An Analysis of Eco-Labelled Honey Practices Employed in the South African Beekeeping Industry: Implications for Agricultural Sustainability

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

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DECLARATION

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

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ABSTRACT

This thesis presents a novel area of research for agricultural sustainability in South Africa, within the field of Geography and Environmental Studies. Previous studies on eco-labels in South Africa focussed on the commercial aspects such as the consumer understanding and perceptions (Stausebach, 2016; Struwig and Adendorff, 2018) and its application in eco-tourism (Pieterse, 2004), rather than the primary sector activities associated with it such as beekeeping. The application of eco-labels in viticulture for biodiversity (Bridgman, 2009) was among the only other sampled literature in the agricultural sector of South Africa, highlighting a gap for further research. Eco-labels serve as a marketing tool to consumers, based on the environmental considerations and performance of a product. For this study they were employed as a measure to determine its efficacy for agricultural sustainability in the beekeeping industry (apiculture) in South Africa. Beekeepers across the country participated in this study to share insight on their harvesting techniques. Their responses provided in the interviews and survey conducted, assisted with understanding how eco-labelled honey is implemented in the beekeeping industry in South Africa. These eco-labels included "Badger-Friendly", "Fairtrade", "Pure", "Organic", "Raw", "Monofloral", "Wild Honey" as well as the "Mobius Loop". Based on a comparative analysis of the eco-label requirements as per the literature review in contrast to the results of the study, it indicated that there are some misconceptions and subsequent misuse of the eco-labels by industry role-players. The ecolabels were either not fully understood or adhered to accordingly. This highlights that further studies are warranted to raise the level of awareness for agricultural sustainability, in the hope of instituting environmental policy changes and reform to this sector.

OPSOMMING

Hierdie tesis bied 'n nuwe navorsings area vir volhoubaarheid binne die landbou sektor van Suid -Afrika op die gebiede van beide aardrykskunde asook omgewingstudies. Vorige studies oor eko-etikette in Suid-Afrika het gefokus op die kommersiële aspekte soos die verbruikers begrip en persepsies (Stausebach, 2016; Struwig and Adendorff, 2018) sowel as die toepassing daarvan in ekotoerisme (Pieterse, 2004), eerder as die aktiwiteite van die primêre sektor wat verband hou daarmee soos byeboerdery. Die toepassing van eko-etikette in wingerdbou vir biodiversiteit (Bridgman, 2009) was een van die enigste ander literatuur in die landbousektor van Suid-Afrika, wat 'n leemte vir verdere navorsing bewerkstellig het. Eko-etikette dien as 'n bemarkings instrument vir verbruikers, gebaseer op die omgewingsoorwegings en prestasie van 'n produk. Vir hierdie studie is hulle gebruik as 'n maatstaf om die doeltreffendheid daarvan vir landbouvolhoubaarheid in die byeboerdery (byeboerdery) in Suid-Afrika te bepaal. Byeboere regoor die land het aan hierdie studie deelgeneem om insig oor hul oestegnieke te deel. Hul antwoorde verskaf in die onderhoude en opname wat gedoen is, het gehelp om te verstaan hoe eko-gemerkte heuning in die byeboerderybedryf in Suid-Afrika geïmplementeer word. Hierdie eko-etikette sluit in "Badger-Friendly", "Organic", "Fairtrade", "Raw", "Pure", "Monofloral", "Wild" heuning sowel as die "Mobius loop". Gebaseer op 'n vergelykende analise van die literatuuroorsig en die resultate van die studie, het aangedui dat daar 'n paar wanopvattings en daaropvolgende misbruik van die eko-etikette deur rolspelers in die bedryf is. Die eko-etikette is óf nie ten volle verstaan nie, óf daarvolgens nagekom. Dit beklemtoon dat verdere studies nodig is om die bewustheid van landbou volhoubaarheid te verhoog, in die hoop om omgewingsbeleid veranderinge en hervorming van hierdie sektor in te stel.

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CHAPTER 1: INTRODUCTION

1.1 Background

Maurice Maeterlinck the Nobel Laureate of 1911, wrote in his book entitled *The Life of the Bee (1901)* that "if the bee disappeared off the surface of the globe, then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man." Einstein is however popularly, and erroneously quoted for it throughout literature. The sentiment of this statement has echoed for over a century and continues to remain relevant, as demonstrated by the agricultural industry's challenges with food security, and the environmental sustainability of beekeeping globally.

In recent years, honeybees and the production of honey has gathered widespread attention. This is owing to concerns surrounding the origins of honey, packaging, harvesting claims, and ultimately the fact that some bee species have recently been classified as endangered (Kings, 2015). Honeybees particularly are a crucial part of the ecosystem as not only do they produce apicultural products such honey, beeswax and propolis. Bees (including honey bees and bumble bees) are also critical pollinators, responsible for pollinating 35% of the global agricultural land (FAO, 2018). The FAO (2018) emphasizes the importance of bees and other pollinators to the environment, for biodiversity and global sustainable development. The loss of honey bees across the world has encouraged public awareness and conservation as a food security necessity.

The adoption of eco-labels into beekeeping practices could potentially assist with environmental sustainability. As an eco-label is a marketing indicator that identifies products or services proven to be environmentally preferable within a specific category. It is employed to assist consumers with ethical and transparent choices, based on specific environmental standards. Eco-labels are a voluntary environmental assurance measure practiced globally, which are certified by a third party (for some) to differentiate products based on their environmental impact (Khachatryan *et al.* 2017). It attests to the producer's claim that the product has certain environmental qualities (De Boer, 2003). The label identifies the overall environmental preference of a product or service based on its origins and end of life (cradle to grave or life-cycle considerations).

By safeguarding honey bees and other pollinators acts to conserve biodiversity and improve pollinator density and diversity, which in turn boosts crop yields (FAO, 2019). It is evident that pollination is part of a causal chain that is integral for maintaining balance in ecosystems. Food security is indebted to pollination and therefore bees in particular are indispensable. According to Van der Sluijs and Vaage (2016) eight seven out of one hundred and fifteen, of the world's leading food crops would not exist without bees. If this trend continues, nutritional crops such as fruits, nuts, seeds, vegetables, flowering shrubs and plant derived medicines will be substituted by staple crops such as corn, rice and potatoes (FAO, 2019).

Population growth puts pressure natural resources such as food supply (inter alia), leaving the majority of beekeepers with increased harvesting challenges whom often resort to adopting unsustainable and overly commercialised farming methods (highly intensive), that have negative impacts on the environment. For this study, eco-labels have been identified as one of the potential measures supporting the agricultural sustainability and conservation of beekeeping in South Africa.

1.2.Aims and Objectives

This study's overarching aim is to establish whether eco-labelled honey harvested at selected farms in South Africa is adhering to the prescribed norms and standards that supports environmental sustainability. In order to achieve this research aim this study set out to assess the reliability of eco-labelled honey as indicators of conservation and agricultural sustainability at selected farms in South Africa.

1.2.1 Objectives

1. To identify and select producers and suppliers of eco-labelled honeybee products
2. To identify beekeeping techniques, practices and activities that correlates to agricultural sustainability, resource management and biodiversity conservation.
3. To observe the reliability of eco-labelled honeybee products along the supply chain.
4. To analyse the requirements of the eco-label or environmental label against the beekeeping industry's activities and practices
5. To review literature regarding natural resource management and sustainable agricultural practices.

To achieve these aims, the research will also consider the following specific sub-questions:

1. What is the contribution of the eco-label to sustainable agriculture, biodiversity conservation?
2. What are the requirements for certifying or awarding eco-labels and are they regulated in South Africa?
3. Are the eco-label holders adhering to the eco-label or environmental standard requirements?
4. What is the perception and understanding of suppliers and the stakeholders involved in the supply chain of eco-labelled products?

1.3. Significance of the Study

The significance of the study is twofold; it first considers the arguments the regarding the honeybee as a species and then broadly surrounding beekeeping as an agricultural practice, and the impacts thereof. It then analyses eco-label practices and claims, by incorporating studies from South African and international literature. The use of eco-labels are applied to beekeeping practices in South Africa, as an indicator for environmental performance towards sustainable agriculture and natural resource management.

In 2016 bees were added to the list of endangered species for the first time in recorded history. In North America seven species of Hawaiian yellow-faced bees were cited as officially endangered under the United States Endangered Species Act, protected by the United States Fish and Wildlife Services (Dell'Amore, 2016; Magnacca, 2007). Additionally, declines in bee populations have been documented across Europe by the International Union for Conservation of Nature (2014). Bayer Crop Science (den Hartigh, 2016) and the FAO (2014) maintain that the greatest threat to these populations is attributed to habitat loss as a result of modern agriculture.

In the global south, particularly samples extracted from South African literature, the research concentrates on the consumer or end-user aspects of eco-labels rather than the primary sector activities associated with it. To this effect thesis sampled included the consumer understanding of eco-labels – which considered Badger-Friendly honey (Stausebach, 2015), Consumer's Perceptions of Eco-labels (Struwig and Adendorff, 2018) and Application of Eco-labels in tourism (Pieterse, 2004). Other local research studied its application in viticulture for biodiversity which looked at both the agricultural and market

side of the label (Bridgman, 2009). In the international literature reviewed, Van Amstel *et al.* (2007) study considered the reliability of eco-label for specific European products, as a management instrument in agrobiodiversity (2007). This study investigated the extent to which eco-labels subscribe to the claims about their contribution to conservation and sustainable use of agricultural biodiversity (Van Amstel *et al.* 2007). The study further outlined that the reliability of eco-labels is an underexposed area in academic or research literature and that most research focuses on their effectiveness and credibility, which speaks to the administration and procedures.

Eco-labels for pollinator friendly plants and crops have recently been researched and served as input to academic literature (Khachatryan *et al.* 2017). According to the United Kingdom's Department for Environment Food and Rural Affairs (2019), bee friendly eco-labels and developing eco-label certification schemes have also recently been introduced in Europe. The aim of these labels are to identify and promote pollinator-friendly products, manufacturing systems and verification of natural honey.

It is therefore apparent that this study could prove useful for a number of reasons as outlined above. New information on stakeholders' views in the industry and of each other could potentially result in better cooperation among stakeholders involved in the beekeeping industry. This may lead to building capacity, enabling development and improvements in the implementation and practices of eco-labels displayed on honeybee products in South Africa.

4. Structure of the Thesis

This dissertation consists of seven chapters. The introductory chapters provide background, motivation and highlighted the aims and objectives of this study. Chapter two outlines the theoretical underpinnings and situates the study within a broader context. It provides discussion on the overarching theories, pertaining to natural resource use and. This includes the history and definition of sustainable development and the concepts of biodiversity conservation and natural resource use. It further synthesizes literature on eco-labels, tracing the origins and the need or warrant for the eco-label.

Chapter three forms the literature review and provides the context for the study. It is divided into two sections. First a review of existing literature, drawing mostly upon research of the trade and industry of honey and beekeeping in South Africa is provided, the ecological values and characteristics of honey bees are explored and the species as a

natural resource for livelihoods and food security is emphasized. The second half of the literature review considers beekeeping activities holistically, along with its associated challenges and opportunities, legislative provisions and standards.

Chapter four provides a discussion on the study's methodological approach and locates the study area. The chapter therefore provides an outline of the research methods employed and the reasons for the selected approaches employed. It also accounts for the limitations evident in the beekeeping industry such as the study area, which hindered situating or locating the beekeeping practices in a geographical context.

Chapter five presents outcomes from the data collection process. This chapter draws on the data collected the stakeholder perceptions, and descriptions of the industry, outlining major themes captured from the research questions and objectives. The results here are presented in a narration of honey harvesting and trading processes.

Chapter six provides an analysis of honey production and eco-labelling practices in South Africa, which include reasons for eco-labelling, claims, and sustainable practices. It discusses the certification process, the limitations or challenges that stakeholders in the beekeeping and honey industry face. It provides a discussion of the beekeeping industry (from the vantage point of those who participated in this study), and the market environment. This chapter also attempts to answer the major question of what constitutes an eco-label or makes a product worthy of the label, and the claims associated with it. It provides categorisation of sustainable and eco-labelled products.

Chapter seven is the concluding chapter and revisits the objectives, provides insight to the implications of the research results and attempts to assess the way forward for the industry and growth of beekeeping and eco-labelling activities. Briefly policy recommendations as well as suggestions for future studies is provided.

CHAPTER 2: AGRICULTURE AND NATURAL RESOURCE CONSERVATION

2.1 Introduction

This chapter provides both foundation and context to the study, it comprises the origins and history of agriculture as the preface to development and sustainability. It explores key aspects of biodiversity and sustainability as this has implications for the practice of beekeeping. The chapter highlights environmental milestones, such as the United Nations Earth Summits, for the purpose of producing protocols, declarations and action plans, (including eco-labels) to which many countries across the world are signatory members. Eco-labels are also defined in this chapter as a tool for sustainability, receiving global strategic attention such as the United Nations Earth Summit. Furthermore, the role of food security and sustainable agriculture are explored for its contribution to biodiversity and conservation.

2.2 The History of Agriculture: Agricultural Revolution

Historically there have been three Agricultural Revolutions, the first dated 11000 BCE (Before Common Era), the second in the 1800s, and the third, the Green Revolution in the 1960s. They are all briefly discussed as background to highlight how agricultural intensification led to the concept of development and population increase. The revolution assisted in combating problems with famine and food security, arising from the impetus of war, but it also gave rise to long-term unsustainable farming practices rooted in the development of new technologies (Rasmussen and Stone, 1982). Food security as defined in the 1996 World Food Summit, exists when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” (Food and Agriculture Organization, 2006). Food security directly causes human suffering and destabilizes economic and ecological conditions on all levels of governance (Pinstrup-Andersen and Pandya-Lorch, 1998).

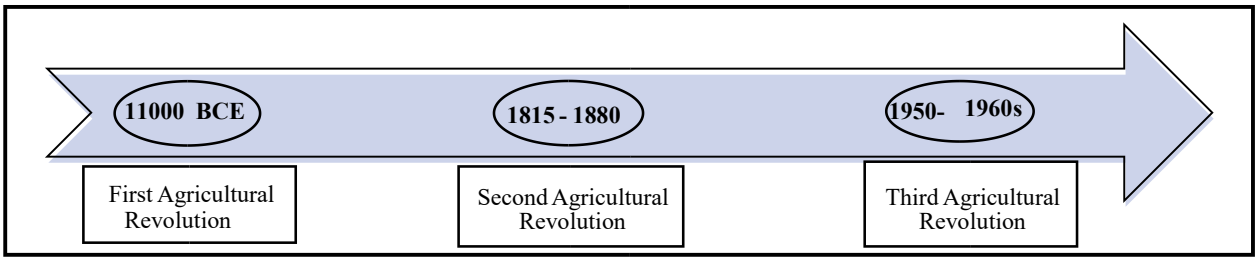


Figure 1: *Timeline of the Agricultural Revolution*

2.2.1 First Agricultural Revolution

The First Agricultural Revolution marked the prehistoric transition from traditional, small group, nomadic hunter-gatherers (subsisting on seasonal and available wild plants and keeping animals) to larger farming settlements (Bocquet-Appel, 2011). Historians refer to the First Agricultural Revolution as the trigger for population explosion, as increased productivity resulted in an increased human fertility rate, marking the start of social and ecological problems (Cobbing, 2012). Hunter-gatherers kept no domesticated animal nor indigenous crops, their nomadic life meant that they would be far and isolated at any given time. The revolution resulted in nomads establishing places of residence and learning to store food surpluses, which birthed the concept of private property and early civilization (Cobbing, 2012).

The process of domestication was ground-breaking during the First Agricultural Revolution, it refers to desirable traits and characteristics that are specifically selected for breeding successive generations of plants and animals (Bocquet-Appel, 2011). Over time domesticated species start differing from its wild or native relative (Bocquet-Appel, 2011), thus forming a socio-ecological interconnection and dependence for humans. The observation of domestication enabled nomads to produce food and keep animals (pastoral) over generations. From foraging to farming, the First Agricultural Revolution changed how humans live, consume and interact with their environment.

Humans discovered that agriculture removed the uncertainty of food scarcity and rather promoted food security, being able to produce their own. Hunter-gatherers were no longer tasked with covering expansive areas in search of food, but instead progressed to orchestrating food supplies moving away from foraging to complete cultivation.

2.2.2 The Second Agricultural Revolution

The British and Scottish was the second Agricultural Revolution, which ran parallel in the 18th century, accompanying the Industrial Revolution (Palmer, 2018). It signified agrarian changes at a rapid rate, and at a large scale. The former farming practices required minimal input, extensive land, greater fallow periods and occurred on a smaller scale (hamlets or villages). It marked a series of innovations and improvements to farming techniques and methodologies towards greater agricultural output and surpluses. These included crop rotations, implementation of enclosures (not common property – a focal point), land conversions and use of ploughs (Assmo, 2012).

It involved the mechanization of agricultural production, advancement in transportation, development of large-scale irrigation systems, and changes to consumption patterns of agricultural goods (Palmer, 2018). Innovations such as advances in livestock breeding, new fertilizers and mechanized harvesting greatly increased food production. Agriculture changed from traditional methods such as subsistence (grow only enough to survive) and pastoral (herding, grazing, composting) to intensive and industrial and increased pressure on land for productivity.

2.2.3 The Third Agricultural Revolution

Agricultural Sciences developed modern techniques during the Third Revolution, this included fertilizers, irrigation systems and chemical-based pesticides (Wu and Butz, 2004). The Third Revolution was dubbed the "Green Revolution" as cereal yields (wheat, corn and rice), total crop production as well as overall food production in developing countries (successful in Mexico and Indian subcontinent) more than doubled (Augustyn, 2020). This accounted for nearly ninety percent of the world's food production in the late 1960s (The Rockefeller Foundation, 2006). The improved high yield varieties resulted in an enormous increase in global food production, necessitated by population growth (Bazuin *et al.* 2011), and as a response to reduce world hunger.

Conversely, the Agricultural Revolution also gave rise to a host of environmental concerns including soil erosion, vulnerability and lack of resilience to pests, water shortages, the commencement of dependency on chemicals for production, as well as the loss of control over seeds (Spring, 2007). This led to the loss of distinct indigenous crops and caused

extinction (Nelson, 2019). The continued innovations, technologies and advancements made during this time, focussed on maximum output for economic growth and disregarded ecological sustainability. The oversight for environmental considerations over time, coupled with consistent agricultural intensification exhausts and depletes resources. The agricultural revolutions extended to beekeeping, that was also transitioning at the time.

2.3 Agriculture as a Preface to Development and Sustainability

The transformation of traditional farming to more industrialized manufacturing began with the Agricultural Revolution, which arguably served as a platform for development. Harry Truman, a former United States President's 1949 Inaugural Address, was amongst the first to publicise the term 'development' following World War II (Britannica, 2016). Development was understood to mean scientific and industrial advancement, resulting in the unconditional belief of progress (Kepe, 2013).

To enhance the notion of development, Rostow's (1960) book entitled *Stages of Economic Growth: A Non-Communist Manifesto* is primarily used as initiatory literature to identify societies in their given economic state, using a five stage model, as illustrated in Figure 1 below. It is contextual for differentiating between developing and developed countries in geographical terms, and understanding societies stage of growth (Jacobs, 2020). Developing countries are identified as being economically poorer, and usually referred to as the global "South" and "East," and according to the model have not taken-off from the traditional society of agriculture.

Rostow's Stages of Economic Growth is employed in this chapter to frame how the agricultural revolution predated mass production, but amidst the ongoing agricultural modifications, the idea of development and advancement remained the primary objective throughout. The model provides a theoretical underpinning to demonstrate how the agricultural revolution was the precursor for development.

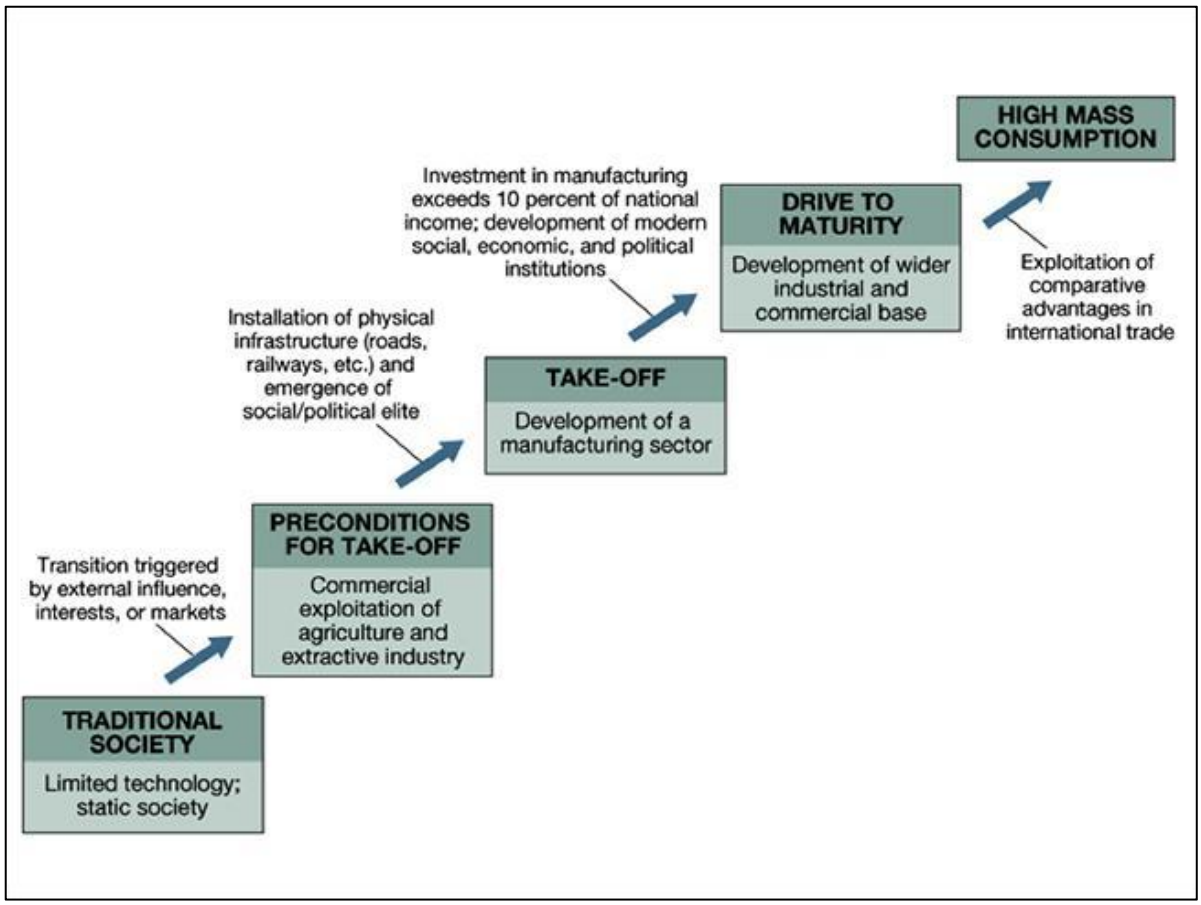


Figure 2: Rostow's Five Stages of Economic Growth (1960)

The model assumes that all countries follow a similar path to development, represented in the chronology as the five stages model. It is exemplified as a flight of stairs leading to the height of development, starting with a traditional farming society and ending with mass consumption. This model shows a direct relationship between agriculture and institutional development leading to mass consumption**.** The model however, focusses solely on economic growth and excludes the effects of natural resource extraction required for development (Vivien, 2008). The model is criticized in many fields of social sciences literature, and as cited by Grossman and Krueger (1995) “there should be a “sixth stage” in pursuit of economic growth that is line with environmental protection”.

A recurring theme presented in development and the Agricultural Revolution, is known as the Tragedy of the Commons (Hardin, 1968), where in a modern context, "commons" refers to any shared natural resource or common-pool goods extracted for individual gain, instead of being shared amongst society as a collective (Meinzen-Dick *et al.* 2006). A natural resource is anything created through natural processes that people use and value,

they are often used without considering the broader consequences of its use (Shackleton, 2012). Examples of the commons include open pasture or arable land for farming, forests for timber and pulp, and oceans for fisheries, *inter alia* (Meinzen-Dick *et al.* 2006). The (over)use of the resource by one-user decreases the supply available to others, resulting in exploitation and depletion of the resource to the detriment of society and the environment, and this why it was coined Tragedy of the Commons. To interpret Hardin (1968), he proposes that a solution to preserving and securing the commons by and large involves sustainable resource management, banning overpopulation, and recognizing natural resources as a necessity controlled by regulations.

A greater portion of what enables development is wealth, and in an elementary sense, wealth is derived from the natural environment (Kepe, 2012). Humanity's basic material needs are fulfilled by transforming the environment for the extraction of natural resources; such as clearing of land for planting crops or mining coal to generate electricity. The environment is instrumental in supporting and maintaining life and providing inputs for production. Particularly concerning is the effects of economic growth and activity on the environment. The state of the environment if not cautious will constrain future economic development. The natural environment is existential for the poor especially, of developing countries, who need it to sustain their livelihoods (Meinzen-Dick *et al.* 2006). Importance has however always been placed on economic growth rather than the longevity of the natural environment.

Before the concept of sustainable development was popularized, early environmental science author, Rachel Carson (1962) sparked public realization of widespread environmental degradation in her publication entitled "A Silent Spring." Carson presented evidence on the detrimental effects from the use of pesticides, particularly aerial spraying of Dichlorodiphenyltrichloroethane, commonly known as DDT over agricultural crops. DDT is notorious for its environmental impact on vermin, as it can obliterate hundreds of insects from a single use, and is amongst the most harmful insecticide (United States Environmental Protection Agency, 2021). It widely accepted that Carson's (1962) book marked the start of a movement toward environmental sustainability (Griswold, 2012). The most cited chapter of the book " A Fable for Tomorrow" depicts the deadly effects of DDT on fresh produce for human consumption (Griswold, 2012). Carson showed linkages in the food chain from the use of pesticide on crops, and the pollution to aquatic and

terrestrial ecosystems caused by its runoff, which impacts on human consumption and health. Noteworthy, chapter three of Silent Spring (1962) entitled “Elixirs of Death,” is of particular reference to the study.Here Carson reiterated that “the world of systemic insecticide is where a bee may carry poisonous nectar back to its hive and produce poisonous honey.” Carson drew attention to the negative effects of insecticides on the health and development of bee colonies, and its impacts on pollination and honey production for human consumption.

2.4 The Path to Biodiversity, Conservation and Sustainable Development

The United Nations Earth Summits are strategic global environmental conferences, occurring on a decennial basis (UN, 2020). World leaders mobilize, to promote sustainable development on an international level. The timeline of the Earth Summits as presented in Figure 3 below starts with the United Nations Conference on Human Environment in 1972 (also called the Stockholm Convention), until arriving at the 2002 World Summit on Sustainable Development. Each marking completion of a milestone in the form of action plans, declarations, protocols and objectives. There were earlier and later summits, but Figure 3 below captures a critical period for escalating biodiversity conservation and agricultural sustainability.

