is recommended to assist people who are living in such poverty e.g. Department of Labour providing skills, Social Welfare for social grants supplementing other departments such as Education, Health, Agriculture and others. Linking these departments with different Departmental programmes like Expanded Public Works Programme where jobs are provided for local people and Land Care programme from the Department of Agriculture would be important.

## CHAPTER 4: METHODOLOGY

### 4.1 Introduction

This chapter presents the research methodology that was used to determine people's views and assess the potential impact of the CARA legislation on guava as an alien invader species to disadvantaged communities of KwaZulu-Natal. This section includes design of the study, description of the population, sampling, data collection methods and analyses.

### 4.2 Design of the study

This study looked at the perceptions regarding the use of guava products from a number of different perspectives. Table 4.1 shows the outline of the methodology used. It includes a combination of quantitative and qualitative methods to provide both a broad perspective and in-depth understanding of the research problem.

**Table 4.1: Design of the study**

| <b>Sample</b>  | <b>Data collection tool</b>                                 | <b>Data</b>  |
|--|---|--|
| Extension Officers<br>(n = 59) groups                    | Telephonic interviews<br>Informal discussions               | Demographic<br>Degree of guava usage<br>Processing methods   |
| Community groups<br>(n = 28)                             | Focus groups discussions<br>Observations                    | Demographic<br>Degree of usage, processing<br>Processing methods<br>Recipes<br>Marketing<br>Benefits |
| Markets<br>(n = 5)<br><br>Guava stall holders<br>(n = 5) | Group interviews<br><br>Observations<br>Informal interviews | Popular products<br>Customers<br>Source of guava   |
| Supermarkets and<br>Home Industries<br>(n = 4)           | Observations  | Types of guava products  |

All Extension officers that were available, working along the coast were interviewed by the researcher using telephonic interviews with questions from a structured questionnaire (interview schedule). See Appendix B. Telephone interviews are cheaper and can be completed within a short period of time (Smit, undated; Wellman & Kruger, 2001). Questionnaires were also given to Extension Officers during gatherings e.g. sports days and workshops where informal discussions were also used as a tool for data collection. Only extension officers from the Value Adding section of the Department of Agriculture participated in the study because they were working with groups involved with guava processing, and understood the degree of guava usage by the community.

Groups that were involved with guava production were identified by these extension officers and focus groups to collect information about the guava usage. Informal market stall holders that stocked guava products were interviewed and observed to understand the marketing requirements. Lastly, supermarkets and home industries were visited to determine potential variety of guava products that could be sold commercially.

### **4.3 Sampling**

A convenient sample of 23 Extension Officials participated in providing information relating to guava processing in the areas where they worked. Information relating to 59 districts was provided by the 23 officials. Through the help of these Extension Officers from the Department of Agriculture and Environmental Affairs, groups involved in guava usage were identified at Mbonambi Umhlathuze, Umlalazi, and Richmond. See Table 4.2. Groups were selected purposively by Extension Officials knowing the areas where they performed their duties. With purposive sampling, the sample obtained is regarded as non-representative of the relevant population, but was typical and ensured that the research issues were addressed from different perspectives. Purposive sampling is also less complicated and more economical in terms of finance and time spent (de Vos, 2000). To gain entry to these district municipalities, the researcher contacted the Regional Directors for the North and South Regions as per agricultural demarcations and the

District Heads where research was conducted and requested that these Extension Officers be part of research.

**Table 4.2: Districts and focus group numbers participating in this study**

| <b>District</b> | <b>Number of groups</b> | <b>Members participating/ present</b> |
|-----------------|-------------------------|---------------------------------------|
| Richmond        | 5                       | 51                                    |
| Mbonambi        | 8                       | 115                                   |
| Umhlathuze      | 8                       | 86                                    |
| Umlalazi        | 7                       | 71                                    |
| <b>Total</b>    | <b>28</b>               | <b>323</b>                            |

Clubs that were involved in value adding activities and active in guava processing were selected. At Mbonambi and Umhlathuze there were 15 sub-wards from where the samples were selected and 8 clubs from each area participated in the study. At Umlalazi there were six sub-wards where 7 clubs involved in guava usage were selected. Only clubs involved in guava utilization were selected by extension officers. The Extension Officer working at Richmond selected the 5 active groups that used guava out of the 11 clubs that are serviced by the Department of Agriculture, KZN. This resulted in all 28 clubs meeting the criteria for participating in the study. Therefore a total of 323 representatives participated in the focus group discussions.

Five markets along the coast were purposively chosen by the researcher namely:- Umgababa, Ndundulu, Hlabisa (Zamimpilo), Nsingweni (Zamani Venders) and Maphumulo (Eplangweni). The markets were identified because they were in the guava producing areas. The researcher also had knowledge of the areas through Extension Officers working along the coast. These comprise large markets that have permanent structures and smaller markets which did not sell fresh produce alone but also included craft. Temporary structures and open roadside markets were not included in the study but the researcher conducted informal observations and took pictures of people selling guavas and other fruits in the markets. The interviewees were chosen by asking all those who had guava on their stalls who were present on that day to participate and answer the questionnaire.

The supermarkets Hilton Quick Spar and Pick and Pay –Victoria Road and two Home Industries (Hilton Farm Stall- Rotunda and Home Sweet Home- Scottsville) were selected because they stocked a variety of guava products. The two supermarkets were using different brand names on the food stuffs, and the researcher wanted to have a variety in terms of available guava products on the shelves.

#### **4.4 Data collection**

The researcher used different methods of data collection for Extension Officers, groups engaged in guava usage, stall holders in the markets, supermarkets and farm stalls. Methods used were the questionnaires, focus group discussions, informal interviews and observations.

##### **4.4.1 Questionnaires**

Extension Officers working in the guava growing areas formed part of the research team. Questionnaires were given to Extension Officers for pre-testing at a one day workshop was conducted by the researcher at Enseleni Agricultural District Office where officials working at Kwa-Mbonambi and Umhlathuze were given an understanding of the contents of the questionnaire, discussing each question in isi-Zulu and English (Appendix B). The questionnaire was given to Extension Officers because they were part of research team and working with groups involved in guava usage Therefore the questionnaire was relevant to them (Babbie and Mouton, 2001). Questionnaires were also used because they are inexpensive when used and administration costs are low in terms of money and time (Krueger,1998).