As the conferences progressed over time they refined the relationship between the environment and development. The conferences drew attention to the problems associated with development and the environment, stemming from the unequal access, distribution and mismanagement of natural resources (Roelofse, 2012). The outcomes from these summits were paramount in bridging the gap between people and environment, creating policies and change for the future. The summits that corresponded to this paper were The World Conservation Strategy, The World Commission on Environment, The UN Conference on Environment and Development (which birthed the Rio Declaration and Agenda 21), and the 2000 Millennium Development Goals. Which were succeeded by the Sustainable Development Goals in 2015, intended to be achieved by 2030 – blueprint included Agenda 2030.

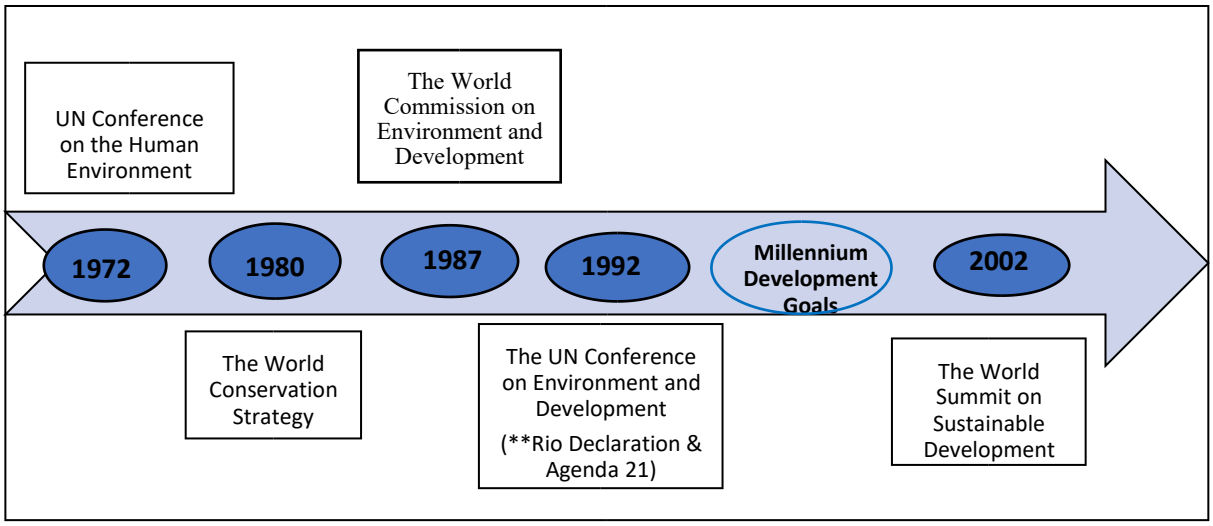


Figure 3: *Timeline of Earth Summits*

2.5 The Emergence of Sustainable Development

2.5.1 The World Conservation Strategy (1980)

The concept of sustainable development was first introduced at the 1980 World Conservation Strategy (WCS). It was the first international document to correlate conservation and development (Kepe, 2010) stating that by conserving the environment, in turn conserves people (WCS, 1980). The report drew attention to the exploitation of natural resources, and its impacts that include extinction of species and varieties, loss of cropland and ecosystem degradation (*inter alia*). The three key objectives of the WCS (1980) included: The maintenance of essential ecological processes and life support systems; safeguarding genetic diversity; and the sustainable use of species and ecosystems. These objectives are all foundational to eco-labels.

2.5.2 The World Commission on Environment and Development (1987)

The World Conservation Strategy was the first conference to introduce the concept of sustainable development, but it only gained traction after it was published in the Brundtland Report, as a product of the 1987 UN World Commission on Environment and Development (Kepe, 2010). Sustainable Development as classically defined in the Brundtland Report (1987) is "economic development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Defining sustainability as a non-decline or appreciating value of natural resources over time, preserving the Earth's capacity to support future generations (Vivien, 2008).

A series of eco-labels ensued between 1977 and 1989 in Europe. Eco-labels were however, only formalized and implemented at Agenda 21 (following Summit- see below), to try encourage a change in consumption patterns, enabling wiser use of environmental resources and energy, as means of promoting sustainable development.

2.5.3 UN Conference on Environment and Development - The Earth Summit (1992)

The United Nations Conference on Environment and Development (UNCED) served as a progress report, from what transpired in the 1987 Brundtland Commission (Kepe, 2010). The primary objective of the UNCED was aimed at international action on environmental and developmental issues that would aid in international cooperation and development policies (Shackleton, 2012). The Summit concluded that sustainable development if strategized effectively, could be an attainable goal for everyone in the world. The Earth Summit had a number of key global outputs that were agreed upon, of which two relate specifically to the study, i.e. Agenda 21 and the Convention on Biological Diversity (CBD). To define biodiversity (biological diversity); it includes the whole range of populations, together with all the genetic variations found within each species (Shackleton, 2012) it encompasses all living things that currently exist on Earth such as fungi, bacteria, protozoa, and viruses (Shackleton, 2012). It also includes all discoverable animals and plants and those that are yet to be discovered (Shackleton, 2012), as they contribute to sustaining a healthy ecosystem. The outcomes and objectives of the convention included; the conservation of biological diversity; the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the use of genetic resources.

A significant product of the Earth Summit, was Agenda 21 (21st Century), which was a nonbinding action plan of the UN, detailing ways to make sustainable development a reality. One of its major objectives was for every local government to develop its own local Agenda 21 (Kepe, 2010). This therefore meant every local government should set objectives, supplemented with a plan of action intended to achieve these objectives towards sustainable development. This would ordinarily be achieved by setting targets, assigning responsibilities to nations and funding required to realize the set targets.

With reference to eco-labels and objectives set out by the Agenda 21 activities, the European Commission (EC) introduced “Towards Sustainability” as their environmental action plan in support of Agenda 21. The EC is the administrative branch of the European

Union, responsible for setting legislation for environmental standards as part of their portfolio (Collins *et al.* 1997). Which European Eco-Labelling Scheme, formed part of the "Towards Sustainability" action plan, which was implemented by the Commission in 1992. The aim of the EC eco-labelling scheme was to promote products that would bear lower environmental impacts throughout their life-cycle and to provide consumers with better information on the environmental impacts associated with their purchased products (Erskine and Collins, 1997). As consumer awareness of sustainability increased, the EU enhanced this by formalizing ecolabels for the purchase of sustainably produced foods.

The Earth Summit encouraged governments to agree to the expansion of environmental labelling and other environmentally related products, which were designed to assist consumers in making informed choices (FAO, 2020). The Earth Summit advocated for certification as a response to address the decline in biodiversity, as organizations have to qualify for some eco-labels by means of certification. For these eco-labels, they are only awarded by an independent third-party audits, assuring that the products meet certain environmental criteria or standards (ISO 14024: 2018). Certification can apply to a production site, an end product to consumers as well an intermediate product in a manufacturing chain (Shackleton, 2012). Once the product meets those criteria or standards, a stamp approval such as an eco-label, may be attached to the product, as it has passed the third party audit and thus awarded certification. The labels may be conveyed or displayed in several forms, such as seals-of-approval, single attribute certification, report cards, information disclosures or hazard warnings (United States Environmental Protection Agency, 1993). Such labelling has many potential societal benefits, including environmental improvement, accurate information dissemination to consumers, improved market share for producers, and increased awareness and interest by the public about environmental issues (Kuhre, 1997; Morris and Scarlett, 1996).

Certification is an environmental management tool for preservation and conservation of a natural product (Shackleton, 2012), as it is designed to ensure harvesting in a guaranteed sustainable manner. The goal of certification in terms of eco-labels related food and agriculture, would therefore ensure market access to certified sustainably produced food products.

2.5.4 The Millennium Development Goals (2000)

In September 2000, world leaders mobilized in commitment to eight goals based on the United Nations Millennium Declaration, which was set for 2015. Of the eight goals; goals one and seven were of particular relevance to sustainable agriculture (eco-labels) and food security (beekeeping). Goal one pertains to the attainment of food security and highlights the need for growth in the agricultural sector as crucial for hunger and poverty reduction (UN Chronicle, 2021) this extends to macroeconomic indicators such as GDP. Goal seven of the MDGs is to ensure environmental sustainability, by means of sustainably managing natural resources and ecosystems to meet people's food requirements (and other social and economic needs). The MDGs states that strategies, policies and institutions for conserving, protecting natural resources should be enforced (FAO of UN, 2021).

The Millennium Development Goals were succeeded by the Sustainable Development Goals in 2015. Member states (193) of the UN adopted a set of objectives (seventeen) comprising one hundred and sixty-nine targets, for signatory governments, international agencies and institutions to meet by 2030 (FAO of the UN, 2016). The seventeen proposed SDGs overarchingly aim to end poverty and hunger, while at the same time try to restore and sustainably manage natural resources (FAO of the UN).

Figure 4: *The Sustainable Development Goals (UN SDG, 2015).*

Eco-labels directly correspond to accomplishing the twelfth global goal of ensuring sustainable consumption and production, eco-labels provide a framework for realizing the twelfth goal. However in tally of the seventeen SDGs as illustrated in Figure 4 above, goals one, two, six, twelve (as aforesaid), thirteen, fourteen and fifteen, include interconnected objectives related to natural resource management (sustainable agriculture) and food security, which would in turn support considerations of a food related eco-label, and its implications for agriculture (food security from pollination) and biodiversity conservation.

2.6 Understanding Sustainable Development: developing an eco-label

The synergies between the environment and development were not being drawn by the signatory members following Agenda 21, this was evidenced by the prevailing concerns surrounding climate and poverty (Kepe, 2012).

The interconnections between the environment and development is better understood by employing a systems approach as it assists with reconciling these linkages. Systems thinking refers to the intricate patterns of causal links and interdependence between different social (including economic and governance aspects) and ecological components of a larger system (Folke et al. 1998). It is an holistic view of components and the interrelationship amongst components. In simpler terms, it is the process of understanding how things influence one another within a whole. It looks at cause and effect between components often across different multitudes or scales.

Collins *et al.* (2011) argues that there should be increasing recognition for the environment to be viewed and as a socio-ecological system. Social-ecological systems comprises social and biophysical components, and human activity influences all natural systems. Examples of social-ecological systems include ecosystems, forests, the water cycle or a food web as it impacts to both people and the environment. It leads to a more coherent understanding of social-ecological systems, which contributes to developing and testing of theories and acts as guide to help current and future environmental and societal challenges.

Supplementary to this, the “Triple Bottom Line” or the “Three Pillars of Sustainability” (social, economic and environmental), as commonly represented in various forms (see Figure 5 below) to depict the three elements centred around sustainability, this figure comprehensively explains the interdependence and interconnectedness of each component to

meet sustainable development (Purvis et al. 2019). This depiction or conceptualisation of sustainable development therefore aims to demonstrate that sustainable development is multifaceted and cannot be viewed as an isolated concept, as it comprises these three elements to achieve true sustainability.

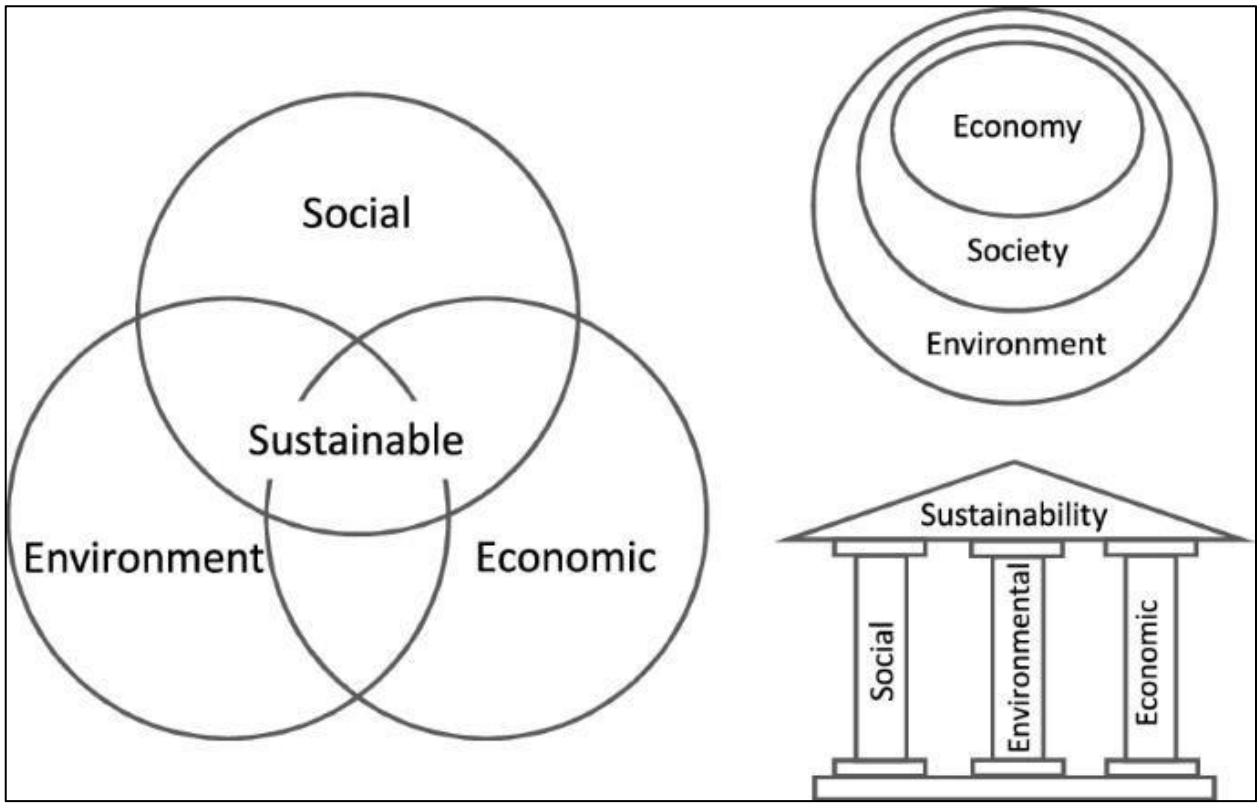


Figure 5: *Triple Bottom Line (left) and pillars of Sustainability (right) concentric circle approach (above) (Purvis, Mao and Robinson, 2019).*

The three pillar concept has served as a basis for many certification systems and environmental standards, particularly in the food industry (Manning *et al.* 2011). Food ecolabels are an incorporation of the three pillars, as they include all the elements, such as production (environmental) consumption (economic) for human use (social), ensuring future sustainability. The concept of sustainability will continue to influence future discourses concerning development, and the best decisions to meet the needs of society, the economy and environment should be based on the three pillar concept of sustainability (Mensah, 2019). As it balances economic growth in line with the consumption of nature resources, meeting fiscal needs whilst at the same time ensuring natural resource management. Conversely, the concept is also critiqued in literature for being too complex,

and has subsequently sparked concerns for vagueness, by allowing for impartiality towards either a social, ecological or economic perspective – tending to reflect a philosophical position as opposed to defining the concept (Kepe, 2012). By placing the two root words of sustainable and development alongside each other to form this concept, is also criticized for being contradictory or an oxymoron (Kepe, 2010). Sustainable refers to consistency or maintenance, which is seemingly promising or optimistic for the environment. Whereas development on the contrary, refers to growth and progress, which is potentially problematic for the environment, signalling a warning. In essence, it seeks considerable growth in an economic activity, however remaining within an ecological threshold (Kepe, 2010). It is slippery to pinpoint, lending itself to an argument or multiple interpretations of anthropocentrism (human-centred system of values) versus ecocentrism (nature-centred values) (Kepe, 2012).

Considering the contentious nature of the sustainable development concept, it is however definitive that natural resources are finite, and that are not replenishable if it is perpetually misused. If it is exploited for economic growth and industrialization it will lead to environmental catastrophes. In order to avoid or minimize the effects of such catastrophes, the critical human or social aspect to consider is slowing population growth, which is the crux to achieving natural resource management and in sustainable development (UNEP, 2007). Sustainable Development is driven by the limitless capacity of human beings for building and creation, matched by equally great powers of destruction and annihilation (WCR, 1980). This ambivalence could potentially lead to an unfavourable agenda of achieving sustainability, by focusing only on the social aspects and not the intended ecological purpose, which fails to meet the point (Kepe, 2010).

While social-ecological systems are considered complex adaptive systems, sustainability science recognises the complexity as a phenomenon that exists as a consequence of interactions between system components (e.g. human and environment components), giving rise to properties that emerge as a result of these interactions (Cundhill, 2009; Hofmeyr, 2012). Part of the complexity is that society can act as agents of environmental system change (combined with natural change), and either threaten ecosystems or they can recognize, respond and adapt to the change through introspective practice which is contributory to sustainability - serving as a both a source of change and also the solution (Hofmeyr, 2012). This way of thinking, including all three spheres of social, economic and environmental in equal measure is noteworthy for developing and implementing an eco-

label as it is in line with achieving greater sustainable development. By only concentrating on one, such as the economic sphere would cause division within the social sphere and pressurizes the environmental sphere. If the focus is not balanced, or evenly distributed amongst the interconnected elements, sustainable development is not be achievable.

2.6.1 Eco-labels: History

The origins of the first eco-label dates back to 1977, with the first ever eco-label being introduced in Germany, known as *Blauer Engel* (Blue Angel). The *Blauer Engel* eco-label is awarded across several sectors (excluding food and beverage) and is supported by a number of German institutions (Blauer-Engel, 2020). The earlier eco-labelling schemes merely provided stamps on products stating that the best environmental characteristics were considered for the products (OECD, 2013). A number of private standards followed in the 1980s and 1990s, varying in scope and nature, but extracted from the same ideals of considering best environmental practices in institutions and organizations. Thus showing the role eco-labelling scheme can play in a movement towards sustainable development. To fast forward to 2021, eco-labels have since progressed from the 1977 *Blauer-Engel*, and there are many more on the market available on the market, suggesting that it is a useful and effective tool for sustainable development. It is evident that Blauer-Engel served part of a global movement towards sustainable development. Eco-labels emerged as a key tool for making sustainable purchasing decisions, this was due to the increasing consumer concerns regarding the environmental impact of goods and services which they purchase (Tranchard, 2018). Ecolabels were therefore necessitated by the consumer willingness to pay for sustainably sourced products that advocated ethical production. The heightened public demand for the inclusion of ecological and or social criteria in the production process markedly changed in 1999 when the International Organization for Standardization (ISO) assigned the first international requirement for eco-labelling known as ISO:14024 (Tranchard, 2018). ISO is an independent, non-governmental international organization (ISO, 2020) comprising certification bodies and standards.

Eco-labels provide information about a product or service that in a specific manner takes the environment into consideration (Stausebach, 2015). Some manufacturers want to convey transparency to their buyers in terms the potential environmental impacts of the products

(Brecard, 2014), thus showing the purpose of an the eco-label, and how it safeguards against its impacts. Eco-labels are communicated visually to the consumer, represented graphically or in script on a product. By the said demonstration of a label, they serve as a tool for consumers to differentiate (eco-labelled) products from other products based on environmental considerations (Brecard, 2014).

2.6.2 Eco-labels in the Context of Food Manufacturing

Beekeeping is a branch of agriculture, and is part of the food manufacturing chain. Therefore beekeeping and its associated practices resides within the food related eco-labels range. Many of the food related labels are implemented by the European Commission for sustainability (EC, 2021). The timeline below demonstrates the history and development of food labels commencing in 1928, to present day. Significant to this study, Fairtrade and Organic ecolabels are mentioned and Non-GMO that is discussed in Chapter six. Overall the timeline exemplified the growing importance of eco-labels in the food industry and the demand and concerns for sustainable agriculture as motivated by the series of UN Summits.

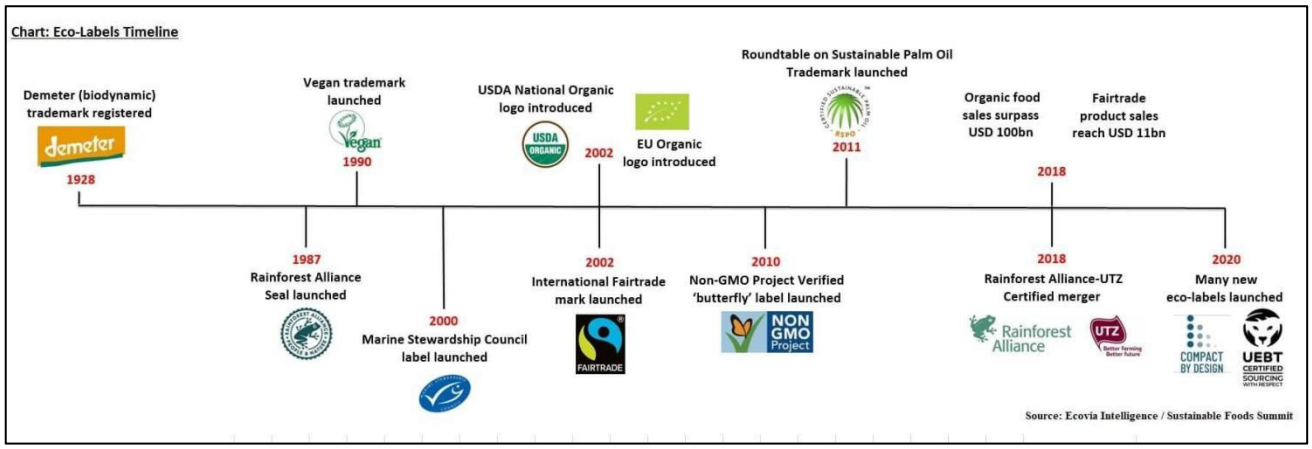


Figure 6: *A timeline of eco-labels in the food industry (Ecovia Intelligence, 2020)*

Food labels are both environmentally and ethically based, stemming from the management of farms and its agricultural processes (Grunert *et al.* 2014). In the case of seafood products and fisheries, consumers demand marine population protection from resource depletion and adequate management of aquaculture farms (FAO, 2020). Popularly or known labels include 'Dolphin Safe" for tuna, relating to the manner in which tuna is caught, promoting dolphin welfare and conservation (FAO, 2020). Eco-labels for marine

harvesting or the aquaculture practices uphold that it be conducted in a sustainable and cruelty-free manner.

2.6.3 Norms and Standards for Eco-labels

ISO 14001:2015 standard provides a framework for a company or organization to be guided by for an effective environmental management system. ISO 14001: 2015 is considered the parent standard, and environmental labels and declarations and other applicable standards fall within this series, but are sub-coded 14020, 14024, 14021 and 14025. In South Africa, the South African Bureau of Standards (SABS) is affiliated to and ISO, (SABS, 2021), ISO being the founding organization assisted with the implementation of SABS, which developed South African National Standards or SANS (SABS, 2021). Eco-labels in South Africa mirror the ISO codes of conduct, for example SANS 14020 is identical to ISO 14020.

Eco-labels comprise specific audits depending on the label requirements, related certification, label awarding, lifecycle analysis, as well as environmental challenges and opportunities (CES, 2013). The overall aim is to assist organizations in minimizing negative environmental impacts caused by its operations. Various initiatives aimed at integrating environmental issues into manufacturing procedures were proposed by governments, NGOs and private stakeholders at the UN Earth Summit (Kepe, 2010). To show commitment in support of the objectives of UN Earth Summit, ISO developed three eco-labelling typologies (Types I, II and III) as well as a single use label, first published in 2000 (ISO, 2020). The United Nations Office for Projects (2009) guide for environmental labels, shows that that eco-labels do not refer to all labels relating to the environment, and rather that the large composite family should be referred to more broadly and generally as environmental labels rather than ecolabels. Eco-labels are more rigid and are sub-group that correlate to specific criteria, comprehensiveness, independence and reliability (UNOPS, 2009). The increase in demand for environmental claims created a need for environmental labelling standards, requiring consideration to all related lifecycle aspects of the product from the commencement of the claim.

2.6.4 ISO 14001 Series Eco-Labelling Typologies: I – III and Single Issue Labels

Type I Environmental Labelling – Principles and Procedures

A summary of the typologies are presented in Figure 4 below. Type I environmental labelling programmes, awards their environmental label to products that meet a set of predetermined requirements. The labelled product must be environmentally preferable and within a particular product category. Type I labelling programmes are voluntary and generally operated by public or private agencies, as they require third-party certification to award the eco-label. Type I eco-labels can be at a national, regional or an international level. Type I eco-labels consider the entire lifecycle of a product (ISO 14024, 2018). It is used to determine the environmental impacts associated with all the stages of the life-cycle of a commercial product, process or service (ISO 14024, 2018). It factors environmental aspects, such as energy consumption, material composition, emissions, use of hazardous substances among others. The labels indicate products with significantly less environmental impacts than the market average along the lifecycle, i.e. "the best in the class" (Rubik, 2015).

Type II Self-Declared Environmental Claims

Type II comprises the self-declared environmental claims associated with environmental labels. Self-declared claims may be made by manufacturers, importers, distributors, retailers, or anyone else likely to benefit from such claims. Environmental claims may appear in statements, symbols, or graphics on the product or package labels, or in product literature, technical bulletins, advertising, telemarketing, as well as digital or electronic media, such as the internet (ISO 14021: 2016). This standard further describes selected terms commonly used in environmental claims and gives qualification for their use. Type II eco-labels requires that it be clear, transparent, and scientifically sound and documented.

Type III- Environmental Declarations – Principles and Procedures

Type III of the environmental declarations present quantifiable environmental information pertaining to the life cycle of a product to allow for comparison among other products performing the same function. For example this may include the carbon emissions in tons per product produced, which is used as a competitive indicator in vehicle manufacturing. Type III as described by the standard (ISO 14025: 2006) are mainly intended for use in

business-to -business communication, but their use in business-to-consumer communication under certain conditions are not excluded. Type III takes the form of a matrix, similar to that of the nutritional declarations of products (UN, 2021)

Single Issue Label or Type I-like (not ISO)

Single Issue labels are a special group that merely addresses a single issue as opposed to considering the entire life cycle (UNOPS, 2009). ISO Type I-like labels are often referred to as "certification schemes" or "sustainability labelling" that share the same principles of Type 1, but focus on impacts, applied only to a specific sector, such as Organic labels (UNEP, 2020). Single use labels evaluate the performance of a product on a range, such as grading for energy or water efficiency. Single issue labels focus specifically on one negative environmental impact or issue often in individual sectors, and therefore cannot classified as eco-labels (OECD, 2013). It is based on a criteria of pass or fail, such as setting a maximum level of energy consumption for electric appliances (i.e. Energy Star label) or ensuring responsible management of the world forests i.e Forest Stewardship Council (UNOPS, 2009). This study considers Type I-like and Type II eco-labels, Type III and Type I are not applicable. Figure 7 as extracted from the OECD (2013) below provides a summary and assisted with understanding the selected eco-label typologies and its related ISO standards. Types I to III are clearly defined and supplemented with examples.