At Umlalazi only one Extension Officer was involved and she accompanied the researcher to reach the seven identified sub-wards. At Richmond the researcher personally conducted data collection with the help of the Extension Officer working in the area for identification. Additional paper was also attached on the questionnaire for open ended questions and responses that contained more information than the provided space in the questionnaire, e.g. recipes.

The questionnaire for Extension Officers included requests for information about degree of guava usage in their areas and processing methods used. See Appendix B.

#### **4.4.2 Focus group discussions**

Data was collected from April-July 2005 through focus group discussions using a discussion guide (Appendix C) and observation as data collection tools. According to Kritzinger (1994), when focus group discussion are used as a method of data collection in research, issues that were not necessarily evident in literature are easily highlighted. Respondents with a common interest are brought together whereas a widely dispersed group would have been brought together at a great expense. Data that was collected was based on the usage, processing methods and recipes derived from guava fruit, medicinal uses, marketing and benefits of guava. Twenty eight community groups were involved in the study.

#### **4.4.3 Informal interviews**

For Stall holders in the markets, informal interviews and observations, were conducted by the researcher to get information on the source of guava fruit, possible customers, types of processed products and the number of sales per week. As a technique for gathering information, the observational method relies on the researcher seeing and hearing things and recording rather than relying on subject's self-report responses to questions or statements (MacMillan & Schumaker, 2001). University of San Francisco, (undated) also describes observations as looking at events, an individual or a group without influencing them and recording for analysis. Data on informal observation was recorded manually by writing notes and mechanically by taking photos. Data was also collected using structured questionnaires as information was collected in a standardized format which is easy to analyze (de Vos, 2000). See Appendix D for observation sheets.



**Figure 4.1 Tourist outlet - Zamimpilo Market**

#### **4.4.4 Observations**

Two supermarkets and two Home industries were included in the study i.e. Hilton Spar, Pick & Pay, Hilton farm Stall (Rotunda) and Home Sweet Home (Scottsville). The aim was to observe the variety of guava products available in the large scale commercial outlets which would provide ideas for potential products and packaging for the rural groups. Repetition occurred fairly quickly because of the limited range of offerings and so few outlets were needed to provide the necessary information. The data collection instrument used was observation as the researcher went through the shelves observing all the products that were made out of guava i.e. raw guava, guava juice, canned, bottled guava, dried guava and baby foods. See Appendix E for observation sheet. With observation as an instrument of data collection, the researcher was able to examine what was available on the shelves rather than relying on the reports from other people or the manager of the shop which can be changed to suit their own interests (Welman & Kruger, 2002).

## **4.5 Data analysis**

- **Extension Officers and Community groups (Focus group discussions)**

Data was collected using questionnaires for both Extension Officers and Community groups. The tools used for the research were quantitative and qualitative. Data was collected and coded, entered into a spreadsheet (Microsoft Excel) and analyzed using Statistical Package for Social Sciences (SPSS) computer programme. Additionally, from the analysis derived from the SPSS, tables, means frequencies in percentages and correlation tests were also used to describe the level of significance of results from other questions that were asked.

- **Markets**

Data was collected using a questionnaire and informal observations; data was analyzed using the narrative form because the information collected was qualitative.

- **Super markets and Home Industries**

Two supermarkets were visited by the researcher where all guava products were observed and a list of all guava products was recorded. Generally all the products that were in the shelves looked the same in both supermarkets with the exception of sugar coated dainty guava cubes that were available at the Spar – Hilton. In both home industries that formed part of the sample, Hilton Farm stall (Rotanda) had more products than Home Sweet Home (Scottsville) as shown in Appendix E. According to the researcher's observations, the reason was that Home Sweet Home is situated in town and has very limited access to resources like guava.

Chapter five will describe the samples and discuss the results. It includes photos, tables and charts.



## **CHAPTER 5: RESULTS AND DISCUSSION**

### **5.1 Introduction**

This chapter discusses the findings that were derived from interviews from Extension Officers, community members through focus group discussions, marketers (stall holders) on the roadside markets and observations from supermarkets and home industries. Research sub-problems investigated were:-

- What is the importance of guava as a source of food to disadvantaged communities?
- What contribution does guava make to income generation of women in three KZN rural communities?
- To what extent do KZN women have medicinal uses for guava?
- To what extent are guava plants used a source of fuel?
- What potential impact does the legislation have on communities living in mid KwaZulu- Natal in terms of food, income, medicines and fuel?

### **5.2 Results from Extension Officer survey**

The results from the Extension Officers survey showed where guava processing activities occurred in the two Regions as per Department of Agriculture demarcations in KwaZulu-Natal.

The distribution of responses from Extension Officers came mostly from Maphumulo and Umzumbe (13.6%) each) closely followed by Kwa-Mbonambi and Ndwedwe (11.9%). These areas also coincide with those which produce guavas well. In all areas, guavas grew wild and were not cultivated and were reported as being used by all the people. See Table 5.1. The majority of the districts (61%) did use and process guavas, through various methods, as can be seen in Table 5.2.

**Table 5.1 Fifty nine groups involved in guava usage as reported on by 23 Extension Officers (n=59)**

| <b>District Name</b> | <b>Groups</b> | <b>Percent</b> |
|----------------------|---------------|----------------|
| Durban Metro         | 1             | 1.7            |
| Hlabisa              | 5             | 8.5            |
| Kwa- Dukuza          | 1             | 1.7            |
| Maphumulo            | 8             | 13.6           |
| Mbonambi             | 7             | 11.9           |
| Mhlabyalingana       | 4             | 6.8            |
| Mhlathuze            | 5             | 8.5            |
| Ndwedwe              | 7             | 11.9           |
| Umbumbulu            | 5             | 8.5            |
| Umgungundlovu        | 1             | 1.7            |
| Umhlathuze           | 4             | 6.8            |
| Umlalazi             | 1             | 1.7            |
| Umzinto              | 1             | 1.7            |
| Umzumbe              | 8             | 13.6           |
| <b>Total</b>         | <b>59</b>     | <b>100.0</b>   |

**Table 5.2 Reported uses of guava for all districts according to Extension Officers (n=59)**

|                           | <b>Total Number of groups</b> | <b>Percent</b> |
|---------------------------|-------------------------------|----------------|
| Raw whole fruit           | 58                            | 98.3           |
| Use leaves                | 57                            | 96.6           |
| Make preserves            | 29                            | 49.2           |
| Juicing                   | 28                            | 47.5           |
| Make jam                  | 27                            | 45.8           |
| Drying                    | 18                            | 30.5           |
| Other uses: wood and bark | 13                            | 22.0           |

Extension officers reported that consumption of raw whole guavas occurred actually in almost all the districts (98.3%) closely followed by the use of leaves (96.6%) for treating diarrhoea, making of preserves, bottled guava halves (49.2%), whilst some (47.5%) made juices, followed by 45.8 percent who made jam. In addition, 30.5 percent of extension officers reported seeing dried guava fruit in their areas while 22.0 percent of the extension officers reported other uses of guava trees such as wood and bark. Wood was used as a source of fuel and bark for the treatment of diarrhoea.

All Officers except one said guava was important in the lives of their communities because guava is a good source of vitamin C and food security (*if they are hungry they eat guava*). Guavas were taken as cheap fruit that each household could easily access without paying. Guava sometimes took the place of certain meals for people traveling long distances if they had not provided other food.

**Table 5.3 Quantity of guavas sold according to extension officers (n=59)**

| <b>Amount of guava sold</b> | <b>Frequency</b> | <b>Percent</b> |
|-----------------------------|------------------|----------------|
| None                        | 40               | 67.8           |
| Large quantity              | 2                | 3.4            |
| Not sure                    | 17               | 28.8           |
| <b>Total</b>                | <b>59</b>        | <b>100.0</b>   |

Extension Officers were mostly not sure of quantities of guava that were sold by the people because guava is felt to be a hobby enterprise by children standing on the road sides as children were able to pick guavas on their way back from school and when looking after cattle during week-ends.

**Table 5.4 District name and whether guavas were processed according to Extension Officers**

| <b>DISTRICT NAME</b>         |  | <b>No Processing</b> | <b>Yes, do processing</b> | <b>Total</b> |
|------------------------------|--|----------------------|---------------------------|--------------|
| Mbonambi <sup>1</sup>        |  | 0                    | 7                         | 7            |
| Ndwedwe <sup>1</sup>         |  | 2                    | 5                         | 7            |
| Umbumbulu <sup>1</sup>       |  | 1                    | 4                         | 5            |
| Umzumbe <sup>2</sup>         |  | 4                    | 4                         | 8            |
| Umhlathuze <sup>1</sup>      |  | 1                    | 3                         | 4            |
| Maphumulo <sup>2</sup>       |  | 6                    | 2                         | 8            |
| Mhlathuze                    |  | 3                    | 2                         | 5            |
| Umgungundlovu                |  | 0                    | 1                         | 1            |
| Umlalazi                     |  | 0                    | 1                         | 1            |
| Umzinto                      |  | 0                    | 1                         | 1            |
| Kwa-Hlabisa                  |  | 0                    | 0                         | 1            |
| Mhlabayalingana <sup>2</sup> |  | 4                    | 0                         | 4            |
| <b>Total</b>                 |  | <b>23</b>            | <b>36</b>                 | <b>59</b>    |

$\chi^2$ test:  $p = 0.021$  significant      <sup>1</sup> = Prolific Processing      <sup>2</sup> = Not always possible

Table 5.4 reflects that some areas carry out significantly more guava processing than others. According to Extension Officers, processing of guavas was found to be done

almost in all the districts but significantly at Kwa-Mbonambi and Umhlathuze. It was intended to include all these good processing districts as part of the focus group discussions but it was not possible to include Ndwedwe because of time constraints.

The communities that processed guavas tended to make jam, juice and dry fruit most often. The most common guava products were jam, bottled guava, juice and guava rolls. See Appendix A for recipes.

### **5.3 Results from Focus Group discussions (Community Groups)**

Results for focus group discussions representing community groups are presented in the following order:-

Focus groups were selected by Extension Officers in the following areas:-Mbonambi, Umhlathuze, Umlalazi and Richmond because of the involvement with guava usage and for being the areas where guavas grow in abundance. The number of focus group discussions per district was 8, 8, 7, and 5 respectively. A total number of people who participated in these 28 focus group discussions was  $n = 323$ .

The most common size of group in any project was 15 followed by 16 and 18 members. The average group size of the community groups was 17 people per group. ( $SD \pm 16.8$ ) - very wide variation. Attendance at the focus group discussions was on average less than 1 man and 10.5 women per group with the average number of people who attended being 11.4 people in a group ( $SD \pm 9.4$  - also wide variation). The variation between groups was great. The groups were therefore found to be predominantly female in both membership and attendance at focus group discussions as the most common mode of females was 12, 14 and 15.

#### **5.3.1 Importance of Guava according to focus group discussions**

All said guava was important in their lives as they used guava for their own consumption, children also ate guava on their way back from school. One of the respondents said: *God*

*created wild fruits so that they could be eaten by everybody* (Richmond group).  
Herdsmen looking after livestock ate guava while in the fields.

**Table 5.5: Importance of guava according to community groups- Focus group discussions (n=28)**

| Responses        | Very valuable | Somewhat valuable | No value |
|------------------|---------------|-------------------|----------|
| Group response   | 23            | 5                 | 0        |
| Individual votes | 303           | 28                | 0        |

\* Individually 331 people voted

All said guava trees grew naturally and wild except one who had planted the trees, because she wanted to have fruit closer to the household and to have shade because guava does not lose its leaves during winter (Richmond group).

**Table 5.6 Availability of products from guava trees (n=28 groups)**

| Availability      | Frequency | Percent      |
|-------------------|-----------|--------------|
| Feb, March, April | 10        | 35.7         |
| April, May, June  | 7         | 25.0         |
| Dec-Jan           | 11        | 39.3         |
| <b>Total</b>      | <b>28</b> | <b>100.0</b> |

Most of the respondents (39.3%) said guava was found during December and January depending on the type and variety of the fruit. About 35.7 percent said guava was available during February, March and April, whilst 25 percent responded by saying that guava was available in April, May and June.

Leaves, wood and bark were available all year round. The trees flowered at any time of the year depending on the variety of the fruits and weather conditions. If there was too much wind during flowering, the pollen is disturbed and fruiting is reduced. Some guavas ripen at any time of the year.