ISO standard	Definition	Examples
Type I - Ecolabels (ISO 14024)	• Seal or logo based on a set of multi-attribute criteria • Third-party-certified, voluntary schemes focusing on non-food products • Typically aimed at consumers	Nordic Swan Japanese Eco-Mark Canadian Environmental Choice
Type II – Self-declared environmental claims (ISO 14021)	• Claims made privately by companies describing a product based on characteristics following general guiding principles • Not third-party certified, but expected to be verifiable and accurate	Recyclable content Biodegradable
Type III – Environmental declarations (ISO 14025)	• Quantitative indicators of environmental performance based on LCA for objective comparisons between products fulfilling the same function • Generally B2B, or used in public procurement	Eco-Leaf Korean Environmental Declaration of Products

The table below shows the OECD categorisation that aims to provides a more comprehensive picture. There are twelve criteria organised around the mode of communication and four focusing on the characteristics of the standard.

Figure 7: *Eco-labelling typologies, definition and examples*

2.6.5 Certification Bodies for Eco-labels

The Classification of eco-labels is revised by Rubik and Frankl (2005) in figure 8 below. A certification body is a non-governmental organization which audits and certifies organizations against the standards, such as Type I eco-labels (Stausebach, 2015).

Type I (ISO 14024: 2016) requires third party certification, and most of the reviewed Single Issue or Type-I labels are also subjected to audits. Certification bodies operate internationally, and have trained and qualified auditors registered to the body to conduct audits on behalf of the certification body for the given standard. The auditor schedules an audit with the manufacturer or organization against their operations in respect of selected clauses of the standard or in its entirety (CES, 2013). Certification in some instances is mandatory in order for organizations to export their products, who are required to uphold their certification status annually. Examples of Certification bodies in South Africa include Flocert, as the certification body for the Fairtrade Standard, and EcoCert for the Organic eco-label. Both Fairtrade and Organic support crops grown in developing countries such as cocoa and coffee in parts of Africa and South America.

Accreditation is the procedure by which a government agency or scientific body verifies the competence of, endorses, qualifies or licenses those doing the certifying (Bridgman, 2009). It refers to the formal recognition that a body is competent and qualified to perform specific tasks. The South African National Accreditation System (SANAS) is the only national body responsible for carrying out accreditations. The Agricultural Research Council laboratories are SANAS accredited to many scientific sampling and testing procedures relating to honey.
Organic honey is accredited to IFOAM and similarly Fairtrade honey is accredited to ISEAL.

In the United States and European Union, the Organic eco-label is regulated. This means that if the honey contains the Organic eco-label it is approved by the EU or the United States Department of Agriculture. The Organic eco-label is not regulated in South Africa, therefore implying that it is not mandatory for the Agricultural Research Council to test for the Organic eco-label (in South Africa). This would therefore come as an additional cost to beekeepers in South Africa as it is not mandatory or regulated in South African legislation. It is argued that this variety in distinguishing labelled products, makes it difficult for consumers to decipher, if they base their willingness to spend on factors such

as environmental considerations (Frydendal *et al.*, 2018; Stausebach, 2015; Struwig and Adendorff, 2018).

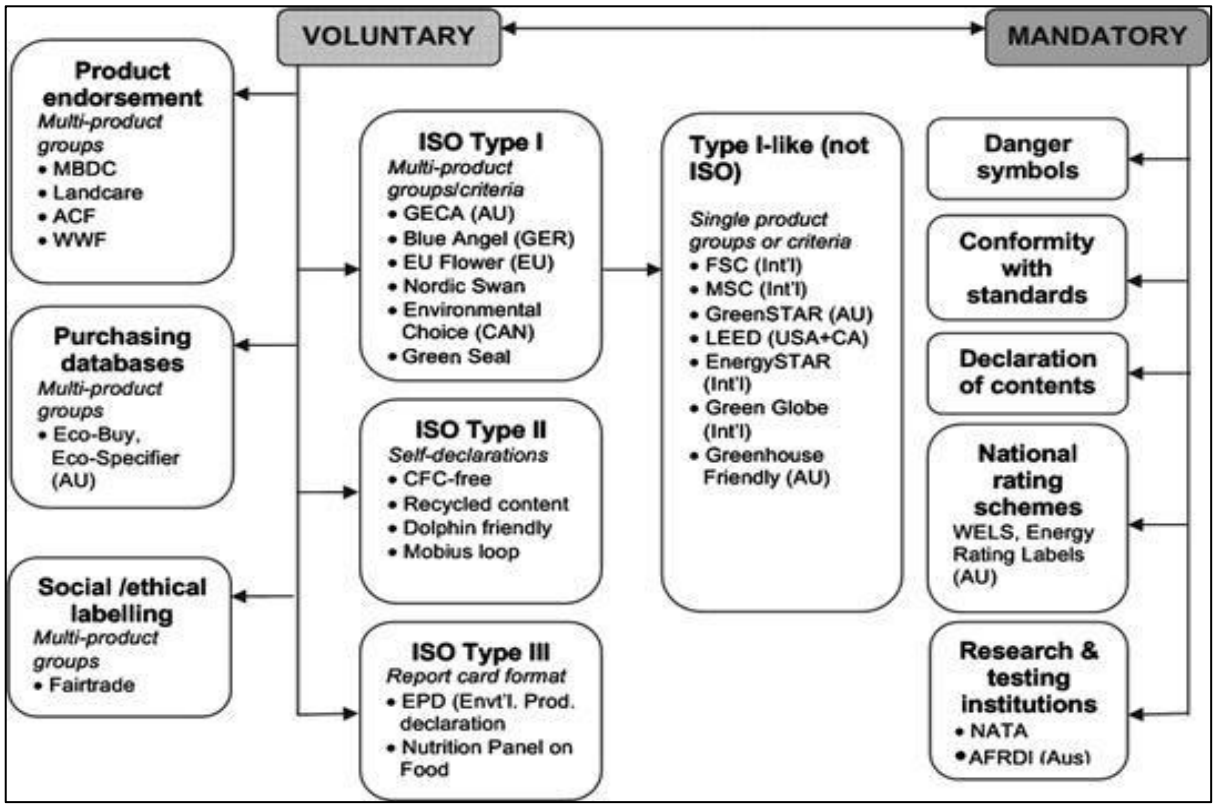


Figure 8: *Classification of eco-labels (Rubik and Frankl, 2005)*

Figure 8 demonstrates the differences in what constitutes a voluntary and mandatory ecolabel. Mandatory approaches mostly consider the health and safety aspects of products, giving details of chemical substances, correct usage and disposal of the product, as well as other types are certificates of conformity of products with specific regulatory requirements (Rubik, 2015). Whereas voluntary labels leaves it to the supplier to declare. Manufacturing and sale of agricultural produce in South Africa is regulated by the Department of Agriculture, Fisheries and Forestry (DAFF, 2020). So testing would therefore correspond to the requirements in DAFF for honey and beekeeping, which would include raw and pure honey.

2.6.6The Challenges to Eco-labels

There are many deceptive retail practices that results in consumers believing that they are making an environmentally conscious purchase (Jamil and Mahadi, 2017). This is known as “greenwashing” and is prevalent in eco-labelling activities, as not all eco-friendly

claims are genuine. For example, self-declared eco-labels that include non-certified sustainable practices can be associated with greenwashing and endanger the perceived value of eco-label (Delmas and Gergaud, 2021).

In a study for the American Academy of Advertising (2018), it was posited that green consumers environmental consciousness would not help in greenwashing detection, but rather enhanced their belief in it (Dongjae and Taeyeon, 2018). The study for the academy involved three types of greenwashing advertising namely vague claims, false labels and true green advertising. This study asserted that green consumers are likely to accept deceptive environmental advertising (greenwashing) owing to their sincere desire to safeguard the environment (Dongjae and Taeyeon, 2018).

Therefore, there is a dependence for consumers to be aware of the labels, advertising and packaging and to assess the sources of information, in order to make sustainably informed choices. The requirements for certification is therefore critical in agricultural sustainability and sincere green consumers, who believe that they are supporting a form of environmental conservation.

2.7 Conclusion

This chapter provided background to understanding the levels of complexity of sustainable development. It highlighted key moments and modifications in agriculture as demonstrated by the revolutions, leading to the development of industries, which in turn increased population growth. With the world's increased population, has resulted in an increase in consumption, placing pressure on the availability of natural resources. The early origins and the introduction implementation of eco-labels, blue-prints and global environmental policies that were birthed out of a series of key UN Summits supported the movement towards preserving present agriculture and natural resources for future generations.

CHAPTER 3: LITERATURE REVIEW

3.1 Introduction

The previous chapter provided a theoretical underpinning to beekeeping and agriculture, contextualizing the problems and highlighting the urgency for natural resource management in order to ensure its sustainability. Here, literature pertaining to beekeeping and agriculture in South Africa is reviewed in light of agricultural sustainability. It commences with the history and origin of the trade, leading to its commercial development and status quo of the industry. To ensure sustainability and the safeguarding of the beekeeping industry in South Africa for future use, applicable South African legislation is referenced, this is followed by the requirements to comply with the eco-label standards.

3.2 The History of Beekeeping in South Africa and the Global Importance of the Industry

The history of early honey trade in South Africa began in the Outeniqua Mountains in the Western Cape, translated to English Outeniqua means “the land of the honey gatherers” (Cambray, 2008). The mountain range falls between the southern coast and the Klein Karoo. Evidence of rock panting dating back fifteen thousand years are found throughout the mountains depicting hunters and honeycombs (Cambray, 2008; Cape Nature, 2019). This area is ascribed to the Khoi San a nomadic hunter-gatherer group, who once inhabited the mountains and would harvest honey (Cape Nature, 2019).

Historical accounts suggest that the Khoi San would travel south, for hundreds of kilometres on end to trade honey with the Xhosa, an Nguni ethnic group of southern Africa. The honey fermented from the retention of pollen grain residues that collected on the fur of the animal hide that the Khoi San used to contain and transport honey. Both pollen grains and honey contain yeast and during transit exposure to heat and precipitation, dilutes and activates the yeast concentrate causing it to ferment, turning it into alcohol (mead). This was of greater bartering value with the Xhosa than ordinary honey. This is

how scientists believe honey brew or mead ("iqhilika") was first discovered (Cambray, 2008).

Further records were documented in a field journal by Dutch colonial administrator, Commander Jan Van Riebeeck. It showed honey and bee related incidents across the former Cape Colony (Du Preez and Moodie, 2015). The field journal suggested that between 1652 and the 1800s, was an era of honey hunting rather than beekeeping. Similar to how the agricultural revolution transitioned from hunter-gathers to agriculture. As honey bees were not kept or domesticated to produce honey, but rather hunted, as part of the nomadic way of life. European explorers such as Francois Le Valliant (1781-1784) and John Campbell (1811-1814) also provided documented evidence of vast amounts of honey dispersed across the globe, including South Africa (du Preez and Moodie, 2015). This suggests that hunting honey was a common global practice. The demand for honey persisted during the early colonial period owing to the increased development of the Cape Colony and the explorers continued search for new farming and trade possibilities (Moodie and du Preez, 2015).

Despite the development and continued search, formalized beekeeping had still not been introduced (Moodie and du Preez, 2015). A reason for this, as suggested by Anderson (1985) was that during the earlier stages of European settlement in South Africa the domestication of honeybees was not considered a necessity, as there was abundance of wild honeybee nests readily available for honey hunters, which did not require beekeeping. It was only when the fruit industry started to develop in the Western Cape, that it warranted the need for the domestication of honeybees for use in pollination services (Lubbe, 2005). The first indications of the origins of beekeeping practice in South Africa, emerged in the early 1900s. The lack of formal apicultural instruction was however a major deterrent, and was only introduced a few years later in 1911 by the establishment of The South African Beekeepers Association (SABA) comprising the Associations of Western Cape Kwa-Zulu Natal and then Transvaal (Lubbe, 2005). SABA was affiliated to the British Beekeepers Association, that marked the start of apicultural instruction and modern commercial beekeeping (Lubbe, 2005). Beekeeping methodologies were modelled on European influence, with the first Langstroth hive (man-made beehive) from England in the late 1920s (Lubbe, 2005). The Department of Agriculture initiated the appointment

of a honeybee specialist, Dr Lundie in 1923, who standardized the use of Langstroth hives as common practice for beekeeping equipment.

In addition to honey harvesting, was the discovery of pollination by honey bees. In Arthur Dobbs (1750) book entitled "*The discovery of the pollination of flowers by insects*" he brought all historical accounts of pollination by insects to light, his book made reference to Joseph Gottlieb Kölreuter, acknowledged for being the founder of pollination. Kolreuter observed that flowers were pollinated by bees and addressed this with the Royal Society of London in 1750. The pollination by bees stands out in contrast to birds and other insects, as bees assist with maintaining natural plant communities and ensuring dispersal of and production of seeds in most flowering plants (FAO, 2008). The role of pollination for agriculture contributes to development indices, such as Gross Domestic Product. Kolreuter's 17th century observation, remains critical to food security and the biodiversity conservation in the 21st century. Pollination supports both natural and domestic landscapes.

Meliponiculture is an alternative method to traditional beekeeping, as employed in the sixteenth century by the ancient Maya, (Cartopassi Laurino *et al*., 2006). Meliponiculture refers to keeping stingless honey bees for honey, pollen, resin, and ecological services (Chidi, 2017). Stingless bees are one of the most important pollinators of native plants and economic crops in tropical and subtropical parts of the world. The economic utilization of Meliponiculture has primarily been reported in Asia (Rattanawannee and Duangphakdee, 2019). Stingless bees are considered to be an enhancer of pollination services both in an agricultural crop and natural ecosystem (Rattanawannee and Duangphakdee, 2019). Stingless bees are generalists, and possess a behavioural characteristic known as flower constancy, which makes it more pollinator efficient (Chidi, 2017). Pollinating animals sometimes restrict their visits to flowers of a single species, the tendency to specialize in this way is known flower constancy (Waser, 1986). Stingless bee colonies have natural longevity and lack a functioning sting, deeming them suitable pollinators for crops cultivated in inhabited areas (Chidi, 2017). This method of beekeeping is therefore supplementary to traditional beekeeping, and it adds value to agriculture as flower constancy and its related pollination efficiency has the propensity to increase agricultural yields. This suggests that it could possibly assist with food security, particularly for monocultures, owing to its flower constancy.

Agriculture, forestry and fisheries are affected by and similarly influence all types of ecosystem services. Ecosystem services are defined as the benefits and economic value humans derive from ecosystems. Bee pollination specifically, falls within regulating ecosystem services which refers to the maintenance of ecosystems that sustains or stabilizes productivity (Millennium Ecosystem Assessment, 2001). Ecosystem services such as pollination are essential for human survival and have significant global value at around USD 16 to 54 trillion a year (Constanza *et al.* 1997). Thus showing the importance of pollination to sustainable development, as it is a catalyst for food security (social), biological diversity preservation (environmental), and it also contributes to economic growth (economic). Showing the interconnectedness of the pillars of sustainability.

3.3 The Beekeeping Trade and Industry Status Quo in South Africa

Geographically, Ethiopia, Tanzania and Kenya's honey production and exports are exponentially higher than South Africa. In comparison to the rest of the southern hemisphere, it is estimated that up to two hundred thousand swarms are managed in South Africa, while more than triple this amount is managed in Australia and double in New Zealand, Chile and Argentina (Langenhoven, 2021). It is estimated that South Africans consume five thousand tons honey per annum, whilst production only amounts to two thousand tons per annum. This means that honey consumption exceeds production in South Africa. Thus making South Africa a net importer of honey, as the country imports more than it exports. To balance the deficit, more than three thousand tons of honey is imported from China annually, whilst South Africa export to other countries is nearly zero (Knowler, 2018). These points are elaborated further in the chapter, where they are raised as concerns in the industry.

Data from 2016 demonstrated that there were about one-hundred-and-five-thousand (105 000) beehives in South Africa (SABIO, 2016), which is evidently nominal in comparison to rest of the world. Increasing evidence indicates that the intensification of agriculture in recent decades, alongside changes in land use and farming practices, has impoverished farmland as a habitat for insect pollinators (Carreck & Williams, 2002; Naug, 2009). This reduction will negatively impact on agricultural produce, which hinders further growth and development for the country. Jarvis *et al*., (2009) maintains that an understanding of

pollination ecology will lead to a better agricultural economy through better and more sustainable yields.

Commercial beekeepers on their own are not capable of providing all the necessary funding and infrastructure needed to support and sustain the honeybee population in South Africa (Allsopp, 2014). This implies that the beekeeping industry would require intervention (governmental or private sector) to support the industry and promote growth. Also noteworthy is that the perceived value currently derived by beekeepers from their honey bees surpasses the importance of agriculture and conservation (Allsopp, 2014). This infers that the contribution of beekeeping to agricultural and conservation is low if the value of beekeepers tending to beehives is of greater value and worth more to them. South Africa's honey production (latest recording) contributes merely 0.11% of the world's total production (Langenhoven, 2021).

3.2 Honeybees and Beekeeping: Significance for Biodiversity and Commercialization

South Africa being a global biodiversity frontrunner, has extensive wild resources that contribute immensely to the country's economy. Biodiversity supports livelihoods either through direct-use or as a source of income (Shackleton & Shackleton, 2004; Shackleton, 2005). The development of local biological resources that are of high value, aids in reaching social objectives of empowerment and job creation, as well as creates the incentive to conserve biodiversity (Shackleton, 2005). This means that by commercializing natural resources that are of high value, in turn supports socio-economic welfare, which serves as a motivation to conserve biodiversity, thus perpetuating a green economy. Different scenarios of biodiversity commercialization applicable to beekeeping are presented below:

3.2.1 Pollination

The demand for pollination was forecast to double in 2021, this was to accommodate the changing profile of deciduous fruits, the increases in vegetable and its related seed production; as well as the expansion of macadamia nut plantations (Allsopp, 2016). South African beekeepers in the deciduous fruit industry receive between one hundred and eighty nine to eight hundred and twenty eight million rand per annum from the ecosystem service of honey pollination (Allsopp, 2016). This was according to SANBI (2020) who also

stated that the local honey industry sees an average turnover of over three billion rand, producing 2000 tonnes per annum. Which is evidently significantly less than the rest of the world.

The conservation of biodiversity particularly of honey bees and wild pollinators is critical for realizing the potential yields of numerous cross-pollinated crops, hybrid seed production, and the preservation of species endemism (Thakur, 2012). Honeybee pollination happens inadvertently when foraging for nectar, pollen or floral oils, required for reproduction (Johannsmeier, 2001). Bees are paramount to both wild ecosystems (more than twenty thousand species of bees are wild) and domestic agriculture. The absence of bees and other pollinators such as birds and bats would eliminate food crops such as coffee, apples, almonds, tomatoes and cocoa, *inter alia,* which are wholly reliant on pollination (FAO, 2014). Honeybee pollination gives rise to forage diversity sources for livestock, which assists with flexibility to adapt to seasonality and climate change and sustains livestock for farmers (FAO, 2014).

3.2.2 Non-Timber Forest Products: Forest Beekeeping

The commodification of materials (other than timber) or resources procured from forests is referred to as Non-Timber Forest Products or NTFPs (Lowore, Meaton and Wood, 2018). There are many types of NTFPs, but specifically insects and their products such as honey bees and honey are included amongst the prime examples.

Forest beekeeping involves the construction and placement of man-made beehives in hope of increasing the number of bee nest sites in a given area of the forest or its trees (Lowore *et al.* 2018). The bee colonies of the indigenous African honeybee *Apis mellifera* live within the forest and forage on nectar and pollen from a very wide range of floral species. Hives are made from locally available materials, obtained from the forest, varying in materials and design. African forest beekeeping capitalises on the wild honeybee population as a resource both for commercial and subsistence use (Lowore *et al.* 2018).

Many African communities that are involved in forest beekeeping are heavily dependent on the income derived from the sales of honey and beeswax. It serves are a primary source of cash for many households, and the number of hives as a wealth indicator (hundred hives or more considered affluent) supporting livelihoods (Lowore *et al.* 2018). Forest honey is common practice in countries such as Zambia, Ethiopia, Cameroon, Tanzania and Angola.

NTFPs harvesting is described as “the practice of extracting economically valuable, nontimber forest products leaving the forests structurally and functionally intact,” (Nepstad and Schwartzman 1992). Natural ecosystems such as woodland districts, as in Tanzania are conserved mainly to train farmers in beekeeping technologies, meant for income generation from the sale of honey. Evans (1993) referred to this as the “conservation by commercialization” hypothesis. Which would serve forest beekeeping well considering it importance for wild ecosystems, it also advocates for wild honey eco-labels.

3.2.3 Afforestation

Beekeeping also contributes to forest and biodiversity conservation by means of afforestation programs (Minja and Nkumilwa, 2016). Trees and over a hundred thousand species of plants have been conserved through beekeeping. They otherwise would have become extinct without bee pollination (Agera, 2011). Beekeeping has proven to be a viable commercial and protective measure that should strongly be considered and integrated into national forest programmes (Agera, 2011) as they have maintained the health of forests for centuries. Considerable honey yields can be obtained where there is suitable forage, such as in forests where there is floral diversity. In Tanzania, bee forest reserves have been established with exclusive access for beekeepers promoting afforestation (Agera, 2011).

3.2.4 Apitourism

Apitourism, is a form of ecotourism that links beekeeping with tourism, it is directed to the natural environment for conservation efforts. It deals with culture and traditions of rural communities beekeeping practices. Apitourism considers beekeeping as a traditional profession using bee products for food, medicinal and ecological purposes (Wos, 2014). Activities associated with Apitourism include apiary visits, bee museums where tourists observe beekeeping methodologies, honey processing and its properties, tourists are also afforded the opportunity to monitor bee colonies, and to understand the ecological relationships between humans and honey bees (Wos, 2014). Apitourism is a progressive practice in Slovenia as it is the first and only country to certify apitourism providers, this attracts great value and generates income for their beekeeping sector in a sustainable manner.

Quantifying the value of ecosystem services such as pollination leads to the development of markets, and would therefore promote wiser use (Shackleton, 2012). Conversely, the absence of markets could lead to environmental degradation. It requires that that natural capital be sustainably used as a source of economic input (Goodland and Daly, 1996). The poor acknowledgment of ecosystem services worth or value means that those who own or control areas (local people and farmers) where the services are produced do not register the real economic benefits that their land provides (Shackleton, 2012). If biodiversity is not managed effectively future options will become even more restricted (UNEP, 2007).

The valuation and Payment for ecosystem services, is a form of conservation banking, it serves as a business approach for people to get paid or compensated for land use practices that reduce negative environmental impacts and protect ecosystem services (Shackleton, 2012). It provides direct economic incentives by all users of the resource to conserve and or encourage wiser use of land and, its resources that supply the resource and or service (Shackleton, 2012). For pollination for example; farmers pay neighbouring forest communities for environmentally- friendly crop production, and respectively conservation donors pay for biodiversity protection and reduced forest harvesting. Pollination is essential to maintain both farm and forest biodiversity. Payments for ecosystem services serves as a great incentive for organizations as regulated by government, allowing for sustainable development. Market-based approaches encourages ecosystem management, and a is method to increase the value of the natural ecosystem.

3.3 The Resource

3.3.1 Characteristics of the Hive: Structure and Ecological Process

Honey bees are social insects and the orchestration of the honeybee hive is governed by a caste system with distinguishable activities, roles and responsibilities. The hive comprises the queen, the highest in the structure, the worker and the drone (male). This section will be briefly discussed in attempt to provide background on honey production, to understand the roles of resource extraction for processing - from the honeybee hives to the market.

The queen bee has two primary functions that is to produce chemical scents that help regulate the unity of the colony and to lay eggs (Johannsmeier, 2001). Only one queen exists per given hive and is the largest bee in the colony, differing morphologically, whereby she is the only female with fully developed ovaries (Johannsmeier, 2001). A strong and productive hive is dependent on the queen, that is central to the colony

(Johannsmeier, 2001). The role of the worker bee is the most multifaceted with a clear division of labour and duties. The worker is also female, but her reproductive organs albeit present are not as developed as the queen, as they are controlled by pheromones that differ (Joahnnsmeier, 2001). The worker is the smallest and the most prevalent member of the colony (about sixty thousand), equipped physiologically to undertake all the work required to run a successful hive.

Worker honey bees graduate between different tasks inside and outside the hive, depending on their age (Butler, 1945). The varying roles, responsibilities and duties correspond to the activity and phase of the worker bee's life. Brooding activities, referring to reproduction is the first phase. Toward the end of the brooding stage, the worker bee commences with the second phase of their duty, known as nest activities. The selection of an adequate nesting site is pivotal as it ensures food storage, thermoregulation of the nest in colder climates and general weather protection in more temperate climates, as well as cavity volume all of which are critical for survival (Beekman *et al.* 2008). Once a suitable nesting site is discovered she communicates the location in the form of a waggle dance (Beekman *et al.* 2008).

3.3.2 Different Honey Bees in South Africa and their Characteristics

South Africa is home to two subspecies of honey bees, that are indigenous to the country; the Cape honeybee (*Apis mellifera capensis*) and the African honeybee (*Apis mellifera scutellata*) (see figure 6). Mitochondrial and microsatellite evidence of the A.m. *capensis* and A.m. *scutellata* populations are indistinguishable according to Franck *et al.*. 2001, but are however characterized by significant differences in behavioural and morphological traits which are differentiated in the table below (SANBI, 2021):

Apis *mellifera capensis*	Apis *mellifera scutellata*
	
DESCRIPTION AND DISTINCTIONS	
The African honeybee has the distinct yellow-striped abdomen, like that of any honeybee, with a slight variation in that its abdomen is also striped with black. It is also slightly smaller bee (average body length of the worker is 19 mm) and the upper body is covered in fine, short hairs. The African bee is also described as an aggressive, tough and resilient bee, capable of producing greater honey crops.	The Cape bee also has the indicative honeybee striped abdomen, but is darker in colour compared to that of other honeybees and sometimes referred to as "black bees". The Cape honeybee is a subspecies of the European honeybee, looking identical to the naked eye and only told apart by genetic analysis and knowing their different behavioural traits. The Cape bee has more docile traits, and unique to this subspecies is that it the worker bee can produce both male and female offspring, which allows the colony to "re-queen" if it is without a queen.
DISTRIBUTION	
The African honeybee occurs throughout South Africa barring parts of Western Cape, and is dispersed across countries to its north and east (Ruttner, 1988). The African bee was also introduced to Brazil in the mid-1950s to increase honey production, the bees adapted immediately to its environment, hybridizing with the locally introduced European bees (Beverley, 2019). Owing to their hardy, aggressive nature, these hybrid bees quickly became known as the infamous "Africanized Killer Bees" colonizing most of South and all of Central America. They gradually migrated to North America, now establishing throughout the south-western states (Beverley, 2019).	The Cape bee occurs naturally in the winter rainfall and southwestern region of South Africa, across the Fynbos biome (SANBI,). It is bounded by an imaginary line that stretches from Vredendal on the Atlantic coastline to Willowvale along the Indian Ocean coastline (SABIO). The Cape bee has not been observed outside of it natural range without human intervention, thus keeping the subspecies segregated (Beekman et al, 2008).

Figure 9: *Differences between the two honeybee subspecies in South Africa*

A hybrid or introgression zone that divides the two honeybee subspecies exist between the regions. This is depicted by a line in the map below, where the two honeybee subspecies are separated (DAFF, 2021). The divide is also regulated by the Department of Agriculture Fisheries and Forestry as outlined further under policy and legislative environment. The A.m. *capensis* and A.m. *scutellata* interbreed without causing a breakdown of the zone or loss of the distinct characteristics of each subspecies (Hepburn and Crewe, 1991). Depending on the differences between the formerly isolated populations, hybrid zones can either be a temporary phase leading to the re-establishment of one interbreeding population, or the two subpopulations may remain separated (Beekman *et al.* 2008). In the case of South Africa, the two have remained separate, the origins or reasons for the divide was not found or known in the literature sampled.

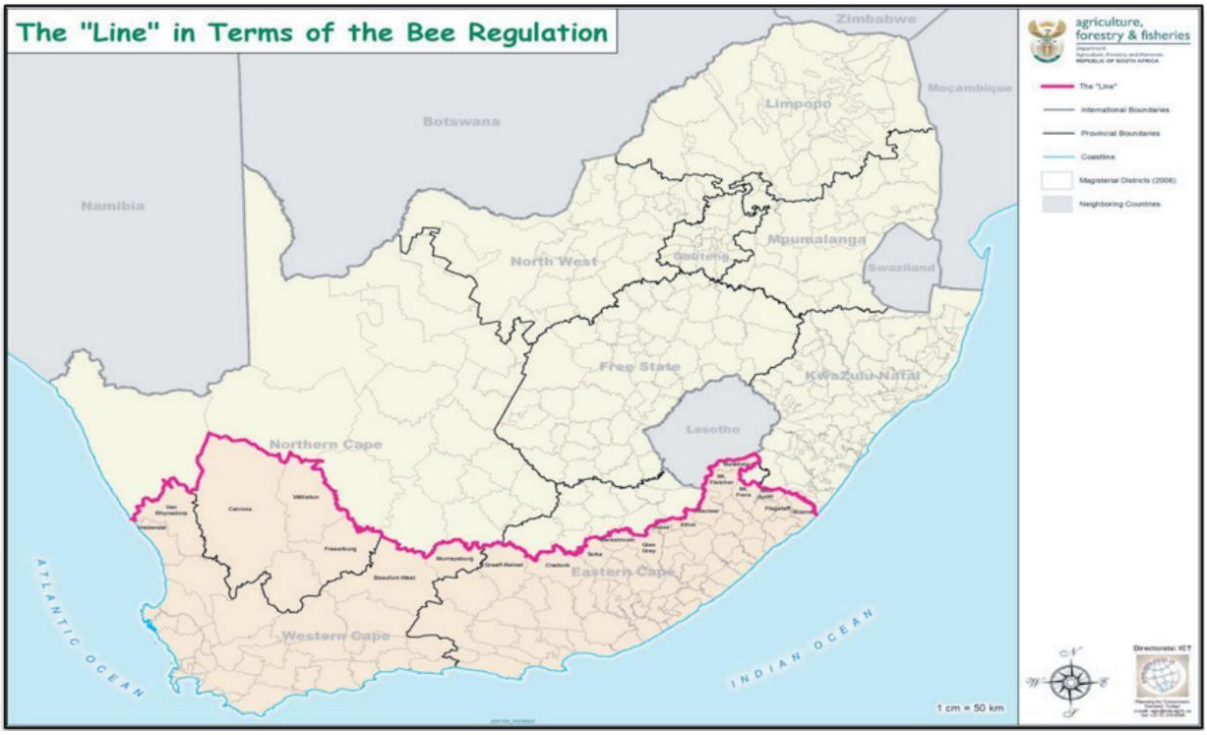


Figure 10: *Dividing line separating Cape honeybee from the African honeybee*

The unique ability of the Cape bee workers to lay eggs, which produce diploid female offspring, called thelytokous parthenogenesis, differs from all other honeybee species wherein the worker produces haploid males, called arrhenotokous parthenogenesis (Allsopp, 2020). This genetic trait gives rise to parasitic and invasive African bee colonies. The Cape bee laying worker eggs invades the African bee colony. Once hatched these invaders then subsequently start to lay their own eggs, competing with the African bees queen's ability to manage her colony (Allsopp, 2016). The original African bee colony is then occupied by the Cape bee, resulting in a collapsing colony. The sudden loss of a colony's worker bee is problematic as hives cannot sustain themselves without worker bees. This is also highlighted as a concern later on this chapter under ecological problems in the industry. This is a cause of disappearance for the African honeybee, when found to be within the same vicinity as the Cape bee colonies. Despite having this parasitic ability, the Cape bee is unable to migrate north of the Cape unless facilitated by a beekeeper (Allsopp, 2016). Parasites, pests and diseases would naturally hinder the honey harvesting output.

3.3.3 Honey Bee Forage: Consumer Preference

Honey bees forage for different resources to meet their dietary and colony needs, this varied diet gives rise to differences in the honey such as the flavour profile (Abou-Shaara, 2014). Honey bees forage freely, traveling several kilometres to do so. The honey bee hive collectively forages on the best forage source in high abundance as they are many to feed. The different climatic classifications (midlatitude and subtropical) of the hybrid zone, supports different types of vegetation, promoting varying forage resources. The Cape honey bee is found only in the Fynbos biome (Mediterranean Climate). The Fynbos Biome is synonymous with the Cape Floristic Region or Cape Floral Kingdom, which is known for its plant species richness (8700 species) and its high endemism (68% of plant species are confined to the Cape Floral Kingdom).

The Fynbos biome is characterized by an ericoid component (Protea family) and restiod component (Restio family) (Mucina and Rutherford, 2006). These floral sources are indicative to labels displayed on honeybee products such as “Pure Fynbos”; “Multifloral”; “ Wild Blossom.” Monofloral honey targets a specific forage source for honey production, which would be the preference of certain consumers. If the hive forages on a particular resource (e.g. Eucalyptus), the flow of nectar would therefore be of that for about a month at a certain time of the year dependent on the diversity of the species present (e.g. Eucalyptus) at a given site. Hives that are stationary require diverse environments to allow nectar and pollen to be available during the year. For “Organic” honey the forage resources are required to be pesticide-free, which safeguards the honeybee and promotes organic farming.

3.3.4 Resource Extraction and Harvesting

As honeybees forage on an array of resources, this influences the flavour of the honey and the corresponding labelling displayed on the honeybee product. Upon the honeybees return to the hive from foraging, it then transfers nectar in the hive by regurgitation (Klein, 2007). This process of regurgitation is repeated until the partially digested nectar is finally deposited in the wax cells of the honeycomb. Once in the honeycomb, nectar is still in its viscous form, the workers then start fanning the honeycomb with their wings in order to evaporate any surplus water and promote favourable temperature, allowing for the moisture content to reduce from about seventy percent to twenty percent (Klein, 2007). This exercise converts or changes the nectar into honey (Abou-Shaara, 2014). Honey is

then placed in storage cells and topped with beeswax in preparation for bee offspring (Abou-Shaara, 2014).

Honey frames are harvested by the beekeepers who extract honey from the honeycomb, generally during spring and summer when they are filled with honey. The first step in the extraction process is to remove the beeswax capping. Once uncapped, the frames are then placed in a honey extractor which spins allowing most of the honey to be extracted. Further honey processing that may occur include heating, straining, sieving, filtration and blending, depending on the beekeeper's selected method or market requirements. These methods of processing correspond to labels such as "Raw" honey, which cannot be heated above natural hive temperatures nor filtered, as well as "Pure" honey which may not contain additives. These are both defined in the DAFF regulations and are discussed in detail later in the chapter. Beekeepers are responsible for ensuring that honey quality passes food health and safety, regulated by DAFF prior to sale, as well as market requirements depending on the consumer preference.

3.3.5 The Applicability of Eco-Labels in Honey Production: South African Agricultural Sector

Hive products for processing and retail include honey, propolis, royal jelly, bee venom, pollen and beeswax and mead. For this study only honey was considered. Honey, by definition is described as a sweet, sticky yellowish-brown viscose liquid or sugary substance made from concentrated nectar of flowers (Johannsmeier, 2001) and is produced throughout South Africa. Honey production and bee pollination are essential for both the economy and the biophysical environment. The eco-labels however serve as a guide or standard to the beekeepers, providing them with sustainable and preservationist harvesting techniques and practices wherein compliance is required. The eco-labels for this study focussed on honey production rather than pollination (which inadvertently occurs), both however can be applicable to agricultural sustainability. The Organic and Fairtrade eco-labels relate to both pollination and honey harvesting, as their standards pertain to general crop management and or specializing in beekeeping (Flocert, 2020; Organic EU, 2020). Monfloral and Wild, given the name of the eco-label, irrespectively could contribute or bear implications for crop pollination and or honey production. Honeybee pollination sustains agriculture and crop variety. Honeybees promote biodiversity in natural landscapes where they have evolved with the indigenous plant species of that area (where they naturally occur). Bees are introduced to transformed landscapes such as

monocultured crops (differing to a natural landscape) for a short period of time if pollination is required. These monocultured crops however do not promote or support biodiversity which is discussed under monocropping and monofloral honey later in the chapter.

3.3.6 Challenges for the Industry: Socio-Economic and Environmental

There has been overwhelming evidence of the South African beekeeping industry practices and activities presented in the media. All forms of media are detecting the same challenges associated with criminality in the industry, the attention drawn to the industry should remain topical and urgent for the sustainability of the industry. The criminal activity of the beekeeping industry in South Africa has been exposed for cases of honey adulteration, where local beekeepers have been caught passing sugar or rice syrup mixtures. Further crimes in South Africa as researched by Masehela (2017) recognizes hive theft and vandalism as a focal point in the beekeeping industry. The crimes in the beekeeping industry show the difficulties beekeepers encounter to have a successful honey production model. Eco-labels are there to support and ensure that the beekeepers, manufacturers and retailers are not selling compromised honey to consumers.

A great deal of South Africa's honey is revealed to be imported from China, and the rest from Zambia, Poland and Romania (Crouth, 2021). Imports from China are much cheaper compared to other countries, this would attract large-scale South African beekeepers, enabling them to supply market demands. Global beekeeping crimes such as tampering of shipping labels to conceal honey origins and adulterated honey being passed and sold as "Pure Honey." Adulterated honey also impacts labels that specify a floral resource, for example " 100% Pure Fynbos," is not a true reflection if it has been blended with rice syrup. As well as "Raw" honey as it has undergone heat application by the beekeeper or manufacturer during processing. These are all self-declared (Type II) eco-labels so there is no certification required, which makes it difficult to administer. These would however be mitigated against in the Type-I-like eco-labels of Organic and Fairtrade, as a requirement to certify to these eco-labels, the coordinates of the apiary sites, along with all the subcontractors involved with the transit and transportation of honey is a compliance obligation (Fairtrade International, 2020; Organic EU, 2020).

Honey crimes have grave repercussions for the livelihoods of beekeepers, as once it has been committed it does not give beekeepers a chance to recover their losses, the hives are

permanently gone and costs for new siting or placement would be incurred (Masehela, 2017). It also discourages bees and beekeeping as whole, which are essential for both natural and domesticated landscapes. In Masehela's study (2017), he assessed different beekeeping practices in South Africa. The study highlighted threats in hive theft and vandalism posed by animal predator and human activity. He differentiates amongst the three types of colony theft which include; removal of the entire hive (box, bees and honey), removal of honey only (bees and hive remains) and the removal of honey and bees (only hive box remains). Allsopp (2013) maintains that these are persistent concerns in the agricultural sector of South Africa. It is a major financial setback to beekeepers who rely on honey sales as their source of income and more than often cripples honey businesses of commercial beekeepers (Nene, 2018). Masehela's study (2017) regards vandalism as major threat to the beekeeping industry South Africa. His study defined vandalism in beekeeping as the partial or complete destruction of the hive where the box, bees and honey are forfeited (Masehela, 2017). The resources and time required to rebuild and replace, these resources comes at a great cost to beekeepers and their livelihoods. The reason for vandalism is related to theft, competition, or as a result of predators such as honey badgers and baboons raiding hives for bee larvae (Masehela, 2017). Foraging bees and their hives are also subject to attack by predators such as wasps, ants and beetles. This problem led to the formation of the badger-friendly eco-label as a conservation measure for honey badgers, and a control for hive losses caused by honey badgers.

According to the FAO (2018), the main occurrence of diseases in honey bees depends on three factors: bees (genetic), pathogens (infectious load), and environment (rainfall variability). To account for each, bees are social insects, foraging on a floral variety, their hygienic behaviour and resistance to various diseases vary from colony to colony depending on the genetic heritage and resilience of the queen bee (FAO, 2014). Genetic variability is important in any animal population as it promotes resilience and diversity. When the majority of worker bees in a colony disappears or die, leaving behind the queen, a surplus of food and a few nurse bees to care for the remaining juvenile bees is known as Colony Collapse Disorder. Colony Collapse Disorder causes structural problems within colony (queen is the highest), leading to its demise. Pathogens depend on the presence of the responsible agent (virus, bacteria, fungus and protozoa) to manifest itself and spread diseases (FAO, 2018). Another commonly reported disease is American Foulbrood. Wherein 2015, forty percent of the Cape honeybee was plagued by American Foulbrood.

It is extremely contagious and difficult to eradicate. The most serious parasite of honeybees however, is the Varroa destructor, which is an ectoparasitic mite that infests the hive (USEPA, 2020). The first report of Varroa in South Africa occurred in 1997, it was common and widespread in both commercial and wild honeybee populations in the Western Cape (Allsopp, 2006).

Environmental conditions and seasonal factors strongly influence the onset and prevalence of diseases (FAO, 2014). With changing climate and varied seasonality such as rainfall and droughts, affects bee forage, which ultimately decreases honey harvesting periods and production. Honey is harvested during Spring and Summer, this is after a prime foraging period for bees, allowing for access to nectar (FAO, 2014). In order to maintain honey flow, nectar needs to be preserved or saved, which is disturbed by the said changing climatic patterns. Changes to climatic patterns disturbs feeding and foraging and increases bee susceptibility to diseases and ailments. Climatic conditions are a main cause for disrupting apiary behaviour, as the longer cold seasons results in bee dormancy (Maurizio, 1975). Honey is less available during rainy seasons and during the drier months hives are susceptible to predators (Maurizio, 1975).

As a control measure, beekeepers utilize pesticides, which are used to manage insect infestation and diseases (USEPA, 2020). Pesticides are also implemented in crop management, where overspray of chemical-based pesticides to beehives occurs. Pesticides are formulated with varying toxicities and chemical properties. Some are designed to kill pests and diseases affecting the honeybee such as Varroa, while others are more directly harmful to the honeybee for deliberate poisoning (Danner, 2016). The use of pesticides can diminish honey bee reproduction, immunity, cognition, and overall physiological functioning, leading to sub-optimal honey bee performance and population reduction (Chmiel *et al*, 2020). Overall, the loss of wild bees caused by diseases and pesticides could have tremendous implications for floral conservation and biodiversity. To mitigate these risks in the beekeeping industry in South Africa. Administrative controls such as legislation, norms and standards are implemented to ensures compliance. Eco-labels fall within the ambit of environment standards, requiring conformance to attain it. Eco-labels are also regulated in some countries particularly in the EU, however in South Africa this is partially the case as covered in Table 1 and Figure 11 below. The said administrative controls guards against diseases, use of banned pesticides and related chemical substances, as well as food health and safety standards.

3.3.7 The Policy and Legislative Environment

The management of honey and beekeeping in South Africa is governed by national legislation and municipal by-laws. The sections of legislation that are most impactful on the beekeeping industry in South Africa, as well as in the context of eco-labels are put forth.

Table 1: *Beekeeping legislation in South Africa (SABIO, 2021; DAFF, 2021).*

NATIONAL LEGISLATION	
NAME	**DESCRIPTION**
Agricultural Pests Act 36 of 1983	Focuses on the restrictions, and permit requirements for the importation of beehive products (i.e. honey and beeswax) as well as used apiary equipment. Section 3 of the Act is specifically for permit requirements for honey importers.
General Notice R1511	Promulgated under the Agricultural Pests Act are the Control Measures for disease control and prevention which includes penalties for non-compliance in terms of these measures. The Control Measure requires the registration of beekeepers with the Department Agriculture Fisheries and Forestry to eradicate the Capensis (Cape Bee) infestation on Scutellata colonies (African bee). Bee Removal Services are also required to register in accordance with the Act. It is also a legal obligation for beekeepers to manage or eradicate American Foul Brood, declared as a notifiable disease.
Agricultural Product Standards Act 119 of 1990	Regulates the sale and consumption of honey or mixtures of bee products, as well as grading, packaging and marking. This piece of legislation is pertinent to the study as it sets the standards for all bee products, particularly the honey varieties such as liquid honey, creamed honey, comb honey and chunk honey. it also defines the two honey grades namely choice grade and Industrial grade for the said honey varieties. In also puts forth the analyses required for determining the standards for the composition, quality and ripeness of honey.
Regulation R835	Regulations relating to the grading, packing and marking of honey and mixtures of bee products intended for sale in the Republic of South Africa. In these regulations any word or expression to which a meaning has been assigned in the Act shall have that meaning.
Foodstuffs, Cosmetics and Disinfectants Act 54 of 1972	Control over the labelling, safety, and quality aspects of the sale, manufacture and importation of foodstuffs. Honey is included in the list of foodstuffs prohibited for sale and importation should it not comply with the provisions of the Act. The requirements for irradiation of honey is also included in this Act. This is to prevent the spreading of pathogens that causes American Foulbrood Disease in honeybees.
Regulation R146	Regulations that prescribe the statutory requirements in terms of labelling, advertising and marketing of foods. It prohibits the use of false, negative or misleading descriptions on the labelling. Primarily the regulations states that no person shall manufacture, import, sell or offer any pre-packaged foodstuff for sale unless labelled in accordance with the prescribed regulation.
National Regulator for Compulsory Specifications Act 5 of 2008	Provides for the administration and maintenance of compulsory specifications in the interests of public safety and health or for environmental protection.

Health Act 63 of 1977	Government Notice R83 of 2018: Regulations Governing General were promulgated under this Act. Overarchingly it covers requirements of the facility or premises where packing and preparation of foodstuff occurs. This includes honey extraction facilities, whereby hygiene and cleanliness standards have to be maintained to avoid contamination.
Conservation of Agricultural Resource Act 43 of 1983	The Act ensures the long-terms protection of agricultural resources such as water sources and vegetation; it also deals with combating alien invasive species, and erosion prevention.
National Environmental Biodiversity Act 10 of 2004	Provides the management and conservation for the country's biodiversity, ecosystems and protection of species.
MUNICIPAL BY-LAWS	
- City of Johannesburg **- City of Tshwane** **- Municipal areas of Free State Province**	Specific municipal by-laws falling under the Health Department within the larger metropoles of the country have been promulgated in respect of keeping bees in urban and municipal areas

Of the cited South African legislation, the Agricultural Product Standards as well as the Foodstuffs, Cosmetics and Disinfectants Act corresponds to the requirements as put forth in the eco-labelling typologies. In the Agricultural Product Standards Act, packaging, grading and marking of honey for sale is regulated, which corresponds to the requirements of honey eco-labels, in that claim made by the manufacturer, importer, distributor or retailer is marked clearly and is transparent on the packaging of the product. This is notably for Type II eco-labels. The Foodstuffs, Cosmetic and Disinfectants Act directly compares to the fundamentals of eco-labels, by regulating labelling for marketing and advertising and prohibiting false and misleading descriptions of the honey. The producer is required to meet the statutory requirements for the particular product. The Conservation of Agricultural Resources Act and the National Environmental Biodiversity Act identifies honeybees as resources and regulates safeguarding the species, protecting ecosystems and conserving biodiversity. As a signatory country to the CBD this legislation supports the international agreement objectives, by adopting the first and second objectives referring to the conservation and sustainable use of biodiversity on a national level.

3.3.8 Standards Advocating Beekeeping: Eco-labelled honey in South Africa

Based on the market research, ten ecolabels were identified in South Africa for honeybee products and used during the data collection phase of the project. They are summarized in Figure 11 below:

SYMBOL	ECO-LABEL	TYPE	SCOPE	Agricultural / Apicultural Management
	Badger Friendly	Type II	South Africa	Predator Control and Hive Protection
	Fairtrade	Type I - like	International	Honeybee-friendly cultivation methods
	Pure	Type II	International	Manufacturing Process (best practice)
	Organic (symbol differs per country)	Type I- like	International	Pollution Prevention; Natural Resouce Use and Management in Practice; Antibiotics and Pesticide Controls
	Raw Honey	Type II / Agricultural Product Standards Act (ACT No. 119 OF 1990)	International	Manufacturing Process (Best Practice)
	Monofloral Honey	Type II / Agricultural Product Standards Act (ACT No. 119 OF 1990)	International	Consumer Preference / Beekeeping Practice for Hive Placement
	Wild	Type II	International	Consumer Preference / Beekeeping Practice for Hive Placement
	Mobius Loop	Type II	International	Waste Management Incorporated Into Practice

Figure 11: Eco-labelled honey products in South Africa (*blue suppliers own)

3.3.9 Badger Friendly

This label is laden with literature to provide background and insight to a unique and original South African eco-label, that is mostly applicable to honey or honey products. Honey badgers are considered to be rare, existing in low densities throughout South Africa (Smithers, 1986; Kruuk &Mills 1983) and it is commonly understood that there have been population declines with local extinctions in areas where badgers were persecuted (Comrie-Greig, 1985). They have a slow reproductive rate, with reproduction recorded February, June and December (Fairall, 1968). Some authors suggested that badgers only mate after feeding on honey implying a connection between breeding and honey (Sikes, 1963, Verheyen, 1951).

The first accounts of beekeeping problems with honey badgers in South Africa are documented in journal articles from the early 1950s to the late 1980s. They are cited as being a pestilence and invincible beehive destroyers distributed throughout tropical Africa (Smith, 1953; Attfield, 1969). Honey badgers are instinctively hardy and fearless animals, they are built with strong claws adapted to breaking, excavating, pushing and climbing as well as being coated with a sting-proof hide (Smith, 1953). Attfield (1969) doubts that any other continent has as many or varied enemies of honeybees as those found in Africa, singling out the Honey Badger as being important. Owing to the many enemies in tropical habitats, bees have developed very strong defence behaviours to resist these adversities, Fichtl (1995) however highlights honey badgers as being a serious enemy of bees and beekeepers.

Honey badgers are omnivorous, foraging primarily on rodents, small reptiles, arthropods, amphibians, birds, and mammals, as well as roots, bulbs, berries, and fruits. Kingdon's (1989) study showed that the attack on hives were closely correlated to the seasonal flow of honey. The distribution of the badgers in South Africa are both widespread and nowhere common. This indicates that these species can adapt to most environments, showing a wide habitat tolerance throughout their range.

Their foreclaws enable them to unearth field nests which are otherwise inaccessible to other predators such as baboons or human beings. They can push hives off stands, and smash timber 7/8 inches thick (Attfield, 1969). Botha considers the badger as the most devastating to field nests. Ultimately Honey Badgers are denoted as a formidable opponent in the animal kingdom and in South African literature there is an old saying (adage) "as tough as a ratel" (Botha, 1970), which demonstrates the resilience and problem-solving abilities of the honey badger;

Apart from the Honey Badger's natural form Kigatiira (1984) describes the ingenuity of these animals. Kigatiira (1984) observed badgers in Kenya, noting how they have learnt to tip over suspended hives so that the lid falls off allowing the comb to spill out, as well as emptying hives at night by repeatedly holding their tail (anal secretion) in front of the hive entrance. Bees (being highly sensitive insects) are disturbed by this act and they start attaching themselves to the badger's tail, where they are then transported some distance from the hive, the badger returns to remove the free (from bees) honey and combs. In addition to its impervious, sting-proof hide, they have also learnt that they can protect their skin from stings by rolling in mud, which is then sun baked, serving as a protective coat.

In terms of beekeeping, badgers can reach and destruct hives and to withstand beestings whilst doing so, making them increasingly difficult to catch, more so than any other honeybee predator, to causing loss and disturbances to beekeepers. Their characteristics and genetic traits, makes them difficult to manage and was a cause for beekeepers to intervene for the sake of their livelihoods.

Badger Friendly Initiative in South Africa

To mitigate this problem beekeepers started implementing trapping methods. In the Western Cape, Stuart (1981) maintains that the majority of these animals were killed during predator control programmes by means of gin traps (more specifically referred to as steel-jawed leghold traps), which clamps the legs of the badgers causing them to be lynched at the stake. A museum post-mortem conducted on two badgers after trapping showed that they had chewed off their remaining lower limb in attempt to escape the trap – but were unsuccessful (Begg, 2001). These methods are cruel and unethical, but at the same time it also exemplifies the level of resilience of the badger.

Gin traps fractures the limbs of the badgers, and tears muscles and tendons from the sharp, protruding spikes on the trap (Begg, 2001). It is a grisly practice to deter honey badgers from beehives. They are widely used by beekeepers as they are amongst the cheapest method; cheaper than cage traps and readily available across the market for instant gratification to the beekeeper. In South Africa they are also legal (without a permit) for catching caracals, black backed jackals and stray dogs (Begg, 2001).

Other methods such as hunting dogs are also used on occasion, this is however avoided because of the risk it poses. As hounds are unable to overpower badgers (Botha, 1970; Stuart 1981). Poisoning is badgers is also common, using a suitable piece of meat (poison is odourless and tasteless), the meat bait is fixed with the poison and then left in the path of the badger close to the hives. This method is however dangerous to other predators, who would be caught in the contaminated food web (McQueen, 1987). Chemical repellents and electric fencing are also employed by beekeepers as a method to deter badgers.

Sustainable and cruelty-free methods of hive protection are exemplified in Kingdon's paper (1989) in Tanzania. One of the beekeepers in his study, who was situated near Tabora hung a number of beehives in trees (155) with a thornbush barrier at the base, these hives were less frequently attacked, using this method and the beekeeper did not lose

a single hive to a honey badger. A senior field officer of the Tanzanian Beekeeping Section designed wire and ground stands both displaying satisfactory results. Confirming that traps, poison, electrocution and hunting dogs were grossly inhumane and ineffective to honey badgers only, as other predators are also implicated.