All respondents in all groups said they used guava fruits for own consumption. Almost all respondents (93%) said they used guava wood as a source of fuel, especially when cooking traditional African beer. Guava wood was also used for fencing and building kraals for goats because it was said to be strong. Most (85.7%) of the respondents used guava leaves for treating diarrhoea and other stomach related disorders. About 7.1% of the groups used bark for diarrhoea. Also 7.1% of the respondents used guava leaves for treating painful eyes and 7% of the respondents used trees as a source of shade during hot weather seasons.

Almost (49%) of the respondents sold raw guava fruit and processed guava in the form of juice, jam and bottled guava. The total sales of raw and processed guava products was R3640.00 for all the respondents who were selling, with the total average of R62.00 per week from raw guava, and total average of R476.00 per week for those who were selling both raw and processed guava products. The total average of R200.00 per week was received by respondents who were selling wood.

There were no other fruit processing methods known by the respondents except the methods mentioned during the discussions. See Appendix A.

Average processed guava fruit products produced during the season was 52 bottles of juice for the five groups who mentioned being engaged in jam making followed by an average production of 53 bottles for the 19 groups who were producing bottled guava halves. An average of 136 bottles of processed guava juice was produced by the two groups involved in juice making.

Seven groups were selling processed guava products informally meaning that the products were sold to local customers around the community members. Raw guava was sold using containers (small buckets, old enamel or plastic dishes). Processed guava products were sold using plastic bottles for juice and bottles for jams and preserved guava halves. The average price of jam per bottle was R7.00 and R10.00 for preserved guava slices plus R2.50 per 250ml guava juice.

The respondents said that the guavas are abundantly available for about six weeks excluding the beginning and the last pickings when guava are found growing on the far tops of the trees or hanging next to the river where it is difficult to reach. The total average sales per season were R1600.00 for the 13 groups who were selling raw guava, processed guava products and wood. The remainder of harvesting was used for own consumption.

The respondents from Umlalazi said that guava can be sold along the beach. *If we can have guava orchards we can sell raw guava to the local shops, markets, clinics, local community and tow.*

#### **5.4 Results from markets**

Markets that were involved in the study all had permanent structures but different methods of operation. The markets included in the study were Umgababa (Umnini, South Coast), Maphumulo (Eplangweni), Zamani Vendors (Ensingweni), Ndundulu market and Zamimpilo market.

- **Umgababa (Umnini)**

Each marketer has a stall and a storage space where products are stored overnight and opened in the morning.

- **Maphumulo (Eplangweni)**

The marketers come with the products in the morning and take them home in the afternoon, depending on the amount of the products left. Sometimes the products are left with friends staying next to the market.

- **Zamimpilo**

The market is managed by the committee where all the marketers bring their products and register the amount they have (craft). It is the duty of the committee to notify the amount of sales per marketer on weekly basis and the marketer will pay a certain percentage depending on the amount of products sold. According to Hlaleleni Mbuyazi, one of the

marketers, guava fruits do not form part of the committee commodity, they are selling guava as additional fruits to add more money to their sales. *We sell guava as an additional fruit as it grows naturally in the fields, they are picked free of charge.*

- **Ndundulu and Zamani Venders (Ensingweni)**

In both markets the members do not pay any rent but there are permanent members who give permission to people are interested in marketing some of the products. Khunjuliwe Mthembu who said *that all the members used to sell guava fruits to add on other fruits produced e.g. mango, avocado pears, pawpaw, banana and litchis as guava grows wild behind and on the sides of the market (a bush of guava trees).*



**Figure 5.1 Zamani Vending Stall (Ensingweni)**





**Figure 5.2 Other fruits and craft selling at Zamani Vending Stall**



**Figure 5.3: Guava trees behind the market at Zamani**

The total number of respondents who were present and had raw guava and guava products on their stalls was 18 out of the total membership of 300 people in all the markets that were selected for the study.

**Table 5.7: Number of respondents from markets participating in the study**

| Market name            | Number of respondents | Membership |
|------------------------|-----------------------|------------|
| Umgababa (Umnini)      | 3                     | 60         |
| Mapumulo (Eplangweani) | 1                     | 15         |
| Zamani Vendors         | 7                     | 30         |
| Ndundulu               | 2                     | 60         |
| Zamimpilo              | 5                     | 135        |
| <b>Total</b>           | <b>18</b>             | <b>300</b> |

The relative contribution of guavas to food or income has not been clearly established in that out of 300 members, only 18 were available to participate in the study. This is a small percentage of people. All respondents said the stalls were opened by nine in the morning unless there were orders that need to be collected on a stipulated time suitable for the customer. Umgababa and Ndundulu close at five in the afternoon depending on the season. During winter the market is closed earlier but in summer when the stalls have more products they close later. During holidays the markets close later because there are more customers especially during Christmas time.

#### **Guava products available for sale**

The question was based on guava products available for sale such as raw guava, bottled, dried, muthi products and wood. All respondents were selling only raw guava with exception of Maphumulo market where bottled guava product was sold. According to Nomusa Mdletshe, chairperson of the market committee: *when bottled products are sold more money is obtained compared to raw guava sales. We do not have proper bottles, we use old mayonnaise bottles and sterilize them as advised by an Extension Officer (Miss Ngema) but she promised to assist us in the next season with proper bottles.*

The amount of stock that was available for sale during the days of interviews was 74 containers of raw guava fruit and six bottles of preserved guava fruits in all selected markets

(Refer Table 5.8). Bottles of preserved guava were priced and labeled accordingly as taught by local Extension Officer (Miss Ngema).

The total estimated income from sales of raw guava for all the respondents per week was ±R1470.00. This averaged a profit of R82.00 per respondent per week. At Maphumulo, the amount of sales of bottled preserved guava was found to be R80.00 per week.

**Table 5.8: Guava products available for sale**

| Market Name | Product type | Amount in stock | Packaging    | Size          | Labelled | Priced | Sales/week/person | Price/unit |
|-------------|--------------|-----------------|--------------|---------------|----------|--------|-------------------|------------|
| Umgababa    | raw          | 13 buckets      | no           | 2litre bucket | no       | yes    | ±25 buckets       | R5         |
| Maphumulo   | raw          | 10 bowls        | no           | 55cm bowl     | no       | yes    | ±30 bowls         | R4         |
|             | bottled      | 6 bottles       | glass bottle | 862g          | yes      | yes    | 5-8 bottles       | R10        |
| Zamani      | raw          | 23 bowls        | no           | 55cm bowl     | no       | yes    | 10 bowls          | R5         |
| Ndundulu    | raw          | 10 bowls        | no           | 55cm bowl     | no       | yes    | 20 bowls          | R5         |
| Zamimpilo   | raw          | 18 bowls        | no           | 55cm bowl     | no       | yes    | 17 bowls          | R5         |

Sources - All said that guava was self picked or by children.