Kingdon (1989) concluded that modern apiculture is less prepared to lose ten percent or more of its production to these animals and poisoning, trapping, snaring, shooting and spearing are resorted to with increasing frequency. Beekeepers are unwilling are rightfully unwilling to lose production as it directly impacts their income, but the methods to counter act the badger problem remain unsustainable.

Developing the Badger Friendly Honey Eco-Label

Meetings held throughout 2001 focused on the conflict between beekeepers and honey badgers. Representatives in these meetings included commercial beekeepers, beekeeping associations, National Parks Board, the Agricultural Research Council, Western Cape Nature Conservation Board, Walker Bay Fynbos Conservancy, and the Endangered Wildlife Trust.

The primary objective of the meetings was to steer towards the Badger Friendly initiative. The discussions in 2001 were centered around establishing a Code of Practice for these labels and finalizing the accreditation and certification process, where the first version was adopted in May 2002.

It must be highlighted here that the Code of Practice use of the terms “certification and accreditation process” is not technically sound against the definitions as stated in Chapter 2 – refer 2.9. However, to tell their story as extracted from the minutes, the continued use of these terms will be put forth. The Code of Practice formed part of the accreditation and certification process as one of the requirements to pass and attain the label. The objective of the Code of Practice was to ensure adequate protection of the honeybee colonies from honey badgers. This piece of data was critical to understanding type of eco-label, indicating that badger-friendly reads like a Type-I eco-label. Amidst the ongoing meetings; email correspondence to the ARC continued, concerning beekeepers and their alternative methods for beehive protection from badgers (namely ground, elevated and or suspended) as well as their respective input toward the initiative. Beekeepers, conservationists and the

likes also raised concerns against media involvement for the initiative, fearing that they would change the narrative of the cause.

Concerns were also raised of the recalcitrance of South African beekeepers who had been vehemently against any form of control or regulation, refusing to co-operate in most circumstances, including being part of voluntary beekeeper associations. Indicating that these badger friendly measures could not be enforceable owing to the resistance received by the beekeepers.

The honey badger gained spotlight attention in 2002, following an article published in Africa Geographic on the use of gin traps in South Africa (Begg, 2001). The article received many emotive responses. Television programme 50/50 on South African Broadcast Channel 2 (SABC2) also shared insight on the beekeeper and honey badger conflict. The programme hosted an opinion poll which received in a high number of votes favouring the badger friendly initiative – with continued emails of support to promoting it. Further notable highlights of the year were discussions that ensued with the heads of major retailers that were already advocating eco-labels such as free-range chickens, organic and non-GMO. Requests for funding towards the badger friendly initiative (for high quality pamphlets) were also submitted to Dr Anton Rupert (well-renowned South African businessman, philanthropist and conservationist) and The Peace Parks Foundation (Non-Profit Organization in Stellenbosch).

During the first half of 2002, meetings were held, and mails were sent, to finalize the accreditation and certification process for the badger friendly label. As the aforementioned version one was adopted by the South African Bee Industry Organization (referred to as SABIE at the time). Minutes from the "Honey badger/Beekeeper Working Group Meeting" in 2002 suggested that accreditation would be done by an appointed third party namely Nedbank Green Trust, the Endangered Wildlife Trust (EWT), Wildlife Environmental Society of South Africa (WESSA), Western Cape Nature Conservation Board (now Cape Nature). The external third parties listed are all primarily non-profit environmental organizations, not certification bodies, nor affiliated to IFOAM or ISEAL.

The accreditation and certification process for the badger friendly label comprised nine requirements. These were a procedure for environmentally-friendly and law-abiding certification of beekeepers (producers and traders of products – DAFF registration), a Public Declaration, Code of Practice, a Protocol for obtaining the South African Badger-

Friendly sticker, an application form for the South African Badger-Friendly sticker (which would be authorized by SABIO (SABIE at the time)), a protocol for the badger friendly accreditation of beekeepers (producers and traders of products from the beehive in South Africa), suggested methods of beehive protection against honey badger damage, designated risk areas for honey badger damage to beehives in South Africa (Western Cape, Eastern Cape, Gauteng, Limpopo, North West Province, Mpumalanga), the last section of the accreditation and certification process was the badger friendly audit questionnaire and report (confidential use of the EWT only – valid for two years). The badger-friendly label is a Type II eco-label, but draws from Type-I-like principles, this may create some confusion and open the label to problems and loopholes, as the approach is not entirely rigorous.

Counter Arguments to the Honey Badger's Endangered Status

Vague and non-definitive descriptions of the honey badger make their given rare and protected status questionable. They are elusive, unobtrusive, mainly nocturnal, covering an expansive range of habitat tolerance – yet situated nowhere common (Begg and Allsopp; 2000). Additionally, as per the said emails if beekeepers are continually trapping badgers, it is open-ended as to whether they are a genuinely rare species. The badger is regarded as rare with seldom recordings, yet beekeepers experience serious badger problems- this does not add up.

A study undertaken in 1972 (Guy, 1972) on commercial beekeeping with African bees only showed one incident throughout the research of a honey badger in an apiary (it accounted for about twenty colonies). A study by Stuart (1981) in the Western Cape showed that of his six sightings, he had only recorded one incident throughout the duration of the project of a honey badger breaking into a beehive to get honey and larvae. Stuart (1981) also stated that along the south coast (notably Riversdale); commercial honey producers occasionally complained of damage to their hives by badgers. The study also examined ten badger stomachs, of which seven were completely empty, the balance contained antelope, a water mongoose and bee larvae. This somewhat contradicts the pestilent description of the honey badger and rather draws more attention to the anthropogenic activity as a cause for honey badger endangerment.

During 1986 the Mammal Research Institute of the University of Pretoria, Department of Zoology, proposed a research project to study honey badgers (Skinner, 1986). The project

sought information from beekeepers on the habits of the honey badger. It asked probing questions on how justified and sincere the claims made by beekeepers are of the honey badger as a problem animal. Or on the contrary; how well-grounded the views are of the conservationists. Due to the fact that, if the animal is so rare as stated, it would not be a threat to the beekeeping industry. Whether the badger is in fact rare at all is also questionable given their nature.

The motivation for the study was prompted by the conservation status of the badger. Badgers were regarded as rare by zoologists in South Africa and a protected species in the Western Cape (as aforementioned in the 2000 survey). This was owing to a combination of persecution and habitat destruction by farmers and beekeepers. The research project noted that despite this, incoming reports from two beekeeping associations continued pertaining to the increasing incidence of badger attacks on apiaries. Professor Skinner of the University of Pretoria (lead researcher at the time for the study) suggested that the scarcity of this elusive and primarily nocturnal animal is perhaps assumed incorrectly from the rare daytime sightings. Unfortunately, nothing further surfaced from the study, but the questions posed remain valid.

3.3.10 Fairtrade

The conditions of coffee and cocoa farms post industrialization era, were scrutinized for lacking ethical and sustainable environmental production considerations (Babu, 2020). The Fairtrade Label was founded in 1997 to serve the interests and rights of farmers, workers and producers in the coffee and cocoa industry. Fairtrade Standards are designed to serve as a social movement, supporting the sustainable development of small producer organizations and agricultural workers in developing countries (Flocert, 2020).

The Fairtrade Standards supports the three pillars of sustainability, by encompassing social, economic and environmental criteria within the standard. The standards contain both core requirements and development requirements, directed at improvements that benefit producers and their communities. Traders are also covered by the standards, emphasizing the commitments companies and businesses must comply to contribute to sustainability along their value chain and operations.

The core requirements of the social principles of the Fairtrade label include; training opportunities, non-discriminatory employment practices, no child labour, access to

democratic decision-making and collective bargaining processes, freedom of association of the workforce, conditions of employment (exceedances of minimum legal requirements), adequate occupational safety and health conditions, and sufficient facilities for the workforce.

The economic development elements of the Fairtrade standard helps producers cover costs related to sustainable production. For all Fairtrade products the standard requires buyers to subscribe to Fairtrade Minimum Price and or Fairtrade Premium to the producers (Flocert, 2020). This serves as capital for producers or the farm worker to invest in improving their environmental or farming situation. Environmentally sound agricultural practices is required to meet the environmental development principles of the Fairtrade standard. The focal areas for this include agrochemicals, waste management, soil fertility, water resources and no use of genetically modified organisms (GMOs). Failure to meet all the Fairtrade criteria results in suspension of the producer organization certification, until remedial action is undertaken and verified, otherwise the producer organization will lose certification and be decertified (Fairtrade International, 2020).

Honey is a standalone product that falls within the Fairtrade product classification system, a system that indicates the relevant product standard applicable to the item. Other products include cereals, cocoa, coffee, fibre crops, flowers and plants, fresh fruit, gold and precious metals, herbs, herbal teas and spices, nuts, oilseeds and oleaginous fruit, prepared and preserved fruit and vegetables, sports balls, sugar, tea and vegetables (Flocert, 2020). The Fairtrade Label South Africa (FLSA) was established in 2009. Over the past eight years FLSA has played an important role in the implementation and promotion of the Fairtrade Standards and the Fairtrade Mark within the Southern African markets. (Fairtrade Africa, 2017).

The label, however has not taken off in South Africa for honey, but it has for other products within the classification system such as coffee and cocoa, which was evident during the market research phase of the study.

3.3.11 Raw and Pure Honey

Raw honey as defined in the Agricultural Products Standards Act, means unfiltered , unheated honey, i.e. honey which would conform to the specifications of Choice Grade liquid honey if so processed. There are two grades of honey stipulated in the legislation

namely Choice and Industrial Grade. The grading is used to determine the composition, quality and ripeness of honey, and compliance to DAFF selected tests. Subject to this definition of raw honey, the legislation states that there shall be no grading of raw honey for honey and mixtures of bee products.

The US Department of Agriculture (USDA), defines raw honey is as it exists in the beehive or as obtained by extraction, but not filtered (2020). Raw honey may contain fine particles, pollen grains, air bubbles, comb, propolis and other defects normally found in suspension. Raw honey by these definition refers to honey in its closest natural state, and that is what the eco-label means.

Pure honey is accepted to mean honey as it is, one hundred percent, without additives. Although it is not defined in the Agricultural Products Standards Act, the definition to "additives" is however listed in the definitions of the Act to mean food additives. The definition also makes reference to the Foodstuffs, Cosmetics and Disinfectants Act No 54 of 1972 for further definitions of food additives.

In a separate but corresponding piece of legislation to the Agricultural Product Standards Act; the National Regulator for Compulsory Specifications Act 5 of 2008, stipulates in the guidelines to these regulations that labelling as per any words, statements or phrases which conveys or implies similar concept is permitted only if compliant within its prescribed criteria (Kamanga, 2008). This means that wording such as a "Raw" and "Pure" must also comply with definitions or as outlined in the legislation.

These labels would bear implications for honey quality, the presence of additives means that it is not pure honey, and if it has undergone industrial heating processes it cannot be labelled raw. Both these activities require manufacturing input such as heating and blending, which in turn puts pressure on natural resources such as energy and water, which would have further ramifications for carbon emissions. Noteworthy, Fairtrade and Organic labels are both require the chain of custody, such as the details and location of the subcontractors and transporting agencies responsible for the shipping and transit of these labels (Flocert, 2020; Organic, 2020).

3.3.12 Organic Honey

Organic Honey is a Type I-like eco-label, and is therefore attained through a certification body such as EcoCert and CERES, which is accredited by IFOAM. In Figure 5, showing

the differences between what constitutes as a mandatory eco-label versus a voluntary eco-label. In South Africa, organic honey is voluntary, however in the European Union and in the USA the standard is regulated (EU, 2020, USDA, 2020). The organic requirements are very stringent for beekeeping and shows partiality to extensive beekeeping or fundamental methods as outlined in the first agricultural revolution. The Department of Agriculture, Fisheries and Forestry's National Policy On Organic Production is on its eighth confidential draft discussion paper for the way forward to South Africa.

The government's Organic Commission, formed a partnership with the South African Organic Sector Organisation (SAOSO) for guidance and influence on an array of sustainability issues impacting the sector and society. South Africa previously did not have an organization to represents the interests of the whole organic sector until 2016. SAOSA is a non-profit organization, and a number of small organizations operate within the South African organic sector and participate in the process administered by SAOSO forum. SAOSO introduced a set of South African Organic standards, that are based on the Standard for Organic Production and Processing of International Federation Organic Agriculture Movement (IFOAM) - Organics International. IFOAM is the worldwide umbrella organization for organic agriculture, it is member-based, comprising eight hundred affiliates in one hundred and seventeen countries - as explained in 2.9 above pertaining to accreditation and certification.

For Organic Certification in South Africa, CERES and Eco-Cert was the most cited in literature review, both are however not IFOAM accredited, but they are ISO 17065 certified (conformity assessment – requirements for bodies certifying products, processes and services). Their requirements are however drawn from IFOAM fundamentals and principles (SAOSO, 2020). South Africa does not have an official certification system in place, these are instead conducted by international and domestic certification bodies, nine private certification bodies are however active in the country (SAOSO, 2020). It is possibly also the reason why they have not yet been accredited to IFOAM, as they are in the EU.

The requirements put forth by Eco-Cert for beekeeping will be summarized herein for it comprehensiveness. Eco-Cert has five beekeeping rules required to meet Organic Certification; they are as follows; the origins of the bees (first requirement), specific requirements and housing conditions in beekeeping, husbandry management and identification; feeding and disease prevention (last requirement). Each rule contains subclauses to highlight for each; the origin of the bees, preference is given to the use of local ecotypes (refer to subpopulations genetically differentiated, restricted to a specific habitat and defined ecosystem (Lorca, 2018).

For new apiaries, the standard calls for the origin of organic bees to be constituted by a division of existing colonies or the attainment of swarms or hives from organically certified units. The housing conditions in beekeeping as per the label considers the siting of the apiaries, citing that apiaries are to be placed in areas to ensure nectar and pollen sources comprise principally of organically produced crops that are only treated with low environmental impact methods. The Eco-Cert Organic Standard also requires that the siting of the apiaries occur within a radius of 3km from the apiary site. Sub-clause 2.3 of the specific housing conditions requires hives to be made essentially of natural materials that present no risk of contamination to the environment or the related apiculture product. The eco-label organic is true to the meaning of the word, derived from nature and living matter. It is a very natural approach.

Clause 3 pertains to husbandry management and identification, prohibiting the use of synthetic chemicals, brood combs, mutilation (i.e. clipping wings of queen bees) as well as the destruction of bees in the combs as a method associated with the harvesting of beekeeping products. The feeding requirements (No 4) factors the survival of the hives which could be endangered by climatic conditions, the requirement also request that at the end of production

season, hives shall be left with sufficient reserves of honey and pollen to survive winter. Disease prevention and veterinary treatment protects frames, hives and combs from pests, stating that only rodenticides are to be used in traps. In the event of colonies becoming sick or infested the are to be treated immediately and placed in isolation. The clause also stipulates the permitted physical treatment methods used for the disinfection of apiaries.

This crucial to the broader environmental impacts caused by chemical runoff into farm depressions, contaminating soils and watercourses. The feeding requirements and food reserves also allows for regeneration, which is enabling for sustainability and conservation as it is not a short-sighted approach, by ensuring that there is forage availability during winter (off season). The disease prevention methods promotes resilience within the colonies, ensuring longevity.

According to an article for Wellness Warehouse (2018) contributed by the Agricultural Research Council; Organic South African honey is very rare and there are few people claiming to produce organic honey locally. While there are regulations in Europe on organic honey (bees must have at least a 12km radius area of pesticide-free, fertiliser free land to forage), there are no such regulations in South Africa. Recently, certified organic brands of honey from Zambia have been made available in South Africa. Allsopp entrusts that most honey from Zambia is honestly organic, noting that agriculture in Zambia is very different to South Africa.

3.3.13 Monofloral Honey

Regulations pertaining to the grading, packaging and marking of honey and mixtures of bee products intended for sale in South Africa is administered under the Agricultural Product Standards Act No. 119 of 1990. The act makes it clear that no wording, illustration or other means of expression which could constitute a misrepresentation or may create a misleading impression of the content. This is not permissible on any container with honey or mixtures of bee products. Further restricted particularities on containers as cited in the Act include the word “honey” or any representation of honey thereof is not permitted to appear anywhere on any honey substitute, its label or packaging. The legislation also states that unless such honey substitute contains any honey, then the word “honey” is only permitted to appear within list of ingredients of such honey substitute.

Following this, as defined in the Agricultural Products Standards Act, floral honey ("blossom honey") means any laevorotary honey derived essentially from the nectar of flowers. Monofloral refers to honey derived from nectar source of a single or particular plant species. These include orange blossom, Blueberry blossom, Fynbos, Eucalyptus, amongst other variants on the shelves in South African markets. All honey producers or packers are required to comply with the requirements as mentioned in the regulations regarding the grading, packing, and marking of honey and mixtures of bee products intended for sale in South Africa. The legislative implications for anyone who fails to comply with the provisions of the regulation shall be guilty of an offence and upon conviction will be liable to a fine or imprisonment (DAFF, 2020).

Honey bees remain true to a type of forage, until they complete production, essentially meaning that bees with stay on source, completing what was started (Klein *et al.* 2019). It does not imply that honey bee colonies are left at a site with a single forage item for an extended period of time. As honey bees are social insects they forage freely. It depends on the floral availability, in that if the hive forages on a particular forage resource, the flow of nectar would also therefore be of that particular forage resource for a short period of time.

This extends to all honey labels, that means of expression (wording, illustration inter alia) on all honey or mixtures of bee products that could misrepresent, create misleading impressions or content must be visible on all its containers. The labelling and its related means of expression placed on honey and bee products is therefore legally binding.

3.3.13 Wild Honey

Wild honey is not cited in the honey regulations, but wild honeybees are opposite to domesticated bees (bees kept by beekeepers). There are no feral honeybees in South Africa. Honeybees in South Africa are an indigenous species and if managed, the honeybee colony absconds, therefore inherently becoming wild again. South Africa is one of the few countries where this is the case. In a natural landscape wild bees exist in forests, woodlands and grasslands where there is an abundance of flowering plants. This promotes foraging on an array of nectar, and not specifically limited to one source of forage (Butz-Huryn, 1997). Beekeeping is a branch of agriculture, so in essence beekeeping is viewed similarly to keeping livestock. Managed bees versus wild bees are comparatively different, according to SANBI wild African bees that are trapped into hives often abscond and swarm, leaving beekeepers uncertain of the impacts on honey quality (SANBI, 2020). Wild honey on labels would therefore be opposite to monocultured honey in this context, where the access to forage is restricted to one source. Examples of NTFP come to the fore here, where honey is harvested in forests and rural areas, this contrasts to commercial beekeeping practices. This is favourable for forest management in terms of pollination for tree endemism and ecosystem productivity. However, in order to acquire the honey could result in a partial destruction of the nest site, affecting the continued productivity of the hive.

3.3.14 The Mobius Loop

The origins of the universal recycling symbol was created for the first anniversary of Earth Day in 1970 (Vitaliev, 2017; Dolic *et al.* 2010). It was created by a student at the University of Southern California School of Architecture, who won the Earth Day design contest on raising ecological awareness, the contest was sponsored by a big producer of recycled paper and cardboard in the US (Vitaliev, 2017). It is represented by spinning arrows (three-chasing arrows), symbolizing the cycle of life and is one of the world's most recognisable design logos.

In 1984, as a request from the ISO Technical Committee (ISOTC 145), the Mobius loop was registered and inserted into the catalogue of symbols for ISO 7000. In 1999, ISO issued the 14021 standard confirming the Mobius loop as the symbol for recyclable, or processable, material (Dolic et al. 2010). Dolic *et al.* (2010) emphasized that since the symbol belongs to the public domain, its use is free, and therefore very difficult to regulate.

The free, unregulated and public domain access, has enabled adaptations and variations of the symbol on the market which are not in accordance with ISO 14021 (Vitaliev, 2017; Dolic et al. 2010). The present symbol as prescribed by ISO 14021, is different from the original 1970 design, which lends itself to different interpretations by the users of the label and consumers, which is a cause of confusion.

A research paper examining the extent to which consumers in Melbourne, Australia understood recycling information on packaging materials and labelling for common products and their resulting recycling behaviour showed that the consumer's understanding is often very poor (Buelow *et al.* 2009). The research found that despite its moral intentions the confusion surrounding current labelling and recycling schemes can be attributed to incorrect labelling and system complexity combined with a lack of consumer understanding and care (Buelow *et al.* 2009). Such interpretations or confusions include packaging being produced entirely from recycled material and or whether a product or packaging is suitable for recycling.

On the bottom of packaging, a number may appear in the middle of the Mobius Loop. If the packaging is made of plastic, the number will indicate the type of plastic it is made out of or the percentage that comes from recycled materials, these numbers serve as guide for the recycling facilities. Waste management forms part of the lifecycle for the ISO 14001 series, considerations for packaging limits waste generation for disposal.

CHAPTER 4: METHODOLOGY AND STUDY AREA

4.1 Research Methodology

The research approach of the study included both qualitative and quantitative methods, however the study was primarily qualitative. The quantitative portion of the study was intermittently generated, by means of an online Google forms survey which included a 5-point Likert scale, dichotomous questions, checkbox and multiple choice questions, open-ended and closed-ended questions, and picture choice questions. This data was then analysed qualitatively to address broader issued raised in the study. This comprised a desktop study and literature review. The fieldwork consisted of market research (identifying eco-labels displayed on honeybee products) and semi-structured key informant interviews.

The purpose of all interviews is to gather reliable information pertaining to the research topic (Hofstee *et al.* 2009). Both interviews and surveys are a way of extracting information directly from the person or people who are presumed to have the prerequisite knowledge and experience in the given field of study (Hofstee *et al.* 2009). Since this study is grounded in the social sciences, qualitative methodologies were employed as it was the most applicable in terms of meeting the research objectives outlined here.

Therefore to address the second, third and fourth objectives of the study, interviews and surveys were the necessary research methodology techniques employed to underpin the theoretical understanding of the honey eco-labels in a practical context. It was paramount that the data collection processes included first-hand and in-depth investigation into the beekeeping procedures and practices in South Africa. The shortcoming however of this approach is that it can return biased results and be difficult to analyse the given data (Hofstee *et al.* 2009).

4.2 Sampling

Fieldwork was undertaken intermittently over a period of two quarters (last quarter of 2019 to the first quarter of 2020) in the Eastern and Western Cape Provinces. It was limited to time, travel and participant availability. The sampling approach for interviews was both voluntary by beekeepers who were willing to participate and purposive, by deliberately selecting suitable

participants who would aid in meeting the aim and objectives of the study. This provided a diverse range of perceptions, and was beneficial for data collection.

This type of sampling enables the emergence of common patterns and derives significance from intersecting heterogeneous data sources (Patton, 1990). The recruiting of prospective research participants was guided by the South African Beekeeping Industry's (2020) distinction of beekeepers to ensure that data would be sampled from a range of beekeepers of varying number of beehives. In terms of the industry's list beekeepers can be defined as follows; commercial beekeeper, small scale, hobbyist beekeeper and smallholder/developmental beekeeper; co-operative bodies or Community Development projects.

The target group consisted of the first (commercial, small-scale and hobbyist) listed above, using a voluntary and purposive approach allowing for an array of beekeepers perceptions and information of the industry and activities in South Africa. This also addressed the first objective of the study of identifying eco-labelled beekeepers.

4.3 Potential Interviewees

After studying the various honeybee honey product labels and learning what was available in the local markets to consumers in South Africa, initiatory contact and networking with the relevant gatekeepers and chief role players for interviews proceeded. Email correspondence, telephonic calls, social media posts and messages were used to make contact and communicate with prominent beekeepers, organizations and retailers who are involved in beekeeping in South Africa. Of which included the South African Bee Industry Organization (SABIO), the Agricultural Research Council (ARC).

SABIO is an organised body representing the Beekeeping Industry in South Africa on all levels; local, regional, national and international. It also acts as the representative in all dealings with the state, forums affecting the beekeeping industry and agriculture as well as trying to stay abreast of world-class apicultural standards for the country. SABIO includes all persons involved in the keeping of honeybees whether for commercial purposes, recreational use, honey production and or pollination (SABIO, 2020). Some of the beekeepers that are SABIO members own generational beekeeping establishments such as apitourism farms, training facilities and related equipment, a meadery and specialist honey stores.

Additionally, SABIO extends its involvement to research, training and development in Apicultural Science and Beekeeping. As well as bottling, packaging or manufacturing of honeybee products, sales or manufacturing of beekeeping equipment and the capturing, removing and relocation of honeybee colonies – these all fall within the South African Bee Industry.

The Honeybee Research Department at the ARC, is a leading science institution that conducts research with partnerships to support and develop the agricultural sector of South Africa. The Department of Agriculture and Forestry appointed their first bee specialist in 1923, and a beekeeping officer in 1950. The Honeybee Research Department focuses on research, development, training, skills and diagnostics services for beekeeping (ARC, 2020). The ARC is to host to several publications on South African honeybee literature. The council is acknowledged widely for its honeybee research and related fields, and has also principally authored numerous publications.

Upon researching SABIO, led to the discovery of an online forum (Google groups) called apiculture-sa@googlegroups.com. Apiculture SA is a very actively engaging platform for all scales of registered South African beekeepers, researchers, enthusiasts as well as chairpersons of local, regional and national beekeeping associations. Access to the group was granted upon submission of an overview of the research topic along with the university's ethical clearance as consent to be a member. This became the most reliable and advantageous approach, as it served as a database and beacon towards potential and future research participants.

Discussions, articles, latest developments, concerns and controversies are brought to light in this forum by the beekeepers. Joining the group was also very enabling for snowballing and networking core research participants for interviews. This group was formed in 2010, and is independently administered, with 830 subscribers (Lennox, 2020).

Fieldwork was twofold comprising key informant interviews followed by a voluntary online Google forms survey, of which the research participants were mainly derived from Apiculture SA group coupled with a social media (LinkedIn, Facebook, WhatsApp and Instagram) advancement. Since Apiculture SA is a Google Group, the online survey optimized Google forms as a survey tool for ease of access and user-friendliness.

Initially the methodology was supposed to only be interviews followed by site visits, of beekeepers showing their process from the farm to the market, to audit the life cycle.

However, owing to a lack of further responses and or cancellations by beekeepers for more interviews, resulted in not meeting the desired number of participants. This led to development and submission of an online Google forms survey which was better received as it was readily available and accessible to participants.

The interviewees a well-renowned honeybee researcher at the Agricultural Research Council (ARC), a beekeeper trainer, owner of a apitourism establishment, generational beekeepers. They comprised large scale commercial beekeepers, small scale beekeepers and hobbyist beekeepers. Seven of the respondents were found and contacted from the Apiculture SA group and four later from public posts shared on social media. The introductions and appointments were made either telephonically or via email. A total of eleven key informant interviews were conducted and forty-one online surveys were completed. Some of the key informants also completed the survey.

The interviews were semi-structured, which led to meaningful interactions that gave insight to the operations of beekeepers and their perspectives on the (mis)use of labels in the industry. Semi-structured interviews allow for digression from a set format in either questions or answers (Hofstee *et al.* 2009); and in this instance it was more answers as informal discussions occurred stemming from the posed questions. Of the interviews conducted, nine were in person and two were telephonic where answers were handwritten ad verbatim and noted in a fieldwork journal. Of the nine interviews, six were done on an individual basis, two were done jointly or in pairs, and one collectively as a family of three. All interviews were conducted in English and each took about one and half to two hours.

Information describing the survey were then shared publicly on all social media, which was further circulated by peers as is commonly done on these platforms. Beekeeper names were referred for contact and responses from beekeeping business pages were received, requesting the link. This also led to contact with members of the Kwa-Zulu Natal Bee farmers Association, whereby further correspondence with beekeepers ensued. The survey responses were kept anonymous and the survey employed user-friendly checkboxes, open and closed-ended questions with graphical representations of the honey labels.

4.4 Data analysis

The interviews and surveys served as primary data, where patterns and themes were identified and defined and then aggregated into codes. In qualitative research, this methodology is

termed “memoing” and it assists the researcher in progressing from raw data towards concepts that explain the research phenomena in its given context of study (Birks et al.., 2008; Punch, 2013).

Information obtained from interviews and surveys was used to compile a comparative analysis of the beekeeper’s perceptions and practice of the labels versus what is stipulated in the given environmental label’s claim. This helped to collate an understanding of the reliability of these labels and their respective purpose for environmental or social consideration.

4.5 Ethical considerations

All ethical considerations as put forth in the Stellenbosch University’s Code for Research were submitted at the commencement of all communication or correspondence to potential participants. Ethical clearance was received for the undertaking of this study, the project number provided by the University’s Ethics Committee is 7641. Respondents were asked to acknowledge or undersign the university’s ethical clearance forms, containing all the necessary information and contact details, for consent to participate in the study. As per the university’s ethical standards, participants are afforded information specifying the aim and nature of the study, including their roles and rights to withdraw at any stage without any implication. Anonymity was also assured, unless otherwise desired by the respondent.

4.6 Study Area

During the study, it was brought to the fore that beekeeping in South Africa is quite a cryptic practice, as not all beekeepers were willing or forthcoming in disclosing the location of their beehives and apiary sites, especially if it is thriving and successful. This is to protect their hives from competing beekeepers wanting to colonize their site, theft, vandalism and to prevent the loss of their established hives. Hives are more often than not branded and marked by beekeepers (Johannsmeier, 2001), but these corresponding apiary sites are commonly situated in distant or remote locations making it difficult for the beekeeper to enforce precautionary measures and constantly monitor them (Du Preez, 2010).

4.7 Limitations to the study

The research participants were unwilling to disclose exact locations of their apiary sites, closest towns and cities were therefore used as a point of reference. Beekeepers are dependent

on landowners for apiary sites in South Africa, a small percentage of beekeeping occurs on owned land. The beekeepers were unwilling to share their sites as they informed that the value of their apiary site is then compromised and reduced due to competition. Honey bee crimes such as theft and vandalism are also common practice in South Africa and throughout the world. This was a hindrance in understanding the exact geography (spatially and temporally) of the study area, in terms of climate, topography, vegetation, as well as the origins or source of the honey.

Fewer volunteers came forward for interviews, but were more willing to participate in an anonymous survey online. This could also have been owing to time availability of the beekeeper. However, anonymous survey methods are shown to promote greater disclosure of sensitive or stigmatizing information as opposed to non-anonymous methods (Murdoch *et al.*. 2014). Higher disclosure rates are traditionally displayed to have been interpreted as being more accurate than lower rates (Murdoch *et al.*. 2014). This was evidenced during the fieldwork collection where the anonymous Google forms were better supported than the in person interviews.

Of the eleven key informants, one beekeeper in the Eastern Cape showed the lifecycle of their practice; which included the hives, harvesting and bottling for sale, one commercial beekeeper in the Western Cape showed the logistical side of incoming honey and its subsequent manufacturing process, and one beekeeper's hives used for research was also shown. Despite the locational masking, the interviews were invaluable as beekeepers were able to disseminate instrumental information about the industry, having years of experience, training and generational knowledge.

CHAPTER 5: THE BEEKEEPING INDUSTRY IN SOUTH AFRICA

5.1 Introduction

This chapter presents the results of the study, by providing insight to the operations of the beekeeping industry in South Africa. This is illustrated by an organogram (see figure 10 below) of the beekeeping industry and its related associations. This chapter will commence with an account of the beekeepers in South Africa, as well as describing the value chain of the trade, which includes the relevant role-players. Here the selected beekeepers practices are contrasted against the stipulated requirements of the respective eco-labelled honey.

A synopsis of each eco-label is provided, outlining its requirements, for both self-declared (Type II) and Type-I-like eco-labels that are certified by a third party. The results obtained from the research participants during the data collection phase of the study are presented against these outlines, entailing the perceptions of the eco-labels, beekeeping techniques employed and an outlook of the industry. The results are structured around common themes that emerged during the data collection phase and analysis of the study. Counter arguments and non-conformances to the eco-label requirements are also presented in these results.

5.2 Beekeepers in the Local Industry

Any person who keeps, owns, or is in charge of a colony of honeybees in South Africa, whether commercial, hobbyist or as a bee removal service provider, is legally required to annually register with the Department of Agriculture, Forestry and Fisheries (DAFF, 2020) as a beekeeper. This is in accordance with the Agricultural Pests Act, 1983 (Act No. 36 of 1983) - Control Measures R858 of 15 November 2013 relating to Honeybees.

Further to DAFF registration, most of the research participants are also members of SABIO, which is a voluntary operation in terms of the constitution. The organization is run by elected board members who represents the interests of beekeepers and the beekeeping industry, to government and other stakeholders in the agricultural and trade industry. It has been in existence for a century comprising two-hundred and seventeen registered members.

Both the ministry and its related organ of state are presented in the organogram (Figure 10) below, supported by the affiliated regional associations, and the scales of beekeepers which are classified correspondingly.

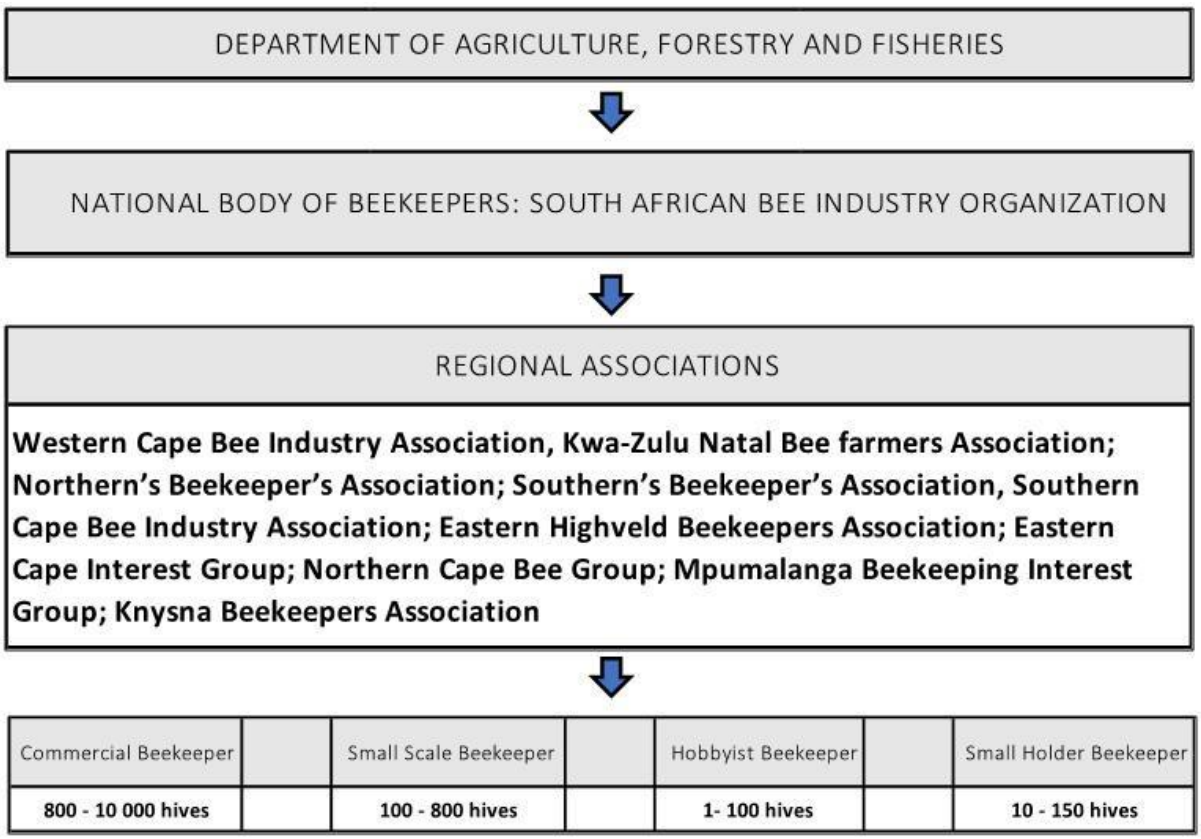


Figure 12: *Organogram of the Beekeeping Industry in South Africa*

From the data gathered in the study it was evident that registered beekeepers have two different roles in South Africa as differentiated in the Table 2 below. A registered beekeeper in South Africa refers to any person who keeps bees and produces honey, and, or, a supplier who does not necessarily keep bees, but rather buys honey from beekeepers to supply supermarkets or for the manufacturing of their own brand. The two roles in the industry are therefore honey producers and honey suppliers, which can apply to both small scale and commercial beekeepers for trading of honey and bee products.

The primary difference for this study is the transparency to the consumer in terms of the origins of the honey and the responsible beekeeper. It was also forthcoming during the data collection phase that honey producers generally will not support honey from anyone else except their own, sharing concerns around the reliability of beekeeper suppliers.

This study's respondents comprised a combination of beekeepers, both producer and supplier, in a commercial and small scale context, as well as hobbyist beekeepers, as summarized in *Table 2* above, comprising the key informants. From groupings of the forty-one online survey

responses, the majority were hobbyist and small-holder (subsistence) beekeepers comprising two-thirds of the total, followed by small-scale and lastly commercial beekeepers. Some of the self-taught beekeepers started as hobbyist and remained hobbyist or small-holder beekeepers, or they developed into small scale and commercial beekeepers to service the market. Both the interviews and surveys remained anonymous.

Table 2: *The role of registered Beekeepers in South Africa*

Honey Producer	**Honey Supplier**
A person who keeps bees to produce honey and/or other bee products (keeps apiaries at apiary sites)	Buys/sources honey from beekeeper/s from multiple sites
Beekeeper transports to own facility	Transported in shipping/containers to a logistical centre or manufacturing facility
Harvested, processed and bottled honey at own "bee room" facility	Honey received from beekeeper, processed and bottled at manufacturing facility
Bottled honey supplied to retailers or sold from own premises	Bottled honey supplied to chain stores or super markets; or sold from manufacturing facility
Sells to suppliers and to the market (and own subsistence)	Sells to the market
Both producer and suppliers in/directly serve the market. Both trade honey products.	

Table 3: *Register of the Key Informants that were interviewed*

Key Informant Interviews	Role in the Industry	Province	Apiary Sites / Manufacturing Facility	Labels produced
Key Informant 1	Well-renowned honeybee researcher and leading author for South African bee literature	Western Cape	Stellenbosch	N/A (Hives only for research)
Key Informant 2	Prominent and generational Eastern Cape Honey brand - Commercial beekeeper (ad hoc bee removal)	Eastern Cape	Cradock, Somerset East, Macleantown, Fort Beaufort, Komgha, Kei River, Mthatha	Choice Grade, Pure, and Monofloral
Key Informant 3	Small scale	Eastern Cape	East coast of East London	Wild Honey
Key Informant 4	Hobbyist beekeeper	Eastern Cape	Port Elizabeth surrounds	Wild Hive Honey
Key Informant 5 (2x Partners)	Commercial beekeeper and supplier to a notable South African snack brand	Western Cape only	Stellenbosch side of Helderberg, Sir Lowry's Pass, Gansbaai, Sandy's Glen, Hermanus, and Walker Bay	Raw, Pure, Creamed and Badger friendly; pollination
Key Informant 6	Chairman of a South African Beekeeping Organization and owner of a generational beekeeping ecotourism establishment - Commercial enterprise	Western Cape	Overberg	Fynbos Honey/Multiflora honey; Pure Honey; Choice Grade
Key Informant 7	Commercial supplier to: 1. Multinational Retail Company (with a Sustainability Division) 2. Major Rooibos Wholesaler	Western Cape	Langebaan (Manufacturing Facility); multiple apiary sites across South Africa	Orange blossom, Fynbos, Blue Gum, Wild Blossom, and Badger-friendly; 100% South African honey;
Key Informant 8 (2x partners)	Prominent industry roleplayers and Manufacturers of Mead and Mead beers	Western Cape	George (Manufacturing Facility)	Choice Grade, Creamed honey, Wild flower (Mead, honey liqueur, honey beer,
Key Informant 9	Commercial beekeeper and trainer, supplier to: 1. Popular South African online store for organic lifestyle 2. SA's largest health, wellness and organic food retailer	Western Cape	Cape Town surrounds	Choice Grade, Raw honey, Creamed Honey, Orange blossom honey, Wild flower honey, Fynbos Honey, Monofloral
Key Informant 10	Hobbyist beekeeper	Western Cape	Somerset West (urban)	Fynbos Honey, multi-floral honey propolis, and beeswax
Key Informant 11 (3xFamily)	Small scale beekeepers and pollination, as well as ad hoc bee and wasp removals and pollination	Western Cape	Cape Town northern and Southern suburbs, as well as the winelands,	Unlabelled/no-name honey

Table 3 above indicates the role of the key informants in the industry, their scale of beekeeping, including the location of either the apiary sites and or the manufacturing facility, as well as the eco-labels that they produce for their honey or bee products.

Table 4: *Online Survey Respondents*

Respondent Online Survey	Scale of activity	Province	Apiary Sites / Manufacturing Facility
Survey Respondent 1	Small-holder	Gauteng	Mogale City (Krugersdorp)
Survey Respondent 2	Hobbyist	KwaZulu-Natal	Margate and pinetown
Survey Respondent 3	Hobbyist	Eastern Cape	East London
Survey Respondent 4	Small-holder	Western Cape	Cape Town
Survey Respondent 5	Hobbyist	Gauteng & North West	Magaliesburg
Survey Respondent 6	Hobbyist	Eastern Cape	East London
Survey Respondent 7	Small-scale	Western Cape	Cape Town
Survey Respondent 8	Hobbyist	Eastern Cape	East London
Survey Respondent 9	Small-holder	KwaZulu-Natal	Pietermaritzburg
Survey Respondent 10	Small-scale	Limpopo	Hoedspruit
Survey Respondent 11	Small-holder	Nil	Nil
Survey Respondent 12	Hobbyist	Western Cape	Somerset West
Survey Respondent 13	Hobbyist	Limpopo	Tzaneen
Survey Respondent 14	On call/demand, Hobbyist	Gauteng	Germiston
Survey Respondent 15	On call/demand	Gauteng	Pretoria
Survey Respondent 16	Small-holder	Gauteng	Pretoria
Survey Respondent 17	Small-holder	Western Cape	Durbanville
Survey Respondent 18	Small-holder	Gauteng and Mpumalanga	Benoni & Middleburg
Survey Respondent 19	Small-scale	Western Cape	George
Survey Respondent 20	Small-scale	Western Cape	Cape Town
Survey Respondent 21	Hobbyist	Northern Cape	Douglas
Survey Respondent 22	Hobbyist	Gauteng	Johannesburg
Survey Respondent 23	Small-holder	Gauteng	Midrand
Survey Respondent 24	Hobbyist	Gauteng	Pretoria
Survey Respondent 25	Commercial	Gauteng, Limpopo, Free State	Pretoria
Survey Respondent 26	On call/demand	North west	Mooinooi
Survey Respondent 27	Hobbyist	Western Cape	Paarl
Survey Respondent 28	Hobbyist	Western Cape	Cape Town
Survey Respondent 29	Small-holder	Western Cape	Wilderness and Cape Town
Survey Respondent 30	Small-holder	Matebeleland	Bulawayo
Survey Respondent 31	Hobbyist	Free State	Bethlehem and Welkom
Survey Respondent 32	Small-holder	Western Cape	Riversdale
Survey Respondent 33	Small-scale, small-holder, On call/demand	Western Cape	Cape Town
Survey Respondent 34	Small-holder	Western Cape	Cape Town
Survey Respondent 35	Hobbyist	Western Cape	Cape Town
Survey Respondent 36	Hobbyist	Western Cape	Wellington
Survey Respondent 37	Commercial	Western Cape	Heidelberg, Albertinia, Napier
Survey Respondent 38	Hobbyist	Western Cape	Hermanus / Riebeek-wes
Survey Respondent 39	Small-scale	Gauteng and North West	Hartbeespoortdam
Survey Respondent 40	Small-scale	Western Cape	Cape Town
Survey Respondent 41	Small-scale	Eastern Cape	Grahamstown

Table 4 represents the forty-one online survey respondents, providing their scale of beekeeping and the location of the manufacturing facility and or apiary sites. The total research participants amounted to fifty-two, combining the key informants and survey respondents. As evidenced in the literature review the number of beekeepers in the country are declining and beekeeper also prefer for the location of their apiary sites to be unknown. Despite the sample size, the data

provided was rich, stemming from some generational beekeepers in South Africa. In addition to anonymity, the questions put forth in the interviews and survey were optional for the respondents to answer, so some eco-labels generated more responses than others.

5.3 The Eco-labelled Honey Supply Chain

As a high-level overview and drawn from the ISO 14000 series, all eco-labelled products follow a common lifecycle assessment i.e. cradle to grave as simplified in the EU Ecolabel figure below. Environmental considerations are taken into account during all the stages of the lifecycle from the origins of raw materials for extraction, along the processing and manufacturing line, to the market, until the final stage of waste management. The ecolabelling requirements for this study applies throughout the value chain, but concentrating on the origins of honey, and its subsequent harvesting from the apiary sites to the processing or manufacturing facility, with waste management as the final stage of the lifecycle.

F***igure 13:*** *Eco-label Lifecycle (EU Ecolabel, 2021)*

Most of the eco-labels included in study related to the primary sector activities (Organic, Fairtrade, Monofloral, Wild), however the secondary sector or the manufacturing stage, only applied to Pure and Raw honey. These eco-labels involve some form of industrial processing such as heating, blending with additives (i.e rice syrup), bottling and packaging which differs to the former sector (agriculture). Only one eco-label included the final stage of the lifecycle and that was the mobius loop, a symbol for waste management by promoting recycling. The mobius

loop is also an example of a complete lifecycle consideration of product, as it is applicable across all the stages for honey storage, promoting sustainable practices.

5.4 Outcomes of Data Collection

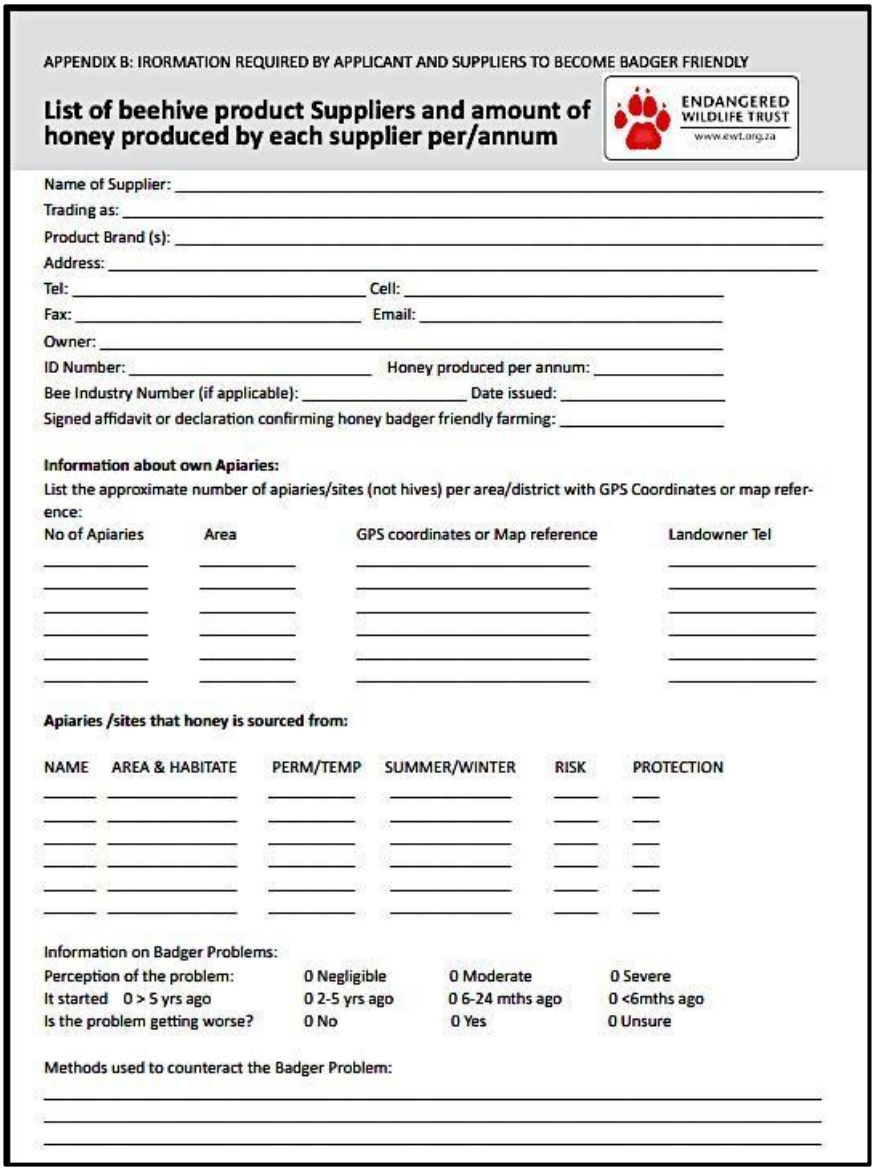
During the data collection phase of the study, information gathered from the Agricultural Research Council, showed initiatory communication on the badger friendly label dating back to the years 2000-2002. Most of the data was in the form of emails and meeting minutes between the ARC, and the Begg's (Collen and Keith Begg). The Beggs' are leading authors for Honey badger literature in South Africa, having spent considerable time researching the interactions between beekeepers and honey badgers, understanding their behaviour as well as the human impact on the honey badger population, inclusive of the beekeeping industry at large.

To highlight the importance of researching the impact of badgers in the honey production industry, a survey compiled by the ARC and Keith Begg was conducted to assess the level of conflict between honey badgers and commercial apiaries in South Africa and to determine whether it necessitated for a more detailed study of the problem. The motivation for the survey was due to the demand for more information, following reports of at least a hundred badgers being killed in apiaries on an annual basis. These were published in local magazines and sparked a high volume of public interest. The survey was funded by the Endangered Wildlife Trust (EWT) and some of the key questions in the survey included number of badgers exterminated annually, the impact of damage, prevention and control for the apiary industry, the vastness of the problem in South Africa and trying to ascertain whether there were viable alternatives to killing badgers. The survey included a brief on the status of Honey Badgers in South Africa, noting that honey badgers (at the time) were listed as vulnerable in the South African Red Data book and were on appendix III of the CITES agreement (Smithers, 1996). Badgers were a Schedule Two on the protected wild animal in the Western Cape in accordance with the Nature and Conservation Ordinance of 1974, meaning that the status of the species was threatened and warranted conservation. They were however unprotected outside of game reserves and national parks in other provinces.

5.4.1Badger Friendly Honey

The overarching objective of the label as put forth by the Endangered Wildlife Trust (Carnivore Conservation Programme) is to ensure the long-term survival of honey badgers by promoting the use of honey badger friendly labels. The requirements for beekeepers to obtain the badger-

friendly eco-label are presented in Figure 14. The requirements from EWT Badger-Friendly eco-label will be used as a comparison against what was collected from the survey results and interviews. The main findings will be described in text boxes and excerpts below, this is done to reflect the richness of the beekeeper's accounts. Extracts from the official data transcripts are also presented verbatim herein to highlight the respondents' positions.