According to the researcher's observations, markets assist in the distribution of guava to the consumers who do not have time and access to collect guava fruits in the wild. Not only guava was sold but also banana, pawpaw, mango, avocado, pineapple and crafts (see Figure 4.1 and Figure 5.2).

Very little marketing cost is involved e.g. time spent by children to walk to the nearby market or to go home before the fruits are taken by parents to the market stall, other fruits are picked just behind the market (Zamani). Price was determined by the availability of the fruit. When there are more fruits in the fields the price is low, when fruits are scarce the price is high. Marketers were willing to reduce the price by 50c or R1 to catch the customers.

The researcher also observed that there was lack of market information skills by stall holders and unstable prices. They were only producing for home and local community consumption because of the lack of exposure, transportation problems, skills and shortage of raw material coupled with storage facilities and seasonality of fruit and so the potential for sales seemed

much greater. Stall holders were reluctant to give any specific financial information; stalls were dominated by women.

### **5.5 Results from Formal Supermarkets**

According to the researcher's observations raw guava fruit and processed guava products were available on the shelves in the selected supermarkets including guava juice, guava halves in bottles which were also found to be made by respondents in the focus groups discussions. See Appendix E. This reflected the potential for processed products that could be marketed by the groups. Some products such as jams, and bottled products were already being made by the women.

### **5.6 Results from Home Industries**

More home processed guava products were available in the shelves including jams, juice and bottled guava halves which were also found being produced by community groups.

### **5.7 Discussion of findings**

Types of guava plants

Strawberry guava / Brazillian guava/ Cherry or Chinese guava (*Psidium cattleneum*) was seldom reported by participants in this study and Koejavel / guava (*Psidium Guajava*) was the type of guava most mentioned in this study. As a limitation, the researcher was unable to identify guava trees and fruits according to their scientific names but the red and white fleshed guava fruit types were available in KwaZulu - Natal.

Uses of parts of guava tree

Only some guava parts were used namely: - fruit was found to be eaten as raw fruit or processed into jams, guava juice, bottled as guava preserves and also included into a number of recipes. Wood was found to be used as a source of fuel and charcoal especially in rural areas. In literature wood was also found used in carpentry and turned for making planks, used for bird perches, tool handles, beams, toys, swings and agricultural implements. The results also showed that guava wood was used in building cattle and goat's kraals and as fencing material (Figure 2.4). Leaves and bark played an important role in manufacturing of

medicines for treating digestive disorders, sore throat, vomiting, diarrhoea, stomach upsets and in the regulation of menstrual disorders.

Processing and marketing - community groups did processing of guava fruits into products such as guava jam, juice and bottled guava halves and the products were used for own consumption with their families and marketed as raw fruit and processed products locally in some of the groups that were selected for interviews. Evidence in literature showed that guava was processed using different methods of food processing including dehydration or drying, canning, bottling and freezing methods. Examples of case studies in literature also showed processing projects for guava products and other related fruits of the forests.

Profit from marketing guavas collected in the wild was impacted by shelf life. Guavas are fragile and spoil quickly therefore, would be picked as they ripened and sold immediately. Guavas which were not sold or damaged through bruising would be consumed at household level.

The results from the markets showed that guava fruits and other parts of guava tree (wood) was sold as raw fruit and other processed products such as bottled guava halves which were selling in one of the selected markets. Through the researcher's observations raw guava was also found selling on the road sides by children.

How CARA would impact the findings?

In areas where guava grow findings show that 100% of selected groups would be disadvantaged if CARA is enforced because not all communities would have access to guava as a source of nutrition as guava is eaten as raw fruits, processed into value added products for own consumption and marketing (income generation), used for medicinal purposes more especially leaves and bark. Wood from guava tree being a source of fuel, building and fencing material is likely to impact most strongly on the poorest women, who have little other access to sources of infrastructure and income.

In the next chapter (Chapter 6) conclusion and recommendations will be discussed linking the sub-problems with the results and data from the literature.

## **CHAPTER 6: CONCLUSION AND RECOMMENDATION**

The main aim of the study was to assess the CARA legislation relating to guava plants as invader species also determining the socio economic importance of guava fruit and plants to people living in rural areas of KZN as a source of food, income, medicine, fuel. Sub-problems were as follows:-

- What is the importance of guava as a source of food to disadvantaged communities?
- What contribution does guava make to income generating of women in three KZN rural communities?
- To what extent do KZN women have medicinal uses for guava?
- To what extent are guava plants used as a source of fuel?
- What potential impact does the legislation have on communities living in mid KwaZulu-Natal for guava in terms of food, medicines and fuel?

The study showed that guava is a source of food to many people living in rural areas of KZN as they were utilizing this commodity as raw fruit and in various processed forms e.g. jam, jellies, juices, preserves and some being sold for income generation. According to information gathered from literature, guava fruit was found to be a good source of Vitamin C, niacin, thiamine, riboflavin, calcium, iron, phosphorus and dietary fibre and all these nutrients are required by the body for good health. People living in urban areas also have access to this resource as raw guava and guava products were found being sold in supermarkets, home industry outlets and market stalls. The guava fruit poses a good opportunity to fight poverty for the poor, through income generation, access by household nutritious to food thereby contributing to the broader goal of safe, nutritious and accessible food to improve food security.

The literature review revealed abundant opportunities that can be established by the respective communities and the corresponding development organizations in forms of government departments i.e. Agriculture, Economic Development and Science and Technology plus non-governmental organizations as well as community based organizations (case studies on fruits from the forests). These initiatives cater both for household

consumption and income generation through the handling and adding value to the fruit for marketing locally, nationally and internationally if high quality standards are achieved.

All the markets that were included in the study had guava as one of the fruits in their stalls. The study showed that guava was collected from the forests without any costs involved which enable the stall holders to generate more profit. Fruits were sold fresh (raw) and also as value added products such as preserved guava thereby creating an income source for women in four selected rural communities.