APPENDIX B: IRORMATION REQUIRED BY APPLICANT AND SUPPLIERS TO BECOME BADGER FRIENDLY

List of beehive product Suppliers and amount of honey produced by each supplier per/annum

ENDANGERED WILDLIFE TRUST www.ewt.org.za

Name of Supplier: _____

Trading as: _____

Product Brand (s): _____

Address: _____

Tel: _____ Cell: _____

Fax: _____ Email: _____

Owner: _____

ID Number: _____ Honey produced per annum: _____

Bee Industry Number (if applicable): _____ Date issued: _____

Signed affidavit or declaration confirming honey badger friendly farming: _____

Information about own Apiaries:

List the approximate number of apiaries/sites (not hives) per area/district with GPS Coordinates or map reference:

No of Apiaries	Area	GPS coordinates or Map reference	Landowner Tel

Apiaries /sites that honey is sourced from:

NAME	AREA & HABITATE	PERM/TEMP	SUMMER/WINTER	RISK	PROTECTION

Information on Badger Problems:

Perception of the problem:	0 Negligible	0 Moderate	0 Severe
It started 0 > 5 yrs ago	0 2-5 yrs ago	0 6-24 mths ago	0 <6mths ago
Is the problem getting worse?	0 No	0 Yes	0 Unsure

Methods used to counteract the Badger Problem:

_____

_____

_____

Figure 14: Badger-Friendly Application Form

The themes presented below pertain to conformance of the label requirements, particularly the beekeeping methodologies for badger conservation, common responses surrounding the reliability of the label as well as the beekeepers perception of the honey badger conservation status. Of all the research participants in the study; Key Informant (KI) 5 and 7 were the only

holders of this label. While exploring perceptions on the challenges and problems associated with badgers KI5 noted the following;

> *"We lose about ten hives a year to badgers, which is insignificant. After the 1910 Hunts Club, there were no natural areas for the badgers to recede from, which was a cause of concern."* The sentiments which captured the concern and status of badgers were also expressed by KI11 who provided some historical aspects around badger 'problems' and added:
>
> *"In the 1950s badgers were killed tremendously. Cape Nature got involved with planning on ways to mitigate the problem as it was unnecessary. Read the Begg's Assessment on the badger situation in the Western Cape… I am unsure of the exact date, so you would need to verify, but when the badger situation hit the press it blew up. The Hunt's Club was a state sponsored vermin removing operation, supported by provincial government. Thousands and thousands of badgers were being killed. The club disbanded in 1987/1988. There were basically no badgers left only in reservoirs (same as jackals and caracals). In the Northern Cape, there was no protected area, the badgers were obliterated, which was inconceivable naturally. They then migrated and filled up in the Western Cape. When the stickers (labels) were introduced the badger killings disappeared. From the 1990s badgers were becoming more frequent and common, but killing was and is still being practiced everywhere. In 1997, there was a group called the "slagysters,"* and they would purposefully catch badgers. *The badger problem is not a fixed one as badgers continue to reproduce, which also raises the question that if they are so rare, then why are they still being killed?"*

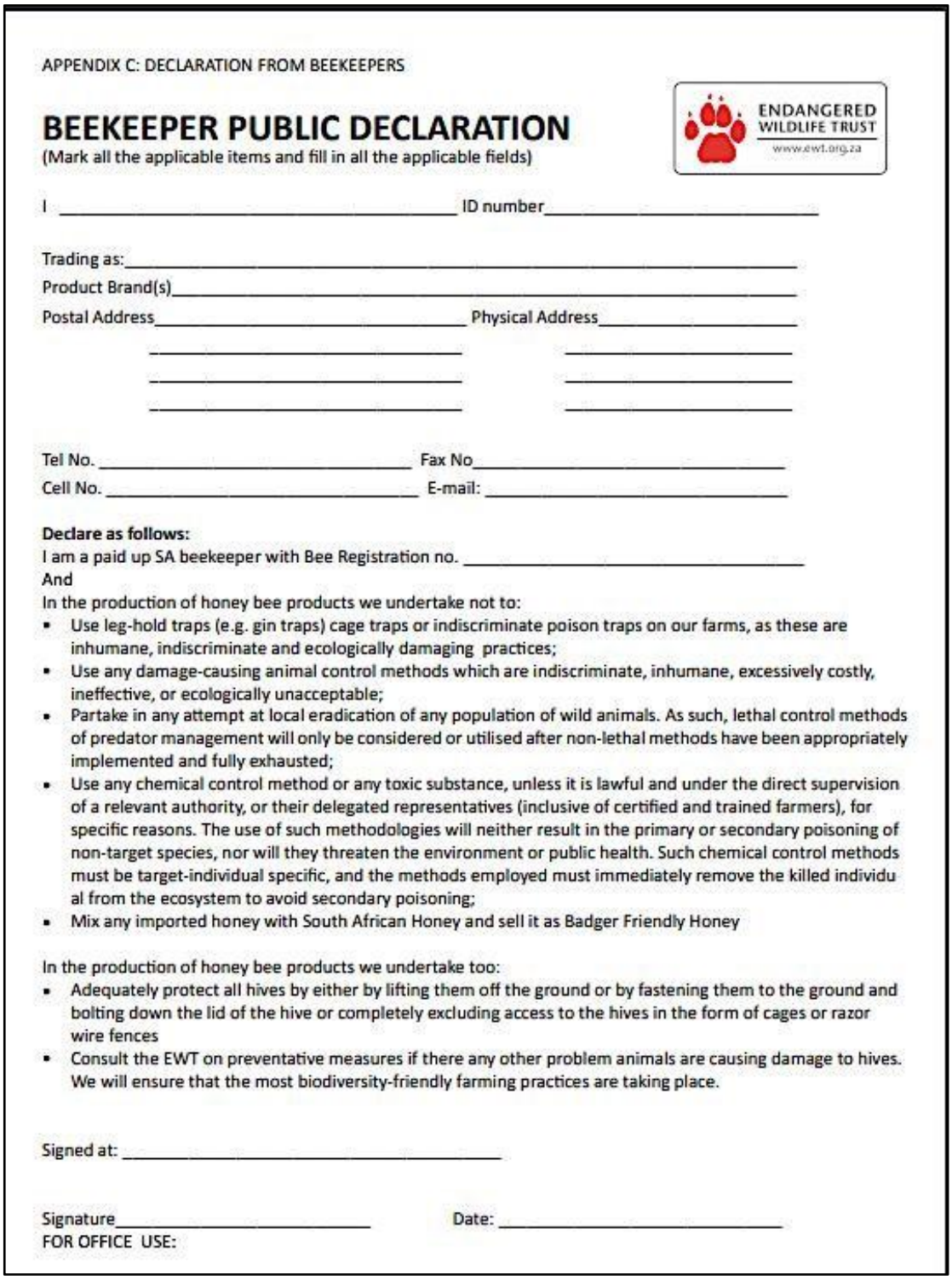
The responses on the badger 'problems' for the key informant interviews were therefore varied as shown in Table 15, as there were respondents who felt that this was an issue of concern while others thought that the badgers were the source of beekeeper's problems. This is of particular reference to KI7 who is a honey supplier (see definition in Table 2 above), sourcing their honey from beekeepers or multiple apiary sites to cater for their commercial scale of beekeeping. As evidenced in the official application form as per Figure 14 above, the form only asks for the GPS co-ordinates of own apiaries and not for the apiary sites from where the honey is sourced. This is however critical in terms of the value chain and lifecycle requirements.

The online survey generated 39 responses primarily contributing to the understanding of this particular label, the methods used and counter arguments against it. The remaining responses of the online survey and Key Informant interviews are illustrated below, showing key responses to

apiary sites, processes and badger conservation. The table demonstrates that the respondents (as coded i.e KI or SR) in the left column aligns to their respective responses in the right column.

Table 5: *Key responses regarding the perception of the badger problem at apiary sites*

PERCEPTION OF THE BADGER PROBLEM AT APIARY SITES	
Key Informants and Survey Respondents	**Key Responses**
KI11	KI11 "We have only had one badger raid that affected 40 hives near Koeberg Nature Reserve. The badgers were never killed as we never saw them."
KI7	"The honey we supply is Badger- Friendly, but we also have a recent endeavour for bee safety and conservation, if badgers are not endangered. We now focus on bee protection and look into how we can assist bee safety. There is no cost benefit for beekeepers to have badger-friendly honey, we can no longer sell honey at a higher price with the label... We source our honey from suppliers / beekeepers and we audit them. We buy, manufacture and bottle."
KI6, KI8 & KI9, SR20, SR38	KI6: "Honey badgers are predators, in 2019 I lost 130 hives owing to badgers " KI8: "Badgers are a problem animal, once they learn to attack they will not stop" KI9: "Badgers are a menace to beekeepers." SR20: "Honey badgers are a problem on occasions." SR38: "Serious badger damage"
SR4; SR7; SR10; SR15; SR32	Of the online survey respondents five answered that that they do not have badger problems in their area, three however (SR 4;7 and 15) reside in the Designated Risk District as per the label - see Figure 16 (albeit East London and Germiston where a considerable portion of land-use activity is industrial).



APPENDIX C: DECLARATION FROM BEEKEEPERS

BEEKEEPER PUBLIC DECLARATION

(Mark all the applicable items and fill in all the applicable fields)

ENDANGERED WILDLIFE TRUST
www.ewt.org.za

I _____ ID number_____

Trading as:_____

Product Brand(s)_____

Postal Address_____ Physical Address_____

_____ _____

_____ _____

_____ _____

Tel No. _____ Fax No_____

Cell No. _____ E-mail: _____

Declare as follows:

I am a paid up SA beekeeper with Bee Registration no. _____

And

In the production of honey bee products we undertake not to:

- Use leg-hold traps (e.g. gin traps) cage traps or indiscriminate poison traps on our farms, as these are inhumane, indiscriminate and ecologically damaging practices;
- Use any damage-causing animal control methods which are indiscriminate, inhumane, excessively costly, ineffective, or ecologically unacceptable;
- Partake in any attempt at local eradication of any population of wild animals. As such, lethal control methods of predator management will only be considered or utilised after non-lethal methods have been appropriately implemented and fully exhausted;
- Use any chemical control method or any toxic substance, unless it is lawful and under the direct supervision of a relevant authority, or their delegated representatives (inclusive of certified and trained farmers), for specific reasons. The use of such methodologies will neither result in the primary or secondary poisoning of non-target species, nor will they threaten the environment or public health. Such chemical control methods must be target-individual specific, and the methods employed must immediately remove the killed individu al from the ecosystem to avoid secondary poisoning;
- Mix any imported honey with South African Honey and sell it as Badger Friendly Honey

In the production of honey bee products we undertake too:

- Adequately protect all hives by either by lifting them off the ground or by fastening them to the ground and bolting down the lid of the hive or completely excluding access to the hives in the form of cages or razor wire fences
- Consult the EWT on preventative measures if there any other problem animals are causing damage to hives. We will ensure that the most biodiversity-friendly farming practices are taking place.

Signed at: _____

Signature_____ Date: _____

FOR OFFICE USE:

Figure 15: *Beekeeper declaration to the production of badger-friendly honeybee products*

As per the declaration in the EWT application form (as highlighted in Figure 15) above, more than half (56.4%) of the 39 survey respondents cited the requirements correctly (see Figure

16). The survey respondents that selected the "none of the above" option were asked to describe their methods used to counteract the badger problem and some of their responses are outlined below.

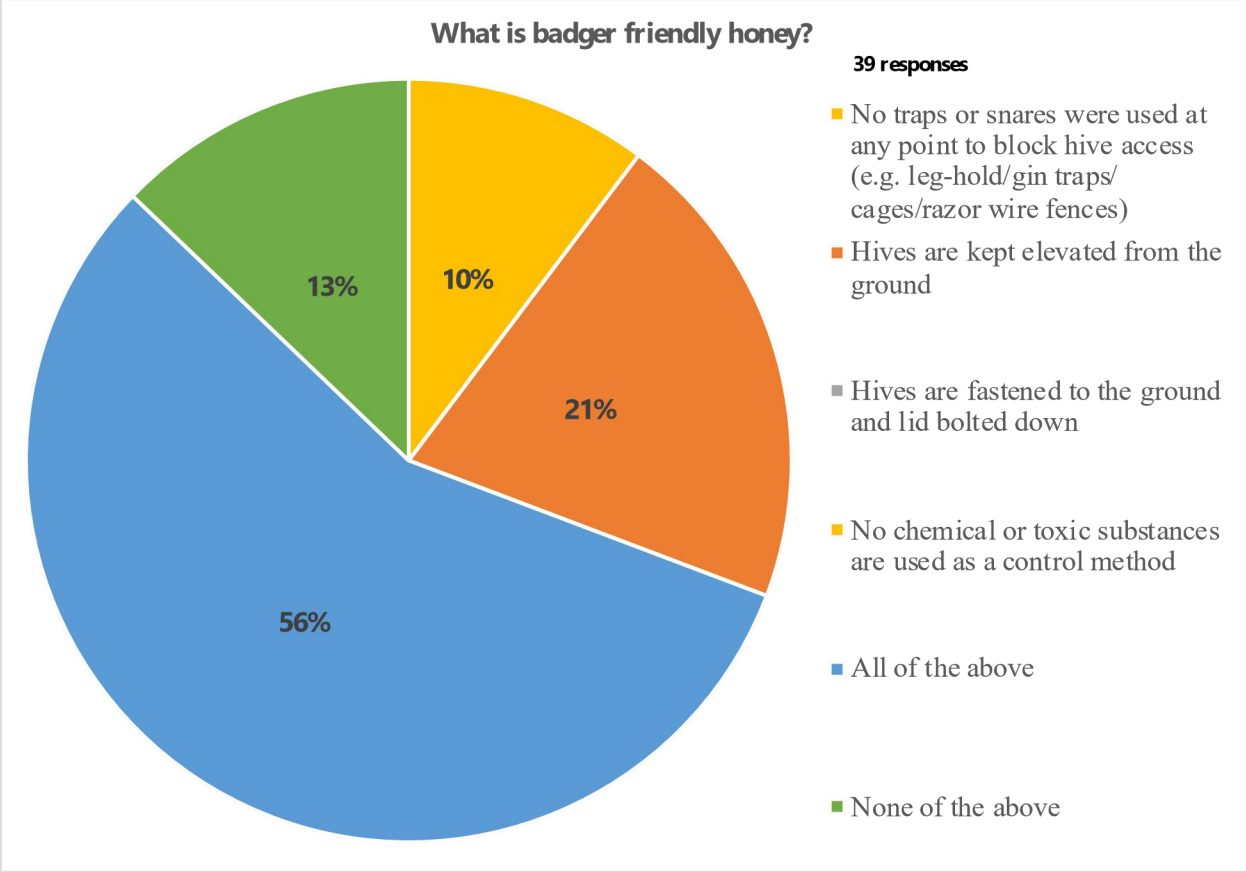


Figure 16: *Beekeepers understanding of badger-friendly honey*

With reference to beehive protection against honey badger damage respondents here also had varied responses in how they perceive and approach this situation. From the interviews, some respondents stated that they use more traditional methods to minimize damage while other implemented more complex deterrents. Here, respondent KI8 stated that *"chicken liver and Temik is commonly used by beekeepers."* Temik is also known as Adicarb, a dangerous pesticide used to poison pests and wildlife (as sizeable as a rhinoceros). It was removed from South African stores in 2011, however it continues to be sold illegally at taxi ranks and other transport nodes (Macleod, 2011).

For those respondents who utilised more extensive methods, the practical use of raised stands were one method employed to safeguard their hives. Here, Respondent KI5 explained *"Some hives are on a stand, or the super is strapped. Only a few hives are kept like that (badger friendly). Visibility is highly important, if it is above the flower line it is easy for the badger to*

see and access. The hives should be higher than you, use a ladder to gauge elevation, so that badgers cannot see over the top. Most stands are 1.2m, less than that is too low. It is also better to scatter the hives. It is difficult to carry a ladder and it is also not good for bee colonies to bounce around by handling." The overall sentiment from respondents were to elevate their hives to safeguard it from badgers and employ the most measure to ensure safety.

In the conclusion of the Begg's (2001) report it was stated that "beekeepers are a significant threat to the conservation of honey badgers in the Western Cape". Their study, which was extensive, interviewed seventy-five beekeepers, maintaining more than twenty-four thousand hives in the Western Cape. Eighty two percent of the beekeepers acknowledged problems with badgers, and seventy-eight percent undertook hive protection measures. Fifty percent of the beekeepers interviewed admitted to killing badgers (despite the vulnerable species status and awareness of the legal protection attached to them). Twenty-two percent continue to kill badgers. The report advised that pressure should be placed on the beekeeping industry to optimize environmentally responsible practices and that all apiaries should be adequately protected if situated within close proximity to habitats. The survey also demonstrated that the problem is prevalent in the Western Cape, affecting beekeepers with beehives in this region only. The survey sample excluded other provinces, and therefore not provide a true representation of the status for the country, rather localized, when honey badger distribution is cited to be widespread – and nowhere common. From this study's analysis, a key method of dealing with the badger problem was to assess and employ a range of tactics to address this problem. This is evident with as KI1 explains as "beekeepers have now learnt how to protect their hives…" (See Table 6 below).

Table 6: *Key themes pertaining to the methods of beehive protection to counteract the badger problem*

METHODS OF BEEHIVE PROTECTION TO COUNTERACT BADGER PROBLEM	
Key Informants and Survey Respondents	**Key Responses**
KI1	"The only way to stop beekeepers from killing badgers is for them to believe that it is not necessary to kill badgers; that is how you secure your hives as well as a decent stand for the boxes as badgers cannot get to them… Badgers are being fed slow baited poison (Temic) by farmers and beekeepers (fewer by farmers, more by beekeepers)... In the USA where they have problems with bears they implement bear-barriers which is a battery that causes sub-lethal shock - but that method would not work necessarily work here ...Reach out to beekeepers on a continual basis, have methods than protect against badgers. Practice the same for all, if one beekeeper lifts hives, does for all. Allow for the expansion of badgers back to original areas as beekeepers have by now learnt how to protect hives, with the recommended 1.1m lift"
KI11; KI3; KI6 & KI9	KI11"…We then raised the hives, but the wind blew it over and the badgers scratched the base thereafter. We also found that some beekeepers set-up cameras to see if there are badgers present" KI3: "A metal pole painted with grease or Vaseline and elevate it" KI6: "Steel strap hives" KI9: "Beekeepers find ways to keep badgers out and away from hives and boxes. Beekeepers implement pallet sandwiches and elevate boxes, but badgers still destroy the boxes and kill the bees... but we do not kill them (badgers)."
SR4; SR12; SR20; SR28; SR38	SR4: "In my area all hives are on steel stands elevated off the ground" SR 12: "Smoke" SR20: "Even with elevated hives and lids, supers etc screwed together. I feel there is less and less forage for the badgers and that's why they break into hives. I have taken to using thicker wood for floors and making sure the hive corners are not affected by moisture." SR28: "Lifted from ground" SR38: "elevated hives as well as used steel strapping."

The last key aspect that was explored in relation to the badger-friendly label was how respondents perceived the badger-friendly claims as well as the attainment process. From the data collected and perceptions shared by interviews there was a general sense that some aspects of the attainment process lacked credibility. The reasons why they thought so was evident in KI1 and KI6 and who responded respectively:

> *"No confidence in the badger friendly audit process. Major South African supermarket chain stores are sourcing their honey from various beekeepers all over the country and neighbouring, the auditing process cannot account for all. There is no way that you can audit all of the hives and apiary sites, its merely a paper exercise as it is not practical. If you have 2000 colonies, how does one manage to audit so many apiary sites? In an apiary landscape context you will have multiple sites and a factory or a facility where it is being collected and or produced. The auditor cannot just audit that part (where it is*

being collected/produced). It needs to be a smart audit and analysis, factoring risk aspects. Badger-friendly a proxy for
South African honey, what about imported honey?"

"I used to have the Badger-Friendly label, however no longer as I feel it is an untrue claim and an indictment on beekeepers. It is not being audited as a sticker anymore. Originally the project was funded (Badger-Friendly label) for research and writing, but then the funding ran out leaving no accreditation process."

Other respondents provided a different take and added that; *"Badger-Friendly honey is credible, it saves badgers and is a label worthy of investing" (KI10).* A further positive response was KI7, who are holders of the badger-friendly eco-label; *"Beekeepers work for themselves it is difficult to monitor their social conditions when all honey is sourced. We audit one farmer per day it takes around thirteen days to audit fifteen farmers, 2016 was our last audit and 2019 our latest, it is valid for two years and we are audited every two years. We are audited against the badger-friendly declaration, the auditor will request documentation, they inspect hives as well the extraction area and they check our operations against DAFF requirements and legislation. Accreditation is removed if found to be noncompliant or not badger-friendly, the auditor will also alert us if one of our suppliers has no longer met the required standards"*

Collectively four survey respondents (i.e SR's 7, 11, 37 and 41) all answered that it is a self-declared label; while four other survey respondents (i.e SR's 20, 28, 31 and 38) all answered that it is attained through an Environmental Organization, which are both in line with the label requirements.

Table 7: *Overall perspective of the Badger-Friendly Eco-label*

ATTAINMENT AND IMPRESSIONS OF THE BADGER FRIENDLY LABEL	
Key Informants and Survey Respondents	**Key Responses**
SR8 & KI9	SR8: "This is a marketing ploy which I do not support" KI9: "It's a marketing campaign started by Woolworths, they vet the site to attain labels... It is not necessary for urban sites to have the label, despite being badger-friendly, but it's good for publicity"
KI1; KI5; SR12	KI1: "… Beekeepers also print their own stickers. Badger-Friendly honey price doubled in a year and it never dropped, consumers are willing to pay for the certification/sticker - have to look at correlation versus cause... "How many beekeepers have been refused of stickers? On what basis? Has it changed? I can conclude by saying that every person sitting with a badger-friendly sticker has not been inspected in a decade. " KI5: "...I have the Badger-Friendly certificate. I was last audited 10 years ago..." SR12: "Created it in a pressing machine"

KI5; SR39	KI5: "...Beekeepers are also not willing to invest in the label so this is working against the badger..." SR39: "I would not bother to get the label"

5.4.2 Fairtrade

The Fairtrade Standard for Honey covers the requirements which are specific to honey producers and traders. Fairtrade honey producers must comply with both the Fairtrade small-scale Producer Organization Standard and the Fairtrade Honey Standard – which are prescribed to be read together as they complement each other. The same applies to Fairtrade Honey traders, where they must comply with both the Fairtrade Trader Standard and Fairtrade Honey Standard. The main requirements for the standard are highlighted in Appendix 3, but the key requirements for this label is premised on voluntary best practices. Which refers to the additional steps that all supply chain actors implement to foster fairer trading conditions. These serve as a reference point for achieving best practise and contribute to greater sustainability along the entire supply chain. Although these practices are voluntary, they are monitored by Fairtrade on a regular basis to identify actors along the value chain that are not complying with the minimum requirements of the best practices, which are all stipulated in the standard and application form for eco-label.
Fairtrade works with beekeepers to establish surroundings in which bees can flourish; such as advising them on bee-friendly cultivation methods. The label is primarily aimed at small-scale producer organizations. Many beekeepers have also used the Fairtrade Premium to change to organic cultivation. Although the standard does not require organic certification, organic production is however promoted and rewarded by higher Fairtrade Minimum Prices for organically grown products (Fairtrade International, 2020). As a social requirement of the standard, fair wages, transportation costs, and operational equipment are considerations. KI5 stated were their *"transport and labour were their biggest overhead costs for their beekeeping business of 6 employees."* For KI10 and K11 transportation and energy costs were raised.

Key Informant 6: Perception of the label

> "Fairtrade honey is doing a fine job in the rest of Africa. Beekeepers here in South Africa cannot afford the label. It is an excellent principle; however, it will not take off in the bee world. Zambia might have accreditation for it…Tesco that sells Organic honey sells Fairtrade honey and they are putting money back to people who need it. The labels require high margins As none of the survey respondents nor the key informants have this label and majority of the research

participants were unaware of, had never heard of, nor knew that the label was applicable to honey.

5.4.3 Raw Honey, Pure Honey, Organic Honey

Owing to the misconception and interchangeable usage of the three labels generally (see figures 18) and by the research participants, it was decided that they be grouped together to highlight these differences. The definitions of the labels, and the Organic Standard requirements are put forth against the survey and interview results. These labels are directly contributory to sustainability either by means of processing such as raw and pure (heating, straining and filtering) or the primary activities (extensive farming) needed to achieve Organic honey. The requirements for EcoCert are presented in the literature review (comprehensive) and the CERES application presented in Appendix 4.

Figure 18: *Image taken at a Health Store in East London grouping Raw, Pure and Organic as one label. See also "Wild Flower" (Hendricks, 2020).*

To revise the definitions of the three eco-labels; they are as follows:

- Raw- unfiltered, unheated honey (not above 38ºC), it is honey that conforms to the specifications and requirements of Choice Grade if

liquid. This is legislated under the Agricultural Product Standards Act 119 of 1990

- Pure – No additives (food additives as defined in the Foodstuffs, Cosmetics and Disinfectants Act 54 of 1972), essentially it is 100% honey
- Organic- A Type-1-like eco-labelled product that has been produced, processed and handled in compliance with Organic production standards and certified by a recognized accredited certification body such as CERES or Eco-Cert. It not regulated in South Africa, but is regulated in the EU and USA.

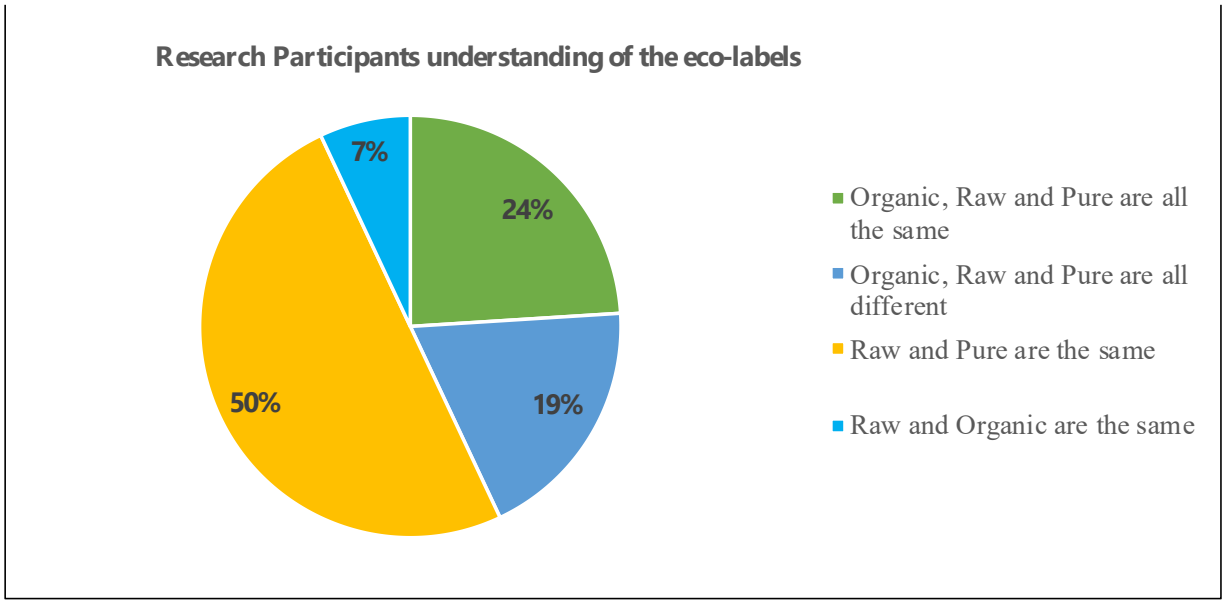


Figure 19: The beekeeper's understanding of eco-labels: Organic, Raw and Pure

From Figure 19 it is outlined that the majority of the research participants describe raw and pure as the same, and a quarter of the responses understood organic, raw and pure as the same.

This data is elaborated in the tables and written responses below.