Based on the results from this study, evidence indicates that guava is also used for medicinal purposes – treating primary symptoms of HIV and AIDS such as diarrhoea by using crushed leaves of guava mixed with water. Leaves and bark are also used for diarrhoea, dysentery, and stomach upsets. See section 5.2. Other medicinal uses for guava from literature included treatment for sore throat, vomiting, bleeding gums, bad breath, toothache, vertigo and regulation of menstrual periods. However no-one participating in this study mentioned this and no scientific evidence was available; so these observations remain anecdotal.

A mixture made from the leaves is used for mouth ulcers, douche for vaginal discharge and a toner for vaginal walls used after childbirth.

Guava plants were found to be used by people living in rural areas of KZN as evidence was led about guava wood being used as a source of fuel and other agricultural needs like fencing and building kraals for goats and perches for birds. Statistics South Africa Census for 2001 showed that wood is found used by rural people as energy for cooking and heating; guava wood may therefore reduce the burden from women in doing the household's roles of collecting wood as guava trees often grow close to the households.

## **6.1 Conclusion**

The potential impact of the Conservation of Agricultural Resources Act No 43 of 1983 legislation prohibitive regulation 15 and 16 on free natural propagation of certain invasive guava cultivars was found to be potentially negative on poor people, mostly women and

children, who utilized the fruit as a source of food and income. Communities using guava during the season would experience vulnerability if the act (CARA) was to be implemented fully. The threat to these communities would be because:

- There will be lack of good nutrition from guava as a source of Vitamin C for food security.
- No possibility of processing and subsequent sales for income generation.
- The income currently generated from sales of raw fruit is valuable if meager - but in such poor communities these make a substantial financial contribution towards their livelihoods.
- Communities would be running short of guava leaves and bark which are used for medicinal purposes for treating diarrhoea and other illnesses.
- There would be less guava wood which is used as a source of fuel, fencing and building material and income generation for other communities.

The strategy and administrative requirements of the legislation are beyond the grasp of the poor who are mostly not literate enough to understand the legislation. The poor status, in which the communities find themselves, with lack of information, education and empowerment, disables the affected communities from applying for permits as per the regulations. This will result in the communities remaining disenfranchised economically, buying costly requirements like fencing and control of spread of seeds.

The development organizations i.e. Department of Agriculture and other sister departments and NGO's are unable to assist the affected people who are using this nutritious fruit. Shortages of skilled staff in the Land Care programme of the Department of Agriculture prevent sufficient assistance to affected communities with training and optimisation for using natural resources in a sustainable manner i.e. use of resources for socio-economic benefit without damage to the natural bio-diversity.



## **6.2 Recommendations for Government**

Government should create pro- active Land Care programmes – providing funding that will assist people in rural areas with permits, fencing and demarcation of land where invasive alien species already exist.

Special targeted programmes for women in affected areas should be introduced to assist them to comply with the law so that the law does not deprive them of a source of sustenance in terms of food and income.

Carefully researched introduction of biological control measures – find outside natural enemies / insects or agents that will eat or prevent guava from spreading outside the demarcated areas.

Government may also provide necessary funding to expand the removal of alien invasive species as Working for Water (WfW) programme does, linking the funding with value adding projects with removed plants so that people can benefit from them, such as making lead pencils out of guava wood; fruits can be dried into powder and be made into juice; fruits can also be processed into jam, concoctions made from guava leaves and bark for the treatment of diarrhoea and other illnesses and these methods can contribute to poverty alleviation.

Government Departments should provide necessary training in marketing.

The establishment of co-operatives should be emphasized by all departments as it increases the market power of the supplier of farm inputs or farm products. If communities organize themselves in a group they would be able to produce in larger quantities.

### **6.3 Recommendations to improve this study**

To carry out the study in other district municipalities in KwaZulu-Natal to assess whether the people are using guava and to find out if guava grows in all soil types and areas as the literature indicated that guava is easily dispersed by wind, birds and animals.

To find out if benefits derived from this invader species (guava) are useful to all the people in KZN, in which case a wider sample selection would be advisable.

Involve other Research Institutions for scientific knowledge (botanists) as the researcher had limitations in finding and observing the leaves of guava trees for identification of varieties except for Cherry or Chinese because the colour of the fruit was different from the others- (Brazilian guava and Durban guava).

### **6.4 Recommendations for Further Research**

It would be valuable to find out what contribution does guava make to the total value of fruit sales at market stalls in KwaZulu Natal.

Target more Government officials, KZN Department of Agriculture (value adding section) for more data on adding value to fruits.

Include the Department of Water Affairs and Forestry (Working for Water programme) and find areas where the alien invader species including guava have been removed and find the views of the communities about the Legislation: whether they are positive or negative.

Recommend that further research with more comparison of the characteristics of various communities would also help to make more specific conclusions about the likely impact of the CARA legislation in other areas.

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[%20food%20security%20concept%20paper%20final%2006\\_09\\_07.pdf](http://www.khanya-aicdd.org/photo_root/concept_papers/microsoft%20word%20word%20-%20food%20security%20concept%20paper%20final%2006_09_07.pdf) Accessed

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## **APPENDICES**

### **APPENDIX A**

Recipes suitable for processing guavas obtained from both literature and the community groups.

## **RECIPES**

### **GUAVA JAM**

#### **Ingredients**

Ripe guavas  
1 cup or more lemon juice  
Brown sugar  
Water (enough to cover fruit)  
Jam jars (sterilized)

#### **Method**

Peel the outer yellow skin off the guavas.

Cut guavas into quarters and remove the seeds.

When making guava jam the outer skins and seeds are not used.

Wash the quartered guavas and put them in a large heavy saucepan.

Pour just enough water into the saucepan to cover guavas and boil briskly until the fruit is all pulpy or soft and remove from stove.

Measure out the fruit mixture and for every cup of fruit, a cup of brown sugar is required e.g. 4 cups fruit = 4 cups brown sugar.

Put the fruit, lemon juice and sugar into a big heavy saucepan and keep boiling briskly, stirring every now and then until a little dropped onto a wet saucer begins to thicken. Overcooked jam will become hard and looks like toffee when cooled.

Remove jam from stove and while still hot, fill all the jars and close tightly with the lids

This jam can keep for months.

Submitted by Ethel Morris – [morrise@usp.ac.fj](mailto:morrise@usp.ac.fj) ; Community groups

## **GUAVA JELLY**

### **Ingredients**

Ripe guavas  
Brown sugar  
Lemon juice (1 or more cups)  
Water (enough to cover fruit)  
Jam jars (sterilized)

### **Method**

When making jelly the whole fruit is used  
Wash all the guavas and cut them into a big heavy saucepan.

Add some water just enough to cover the fruit, and boil briskly until the fruit is all mushy and very soft.

Pour fruit mixture into a muslin cloth and hang suspended overnight above a clean basin so that all the juice can drip out. This method will allow jelly to become nice and transparent and not clouded.

On the following day, put the fruit, lemon juice and sugar into a big heavy saucepan and keep boiling briskly, stirring every now and then until a little dropped onto a wet saucer begins to thicken, remove from stove and fill the jars.

Submitted by Ethel Morris- [morrise@usp.fj](mailto:morrise@usp.fj)

### **The following three recipes were obtained from the publication below:**

Title- **Cultivating Subtropical Crops**, 2003. compiled by , Directorate Agricultural Information Services and ARC- Institute for Tropical and Subtropical Crops.  
Printed by- Department of Agriculture, Directorate Agricultural Information Services, Private Bag X144, Pretoria, 0001, South Africa

## **GUAVA PULP**

Use any ripe guavas (even dropped ones underneath the tree which are in a good condition).

Put the guavas in a pot and cover them with water.

Boil the guavas until they are blanched (the skins crack and loosen).

Prevent over-cooking as it will result in a dark brown pulp instead of the desired pink-coloured pulp. Remove the cooked guavas from the boiling water.

Place in a clean container and mash with potato masher.

The mashed guavas are then pressed through the strainer to separate seeds from pulp.

Throw away the pips and keep the pulp for the guava rolls and guava juice.

The pulp is highly perishable and should be used immediately or kept in a fridge for use at a later stage. <http://www.nda.agric.za/docs/subtrpical.pdf> Accessed 13.07.2005

## **MAKING GUAVA JUICE**

Mix one cup of guava pulp, prepared in the first stage with three cups of water and add sugar according to taste.

The juice contains no preservatives and should be consumed immediately or kept in a fridge.

This is healthy drink with high Vitamin C content.

<http://www.nda.agric.za/docs/subtrpical.pdf> Accessed 13.07.2005; Community groups

## **MAKING GUAVA ROLLS**

Open a piece of plastic. Cover the plastic with a thin layer of cooking oil, followed by a thin layer of guava pulp. The layer of cooking oil prevent the pulp from sticking to the plastic when it dries.

Allow the pulp to dry in the sun for about a day. The dried guava rolls can be cut into pieces and covered in plastic for use at a later stage.

<http://www.nda.agric.za/docs/subtrpical.pdf> Accessed 13.07.2005

## **BOTTLING**

Peel firm ripe guavas and cut them in half.

Remove all the bruised and damaged parts of the fruit.

Prepare syrup by dissolving one cup of sugar in two cups of water and bring to the boiling point.

Place the peeled guavas in the boiled syrup and cook until froth starts to appear on top of the syrup or pips starts to loosen, be careful not to over-cook guavas as over-cooked guavas loose their pips.

Sterilize bottles by boiling in water for 30 minutes. Bottles must have metal caps and should not be cracked or chipped.

Remove the bottles from boiling water and fill up to the rim with cooked guavas and syrup.

Remove the air bubbles by inserting a knife against the inside of the bottles.

Close the cap tightly and place the bottle upside down while it cools. This will ensure that the bottles seal properly. The bottles must be sealed tightly.

<http://www.nda.agric.za/docs/subtrpical.pdf> Accessed 13.07.2005; Community groups

**The following product recipes were obtained from Internet but were not processed during this study or seen in the market places:**

### **Guava Smoothie**

#### **Ingredients**

4 medium ripe guavas  
2 cups water  
2 teaspoons sugar (optional)

#### **Method**

Wash and peel guavas  
Grate in bowl, add sugar and water to taste.  
Serve in tall glasses with a slice of lemon.  
Makes 2 cups

### **Guava Milkshake**

#### **Ingredients**

1 cup milk  
1½ tablespoon guava puree

#### **Method**

Mix milk and guava puree in a glass jar and cover with tightly fitting lid.  
Refrigerate if possible, shake and serve

Go for Guava September 22, 2004

<http://www.jfpm.co.za/news/sep22guava.stm> Accessed 20.09.2006

### **Guava Supreme**

#### **Ingredients**

12 fresh guavas  
2 cups sugar  
2 spoons lemon juice  
Cinnamon (lots- or to taste)  
1 cup muscadel wine

#### **Method**

Cut off ends of guavas, do not peel  
Cut guava into thin slices (5mm thickness).  
Put in a glass bowl and make layers of all other ingredients  
Microwave for 5 minutes and let it stand overnight  
Enjoy with custard, ice cream, cream chocolate mousse or any suitable topping.

FOOD 24 Recipe Centre

<http://www.food24.com/Food24/Components/f24> Accessed 20.09.2006

## **Lydia's guava tart**

### **Ingredients**

1 swiss roll  
825g guavas  
Ultra Mel custard  
1 Tin condensed milk  
125 ml lemon juice  
1 Tin smooth cottage cheese  
250ml cream  
castor sugar  
Vanilla essence

### **Method**

Cut swiss roll into thin slices and arrange in the bottom of tart-pan.

Peel guavas and cut into halves, boil until tender (just enough water to cover guavas and 1 cup (250ml) sugar.

Use fork to flatten guavas, dab hot mixture over swiss roll, and cover with Ultra Mel custard and allow to cool.

Beat condensed milk, cottage cheese and lemon juice, dab over guava layer.

Whip the cream, sweeten with castor sugar (optional) and add a little vanilla essence.

Cover tart and refrigerate. Sprinkle a small amount of red jelly-powder over the tart just before serving.

## **Guava Salad**

### **Ingredients**

1.5 kg guavas  
500g onions  
250ml white sugar  
125ml white vinegar  
25ml salt  
25ml mild curry powder  
2ml fine cloves

### **Method**

Cut guava and onion into small even cubes.

Mix all remaining ingredients and pour over guava and onion mix.

Cover tightly and refrigerate for three days, stirring once every day.

Reduce sugar if desired. Ideal with braai

Guavas: poor mans apple – Tue 25 July 2006

[http://lifestyle.iafrica.com/dining\\_in\\_healthy\\_eating/773028.htm](http://lifestyle.iafrica.com/dining_in_healthy_eating/773028.htm) Accessed 20.09.2006



## **Stewed guavas**

### **Ingredients**

2 cups sliced ripe guavas  
2 tablespoons lemon juice  
Water

### **Method**

Put sliced guavas in a pot with a little lemon juice.

Fill the pot with water until the fruit is just covered.

Bring to the boil, then turn heat to low and simmer 5-7 minutes, or until guava is not soft but not mushy.

Serve hot or cold with coconut cream.

Leaflet No.4 <http://www.fao/WAIRdocs/x5425e/x5425e04.htm> Accessed 14. 09.2007

## APPENDIX B

### QUESTIONNAIRE FOR EXTENSION OFFICERS:

Where in KZN are there communities that:

GROW guavas

USE or PROCESS guavas

SELL guavas?

How much is produced in each of these communities (or harvested?)

| Community name | GROW | USE/PROCESS | SELL | QUANTITY Kg |
|----------------|------|-------------|------|-------------|
|                |      |             |      |             |
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|                |      |             |      |             |
|                |      |             |      |             |
|                |      |             |      |             |

IN these areas, do you think that guavas form an important part of their diet? Why?

Are these places documented anywhere? Where?

## APPENDIX C

### FOCUS GROUP DISCUSSION GUIDE

Number.....

#### Groups involved with guava usage / processing

DISTRICT MUNICIPALITY :

DISTRICT NAME :

WARD :

NAME OF ORGANIZATION :

MEMBERSHIP (number of people in a group) :

Number of people present :

Gender

| Number of males | Number of females | In group | Males present | Females present |
|-----------------|-------------------|----------|---------------|-----------------|
|                 |                   |          |               |                 |

Age groups

| Age   | Number of people in group | Number of people present |
|-------|---------------------------|--------------------------|
| <30   |                           |                          |
| 30-35 |                           |                          |
| 36-41 |                           |                          |
| 42-47 |                           |                          |
| 48-53 |                           |                          |
| above |                           |                          |

How many people in group use any part of guava trees? [*vote*]

1. How valuable do you see guava as being in your lives?

(Tick the appropriate box)

|               |  |
|---------------|--|
| Very valuable |  |
| A little      |  |
| Not valuable  |  |

Why? - give full reasons for your answer

2. Did the trees grow naturally or were they planted?  
If planted-

## Who planted them?

## When?

## Why?

Are they watered?

- ### 3. Availability and use of guava products.

**basis for rating**nothing = **0**

a little = \*

more  $\quad \quad \quad = **$

very much      = \*\*\*

[illegible]

3. What are the trees or their products used for?

|         | Yes/No | How are they used (give details, recipes and processes) | Own consumption Yes / No | Selling Yes / No | How much per week / Rands (season) |
|---------|--------|---|--------------------------|------------------|------------------------------------|
| Fruit   |        |   |                          |                  |                                    |
| Leaves  |        |   |                          |                  |                                    |
| Bark    |        |   |                          |                  |                                    |
| Flowers |        |   |                          |                  |                                    |
| Wood    |        |   |                          |                  |                                    |
| Other   |        |   |                          |                  |                                    |

(a) Which other methods of **fruit processing** do you use?

(b) How much processed fruit products do you produce over the season?

6. (a) Do you sell processed guava products? (Yes / No)

(b) If yes where do you sell your products?

Types of markets

1= informal – simple

2 = informal + structure

3 = semi formal – part time

4 = formal- permanent structure – full time

| Product | Place (Name) | Type of market | Distance | Mode of transport | Cost |
|---------|--------------|----------------|----------|-------------------|------|
|         |              |                |          |                   |      |
|         |              |                |          |                   |      |
|         |              |                |          |                   |      |
|         |              |                |          |                   |      |

(c) How much do you sell per season?

How much did you produce last season?

| Product | Total produced | Total sold | Unit price | What happened to the remainder? |
|---------|----------------|------------|------------|---------------------------------|
|         |                |            |            |                                 |
|         |                |            |            |                                 |
|         |                |            |            |                                 |
|         |                |            |            |                                 |
|         |                |            |            |                                 |

(d) Do you know of other places where you could sell your guava products? Specify all

**THANK YOU FOR YOUR CO-OPERATION**

## APPENDIX D

### QUESTIONNAIRE FOR STALL HOLDERS (MARKETS)

1. When do you start marketing your guava products?

2. What time will you finish? (estimate)

3. What guava products do you have available for sale?

| Type    | Amount<br>in stock | Packaging | Size | Labelled<br>Y / N | Priced<br>Y / N | Available<br>sales/week | Price<br>/Unit | Source |
|---------|--------------------|-----------|------|-------------------|-----------------|-------------------------|----------------|--------|
| Raw     |                    |           |      |                   |                 |                         |                |        |
| Bottled |                    |           |      |                   |                 |                         |                |        |
| Dried   |                    |           |      |                   |                 |                         |                |        |
| Muthi   |                    |           |      |                   |                 |                         |                |        |
| Fuel    |                    |           |      |                   |                 |                         |                |        |

**Source:**

1. self picked
2. From farmer association
3. local NGO
4. commercial agent
5. other (specify)

4. Who are your customers?

|                |  |
|----------------|--|
| Tourists       |  |
| School kids    |  |
| Adults         |  |
| Other(specify) |  |

5. What types of products sell better?

## **APPENDIX E**

### **AVAILABLE GUAVA PRODUCTS IN SUPER MARKETS AND HOME INDUSTRY**

#### **SPAR – HILTON**

Guava juice  
Guava nectar (Clover)  
Guava concentrated nectar (Halls)  
Guava halves (in cans and bottles)  
Guava rolls  
Sugar coated dainty guava cubes  
Fresh guava  
Baby food (Purity)

#### **PICK and PAY – Victoria Road**

Guava Juice  
Guava halves (in cans; bottles)  
Fresh guava  
Guava rolls  
Guava jelly  
Baby food (Purity)

#### **HOME INDUSTRIES**

##### **HILTON FARM STALL (Rotanda)**

Guava jelly  
Guava roll  
Dried guava fruit leather (from puree)  
Guava juice  
Bottled guava

##### **HOME SWEET HOME (Scottsville)**

Guava jelly  
Guava roll