The main requirements of Organic eco-label include the number and location of colonies and apiaries as well as the related sites, including the location of migratory apiary sites, the distance from the apiary sites of the prospective applicant is also required (See Appendix 4 for these requirements). The location of the apiary sites is critical to this eco-label, as beekeepers have to prove that their produce has not been contaminated with pesticides or atmospheric pollution the, hence the number of questions in the application form pertaining to this point. The number of postharvest units refers to hives during rainy seasons when there is no productivity in the hives,

and bees are dormant during this period. Which is important to allow the species to recover during this period. The sub-contractors involved in the process is also required in terms of the lifecycle considerations, the application form also requests their location. In terms of the beekeeper's understanding and definitions of what constitutes as raw, organic and pure honey; it was apparent that these are used interchangeably, owing to the varied responses. As none of the respondents were holders of Organic honey, the important aspects worth highlighting are however represented in the tables below. Three key informants (i.e. KI6, KI8 and KI10 correspondingly) shared on their views on Organic honey in South Africa pertaining to the location and third party certification, of which all were insightful in terms of understanding vegetation, regulations and the challenges faced in the industry to be label holders. Their response are captured below:

> *"Organic is a loosely used word in South Africa, you cannot use the label unless you have the registration. There are only two Organic beekeepers in South Africa. Others using the label are cheating the system. There is no organic legislation passed in South Africa, no act of parliament. It is regulated in countries such as England, the Netherlands and Switzerland." (KI6)*
>
> *"Organic honey requires registration with a certification body, one cannot sell without certification such as Eco-Cert. This label may do well in the karoo or veld in South Africa where there are no influences or intruders. (KI8)*
>
> *"Organic honey has to go through Eco-Cert for certification, there are only two producers of organic honey in South Africa. There are no major roads and agricultural practices surrounding the hives. Organic harvesters yield small amounts of honey. The premises needs to be organically certified, it's very costly. It is a separate local product from organic product. We (South Africa) are a net importer of honey , as there is a deficit in the market, why must we further distinguish if we can't meet existing market"* (KI9)
>
> Raw and pure were generally better understood by the research participants, it showed that most were versed in the Agricultural Product Standards Act, which makes sense to be a registered beekeeper in South Africa and compliant with the DAFF regulations (as they all were). The beekeepers provided data rich accounts of the operations in the industry. The themes for these three labels considered respondents understanding and value-add to sustainable practices, as well as the parameters required and its adherence to meet these ecolabels. In terms of the research participants understanding of the eco-

label and its relation to sustainable harvesting; the selected key informants and survey respondents had the following to say:

According to KI1 *"South Africa remains exclusively raw honey, less exposure to residue pesticide and fungicide unlike everywhere else in the world where antibiotics inside beehives accumulate in honey"*

SR39 differentiated amongst the three by indicating that: *"raw is recently harvested, never crystalized, not heated. Pure is not adulterated, nothing mixed in, as harvested. Organic produced far from (farming) activities where chemicals and poisons are used , no chemicals used applied on bees and hives, no contamination with these"*

SR29 made a noteworthy remark concerning the control of bee forage for Organic*: "Raw honey hasn't been heated above 35 - 40 degrees Celsius. Organic honey is a dicey one, as we can't guarantee where our bees are flying and what they're coming into contact with. Pure is not a grade or qualification. It's redundant, because as a requirement for honey to be sold, it should be free from impurities or additives."*

SR35 distinguished the three labels succinctly, which helped enhance the understanding: *"Raw honey has not been heated or fine filtered it is typically cold extracted and strained. Pure honey can be heated and filtered and is not adulterated with any other ingredients. Organic honey has to be certified as such and has strict compliance requirements for environmental influences and farming practises both of which must be natural.*

Table 8 below compares and contrasts the respondents perceptions of Pure, Organic and Raw.

Table 8: *Key Responses to Raw, Pure, Organic*

RAW, PURE AND ORGANIC HONEY: BEEKEEPERS UNDERSTANDING OF ECO-LABELLED HONEY AND ITS RELATION TO SUSTAINABLE PRACTICES	
Key Informants and	**Key Responses**

Survey Respondents	
SR6, SR7, SR11, SR15; KI11; KI10	Raw and Pure are the same (SR6,SR7SR11,SR15) KI10 "Pure honey is the same as raw honey, pure honey has no contamination, it is just honey." KI11 "there should be residual particles in raw honey, raw honey can't be clear. There are no additives such as sugar, water, syrup or natural additives. Pure honey is the same as raw honey, in that they don't mix. There are no residues left, and lots of straining to get rid of the residues"
SR9,SR20,SR21	Raw and Organic are the same. (SR9,SR20,SR21) SR20 added: Raw and Organic are the same, however they should be spun out of the combs and bottled while Pure honey could be strained and /or heated.
SR10, SR16, SR19, SR24, S R26,	**Distinctions amongst the three:** SR10: "Raw Honey: should be unpasteurized honey may contain pieces of comb. Pure Honey: Should be pasteurized honey and filtered. Organic honey: should be honey sourced from organically grow fields whether mono crop or not however, there is still much debate around what these terms actually mean." SR16: "Raw - as extracted from combs using filtering etc only. Pure - sometimes heating is also used. Organic - honey from hives where crops are proven to be 100% organic." SR19:"Raw honey is just that, direct from hive little or no filtration. Pure honey is not an official classification or a grade of honey! Organic can only be used on honey miles away from any commercial farming activities" SR24: "Raw honey may not be pure honey nor may it be organic. Same goes for others." SR26: "different process"
SR18, SR23,SR32,	**Distinctions amongst the three labels (Raw Honey in line with the definition)** SR18: "Raw honey has not been heated at all during the bottling process and also there is no added sugar. Pure honey refers to there being nothing added but it may have been heated at some point. And organic is a very general term which only indicates that no pesticides have been used so it could have been heated and watered down." SR23: "Raw means it is unheated. Pure means it is not mixed with glucose syrups or other added substances and organic means that it is produced under natural conditions. These are not mutually exclusive." SR32: "Raw Honey - no excessive heating - is the real thing. Pure honey - in my view may have been heated excessively very clean unhealthy but meets certain "food safety" standards. Don't know how one can put that on a label."

With regard to adherence to the label requirements for raw, pure and organic and its related parameters to meet; two key informants (KI2; KI5) stated that the definition of raw honey is stipulated in the Honey Standards Act, (commonly referred to by the beekeepers for Agricultural Product Standards Act). They further added that "*raw honey is straight from the hive and strained… and has not been heated.*" This was further substantiated by KI9 who said that "*raw honey has not been heated and filtered. It is the same as or similar to choice grade honey, as it has not been processed. Choice grade conforms to the Honey Standards Act in that it can't be heated, filtered and no additives. It can however be strained. Raw honey can be Choice Grade."*

KI8 stated that raw honey its true meaning is not legally permissible *"it comes straight out of the hive, and does not surpass moisture content of 20%. Choice grade honey has*

to have all the aromas or perfumery in it, which comes from the bees itself (vomiting and storing). It actually cannot legally be sold like this as it is full of dead bees, vomit and dirty brood carcasses. It is a risk for the consumer to buy and they can sue for medical costs."

KI1 insisted that Pure honey should actually be the most desirable to the market stating that; *"Crystalized honey is pure honey, caring consumers should want this, but South Africans will not buy crystallized honey. All honey naturally crystallizes. If honey crystallizes, beekeepers have to take it back and ultra-filter it to get rid of crystals."*

Overall, honey testing was brought up by two key informants; KI1 drew attention to the testing for raw honey stating that "*The quality assurance test for this HMF (Hydroxymethylfurfural) which is an indicator of whether honey is heated or not if the HMF levels are high. Most honey that is labelled as raw cannot pass the test and are not meeting the requirements, including very prominent retailers."*KI1 also noted that for Organic honey *"MRL tests honey pesticide residue. Zero MRL is the result you should want. A 12km pesticide free radius. If you look at natural honey under a microscope you will see wings, heads etc. Consumers would be less happy if they knew what it (organic) meant."*

KI9 indicated that "Pure honey is for people trying to differentiate themself from each other. All honey is locally sourced, about 10 tonnes per annum, and it is tested through SGS laboratories for sugar content, glucose, sucrose, HMF and moisture. No mention of additives such as C3 and C4 sugar in Honey Standards Act and the Blue Book."

The remaining responses on the three labels are tabulated below (9), outlining the main themes for each, where testing, reference to legislation, and prohibition of pesticides for organic are still prevalent.

Table 9: *Adherence to the procedures*

RAW, PURE AND ORGANIC HONEY: PARAMETERS FOR THE ECO-LABEL AND ITS ADHERENCE TO THE PROCEDURES	
Key Informants and Survey Respondents	**Key Responses**

KI1;KI7 KI10; KI6	**Raw Honey** KI:1"The Honey Standards Act allows for raw honey, which is unheated and unfiltered. Raw honey can be strained and not filtered and not heated above 38 degrees Celsius. Strained honey is filtered under its own weight, the honey runs through the holes of the strainer by itself. Pressure through the holes. KI7: "the raw honey we supply is 35 micron filters. The honey is drained, filtered and then bottled" KI0"Honey is taken from the hive and is then spun, ensuring 95% of no contamination, only 5% may contain bee particles. I believe honey should be kept in wax." KI16"Raw honey is not heated. Technically unripened by bees"
KI3; KI5; KI8; KI6	**Pure Honey** KI3: "For pure honey, nobody can test that there are additives. There are credibility tests at a reasonable fee. Pure honey has no gardens or agricultural influence, it is not heated, but can go through sieves. There is no control on mixing honey in South Africa, beekeepers should declare the ratio of mixing and the origins of the honey." KI5"pure honey means nothing is added" KI8"Pure is just honey, from flowers, collected fruit such as burst grapes and apples for nectar. The problem is that bees cannot read the regulations' KI6: "Uses of label not identified in the Honey Standards Act, it is an assumed of the word to mean honey that comes straight from the bee."
KI9; SR8; KI10 KI11;	**Organic Honey** KI9: "Organic means no pesticides, insecticides, or traffic pollution, and is all natural and no alien trees. KI10: "In order to state your honey is organic you need to have it certified as organic." KI11: "Comes from hive, has not been tampered with from box or hive."
SR38,SR42	**All three labels** SR38: "Raw honey is defined as unheated (not above 38 degrees) and unfiltered. Pure Honey is really just emphasizing it as a pure honey but is not defined in honey standards act so a marketing ploy. Organic honey should have a registration number stating that it has been audited as organic." SR42: "My understanding is: raw honey is not heat treated and processed. 'Pure honey' states that the honey has no additives. 100% organic means that no chemicals and pesticides were used in any part of the honey production process including crop spraying of flowers that the nectar was collected from."

5.4.4 Monofloral Honey and Wild Honey

Floral honey "blossom honey" means any laevorotatory honey derived essentially from the nectar of flowers. (Agricultural Product Standards Act, 1990). Monofloral honey therefore has a distinctive flavour attributed to the predominant nectar of one plant species. For consumers, wild Honey as seen on the jars and bottles in stores is generally perceived to mean the opposite to monofloral honey. Wild honey also refers to forest beekeeping, where the bees are not ‘domesticated’ or kept by beekeepers.

Before outlining the survey responses, respondents were asked to provide their opinion on whether they preferred monofloral sources for their bees. As highlighted in Figure 21, two thirds

of the responses were against this technique, and the remaining third favoured monofloral sources.

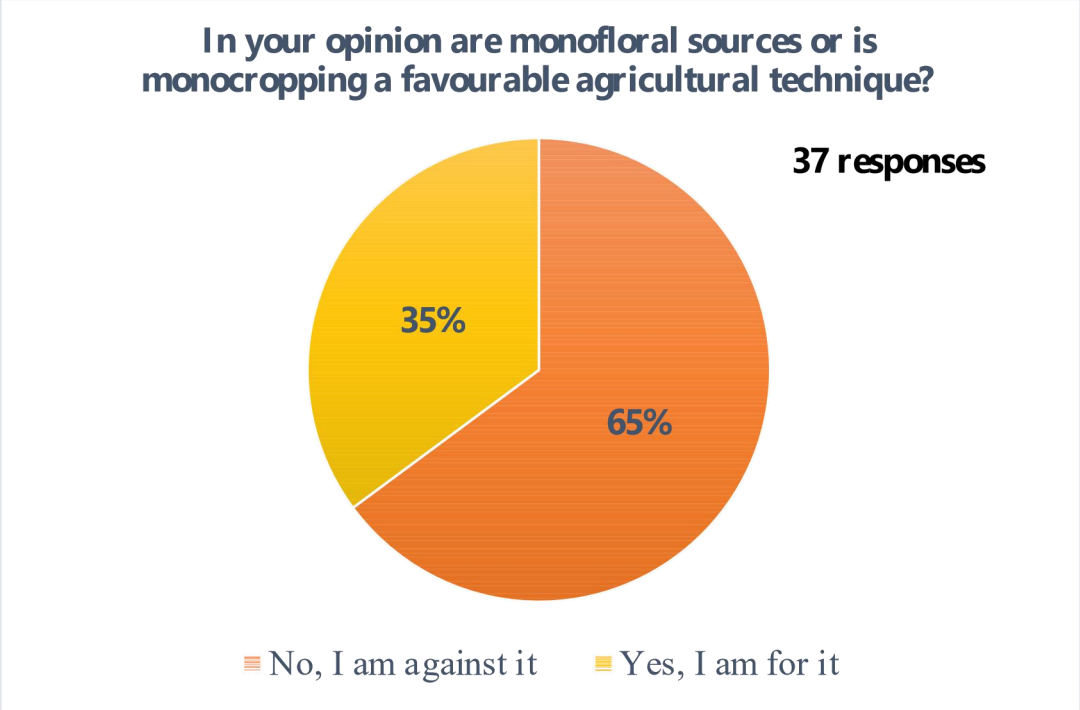


Figure 21: Perceptions on Monofloral

Where respondents were asked to comment on aspects related to diversity, sustainability and the nature of the techniques, the following was shared (see Table 10 below)

SR3*: "A human cannot dictate to a bee what tree or bush she should visit in order to forage, especially in an Eco Village where there is a large diversity. Also a bee is a complex though small organism but still need a multiplicity of chemicals in their diet and we have not even begin to understand what their actual requirements and needs are".*

SR22*: "It limits the diversity of foods available to the bees themselves, increasing the likelihood of nutritional deficiencies and compromised immune/hive response to exposure to novel pathogens… Effectively it is for the same reason as the fact that monoculture is unfavourable. Allowing feral beekeeping exposes the hive to a wide range of potential food sources and genes in the plants which serves to strengthen the immune responses of individuals and the hive in general."*

In terms of sustainability, two survey respondents added to monocropping as an agricultural practice and beekeeping bees in these farming environments, the following was noted:

SR1: *I don't think it is a sustainable way to farm. I think it creates the need to use pesticides and Genetically modified seeds in order to sustain it. Although for large scale food producers I do*

understand it can be challenging to practise crop rotation and companion planting... It is as nature intended. Unfortunately not everyone practises responsible farming and so make use of pesticides. This is sadly out of our control where the bees choose to forage."

SR29 (generational beekeepers and owner of apitourism establishment in the Western Cape): "*It's not a sustainable nor ecologically sound practice. Increased use of fertilisers and pesticides leads to various forms of pollution and knock-on effects for the fauna and surrounding environment. Also, I read a while ago that bees are actually attracted to crops with pest/herbicides more so than those without. So of course, promotion of monocropping can't be good for any bee population, regardless of whether it is kept or wild. Furthermore, it's not to say that multi-cropping is any better because they also use fertilisers and pesticides etc. but it is probably more favourable in that the practice is less aggressive, comparatively… 1. Harvesting from feral bees e.g. in a tree, or under a manhole: I don't think its favourable as those bees are part of that ecosystem. 2. Actively capturing feral bees to keep in a different location to where you've caught them: Acceptable only if they are considered a pest and the colony was going to be exterminated. Context: Regarding most of my hives, I have set up empty boxes and allowed bees to naturally move in to them. I'm not sure if this is what you would consider "feral beekeeping". I only manage the hives in terms of checking up on their health and progress. With regards to "allowing free range", I can't understand how you can restrict them? Maybe this is only applicable to large-scale and/or commercial practices. Free range in terms of foraging or free range in terms of not keeping them in a conventional hive?"*

A common response recorded from SR6, SR12, and SR35 cites that monocropping and monofloral sources *"are unnatural for bees.*" The results on these monofloral practices influencing the flavour of honey was also forthcoming as indicated by respondents 36 and 38:

SR36: "*The flavour of the honey - in our case Bluegum - is more distinctive than say multifloral crop."*

SR38: "*One of my USP's (unique selling propositions) // honeys then have distinctive colours and tastes and each one develops a following i.e. people who prefer it and ask for it."*

There were new points raised by SR4 and SR33 pertaining to "UJUBEE" which was with reference to wild honey, which is an aspect not commonly reported on. Here the respondents added:

SR4: *Feral beekeeping, as in bees in trees and cavities they have chosen, then yes. We need feral bees as a source of new swarms for the future. If by feral, as in, keeping bees in other hives than Langstroth and top-bar hives as advocated by UJUBEE, I am not in favour.*
SR33: *Not as advocated by UJUBEE. I trap swarms and remove swarms when they have become a nuisance.*

Upon researching it was discovered that UJUBEE refers to vestiges of a historical event regarding the removal of wild honey nests in South Africa to allow for the importation of English honeybees (Tribe, 2017).

Table 10: *Research participants perspectives on beekeeping techniques: Monofloral and Wild (monocropping as an agricultural practice was also included in the table under Monofloral)*

RESEARCH PARTICIPANTS PERSPECTIVES ON BEEKEEPING/AGRICULTURAL TECHNIQUES FOR THE LABELS		
Key Informants and Survey Respondents	**MONOFLORAL HONEY**	**WILD HONEY**
Key Theme: Diversity	SR18: It is not natural, I believe bees like humans a varied diet if important to a species. SR28: Diversity is better for the colony. Mono crops are mono seasonal, so the honeybees struggle in the "off" seasons. SR30: Against monocroping to give bees a variety of flowers for their forage SR39: It offers a variety of different flavours of honey to customers. SR33:Bees need to get their nectar from a number of sources to remain healthy. SR21:For the health of the bee it needs to forage on multifloral.	SR17: It would be better for the bees to collect pollen from multiple sources as it keeps them healthier. SR21: The bees are in charge SR26:We prefer multi-floral on year around fixed sites. Less management problems and diseases. SR27: Is there an alternative? Bees fly as they wish SR30: Free range is very favourable SR37:All bees are free range by nature.
Key Theme: Sustainability	SR4: It is problematic due to the mass extermination of bluegums by the government. SR34: Monocropping results in a single floral source of honey which is more valuable. However mono cropping as an agricultural practise is probematic, due to the potential for large pest expansion requiring agro chemical intervention. Mono floral forage is also not an ideal food source for bees. They need diversity of pollen and nectar for optimal health.	No further response
Key Theme: Nature of the Practice	SR10: We prefer our bees to feed naturally, and different plants flower at different times of the year SR13:Think bees should use the natural surrounding bush as well SR35: Let nature go it's way SR34: I prefer to let the bees do their thing as natural as possible	SR2: Those shall swarm naturally, increasing the bee population. SR19: This is the natural foraging process of wild honey bees SR34: Feral beekeeping as I understand it is the use of bee colonies found in nature. The harvesting of honey from feral colonies is often destructive and therefore detrimental to the feral population. This is not a favourable practise.
Key Theme: Flavour Profile	SR21:Focusing on a particular taste	SR41: I prefer the taste and quality of the honey, yes. However it is not a practica commercial beekeeping method.
Key Theme: Seasonality and Floral Source	SR14: It takes time and I don't like moving bees SR19:If you have sufficient honey flow and can manage your colonies correctly. i.e. remove all honey in the supers before the mono flow and then remove the mono flow honey before the next honey flow starts. SR20:Because they only provide food for a few months of the year SR39:Pollination is important to any food source, it is how we manage that food source that is important. Honey is an alternative source of food and should not be limited to monocropping or the alternative.	SR28: Because I'm keeping bees in an urban setting, I can't imagine controlling what they find to forage on. I do imagine they'd be better at finding resources they need than I could.
Key Theme: Market and Business	SR25: favourable for a bigger market SR37: Yes but difficult to market as no honey can really be monofloral	SR38: As part of your overall business model yes, however there is so little uncultivated areas over (where my bees are) that wild honey does not exist SR3: This works, but with due diligence in place

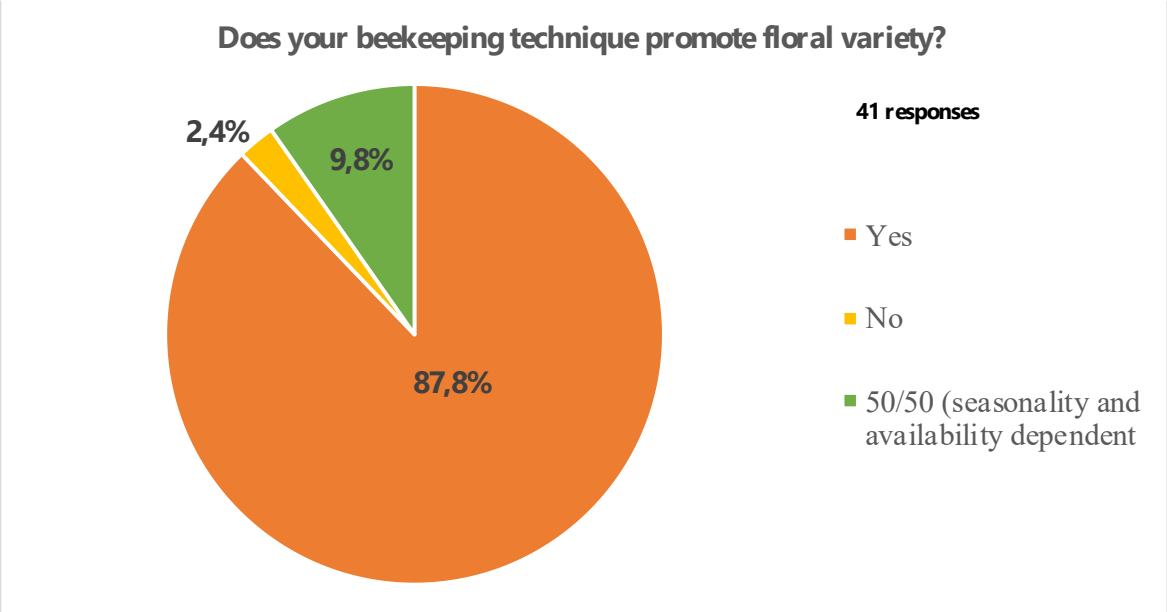


Figure 22: Multifloral vs Monofloral

As illustrated in Figure 22, when the research participants were asked to provide their perspective on these labels, their overall responses were partial monofloral honey and favoured wild honey. KI3 residing in the Eastern Cape, is a retired Environmental Assessment Practitioner, a generational beekeeper (originally from Germany) and is holder of wild honey label stated the following impacts of monocropping:

"Monocropping is not healthy for bees, but is easy for pesticide use. The blueberry farms in the Eastern Cape are not a good idea for bees. The farmers use toxins and this practice kills bees due to enclosures, that become bug-proof. Government must stop annihilating forage. The use of toxins and lack of forage is a bad scenario happening presently in South Africa, it equals doom... My bees are "woes" and aggressive, I let them fly around, it allows for a more sensitive bee, for example menstrual women cannot come near to them without them buzzing. This response was further supported by a by KI2 who said that: "*Bees are inherently attracted to sugar and nectar content, irrespective of their surrounding environment or vegetation type".* KI2 is also from the Eastern Cape and is a well-renowned generational beekeeper (offering ad hoc bee removal services)

Further responses derived from KI1, KI5, KI6, and KI11 denoting their opinions on monofloral are represented in-text below.

KI1: *"By convention monofloral honey has 45% (minimum) that allows you to call it that, i.e. litchi, blueberry etc. If more than 45% then you can call it "blueberry honey," 45% is a safe figure as it is roughly half. A good working radius for bees is 5km to ensure the same forage. The EU Regulations honey and GM crops started at 3km now it is 12 km for roughly 100 000ha. Consumers are reliant on what farmers say for monofloral crops i.e. say "veld" for Fynbos. It must be tested against legislation check for chemicals/pesticides. HMF levels (all less than 1)"*

K15:"*Citrus farming pesticide is high; there are usually no beekeepers nearby, as they don't want seeds (want seedless). Bees are not able to utilize valuable food resource, and it ends up poisoning the bee. Monofloral areas are deciduous fruit, seed crops and berries."*

K16: *"Monofloral honey is honey out of the hive and it may be primarily or predominant, but there is a range. There is even diversity in Fynbos. Assess the percentage in New Zealand for Manuka Honey, can only say primarily that it is this source… but in Greece for example, honey is seasonal. There is a variety in Fynbos, 5000 different plants; Fynbos is of exceptional quality to beekeeping… It is safer to say Multifloral or Wild Honey rather than a monosource. In fact, it is more reliable to say "actually from bees." I would not use either of the two terms, monofloral*

or multifloral as it is not saying much by calling it wild or multifloral honey, as it already implies that."

K11: *"For it to be purely Fynbos it would need a 5km radius of Fynbos. If the hives are not in the middle of the radius of pure Fynbos vegetation it will not be truly Fynbos honey. Monofloral is only if there is a forest of one particular tree or one type of plant only. It is only Monofloral crops if you know the source exactly. We laugh and call Franschhoek 'Champagne honey'."*

Further responses are tabled as a comparison between the two eco-labels as shown in Table 11 below.

Table 11: Research Participants Perceptions of the application of these labels

RESEARCH PARTICIPANTS PERSPECTIVES ON THE LABELS		
Key Informants and Survey Respondents	**MONOFLORAL HONEY**	**WILD HONEY**
KI7	K17: The ratio is 60% filter honey such as wild blossom, Fynbos or Blue Gum. The 40% is canola or sunflower creamers. Seasonal honey includes litchi, sunflower, avocado or aloe, Bluegum, Orange Blossom and Fynbos.	No further input
KI8	K18: Canola honey is primarily for mead as it ferments well and does not give any off flavours. For Thorn tree, Maltose, Fynbos, Vasbossieand Erica (nectar sources) you would have to know amounts well. Some honeys cannot be fermented such as Eucalyptus as it gives a metal taste and Sunflower is plasticky.	No further input
KI9	K19: Monofloral for example; Eucalyptus. The nurse bee, field and scout bees stay on one floral source. Monofloral honey is harvested in an area of abundance Eucalyptus (flow). The super is empty, bees fill super. Aroma and taste of honey same as what Eucalyptus honey should taste like wide variety of Eucalyptus.	K19 Multiflora or wild flower is an arrange of floral source in an area. Bees travels up to 6 kms to get sustenance.

KI10	K110: There are characteristics that are indicative to Monofloral. Honey crystallizes, it is a natural occurrences, notices only certain honey crystalizes like Blue Gum that goes toffee. I don't believe that bees are meant to be moved around, I think that they are meant to be kept in one place. Bees collect 2km from hive so bees need to be confined only to that source or product. I do not trust this label though, bees will travel further after source.	K110 Multiflora or mixed harvest I believe is more of what honey should be like. I do urban beekeeping and the source of forage is applicable to the bees current situation. Bees forage in urban areas on Lavender, Blue Gum, Acacia, Wattle and Fynbos

The research questions also investigated whether participants declared whether they allowed free range or if their beekeeping technique entailed controlling nectar sources. From Figure22 The majority of the responses returned by the research participants promoted floral variety.

5.4.5 The Mobius Loop

The mobius loop contributes to sustainable practices by disallowing waste materials to be landfilled or in the event of littering it will eventually degrade and be less of a pollutant. For the purpose of the study, this eco-label address's objective two, by using recyclable materials and or packaging as a sustainable process to transport and store and dispose of honey. It was also used to gauge beekeeper's understanding of the label and bring awareness to those who were unfamiliar with the meaning behind the three-chasing-arrows.

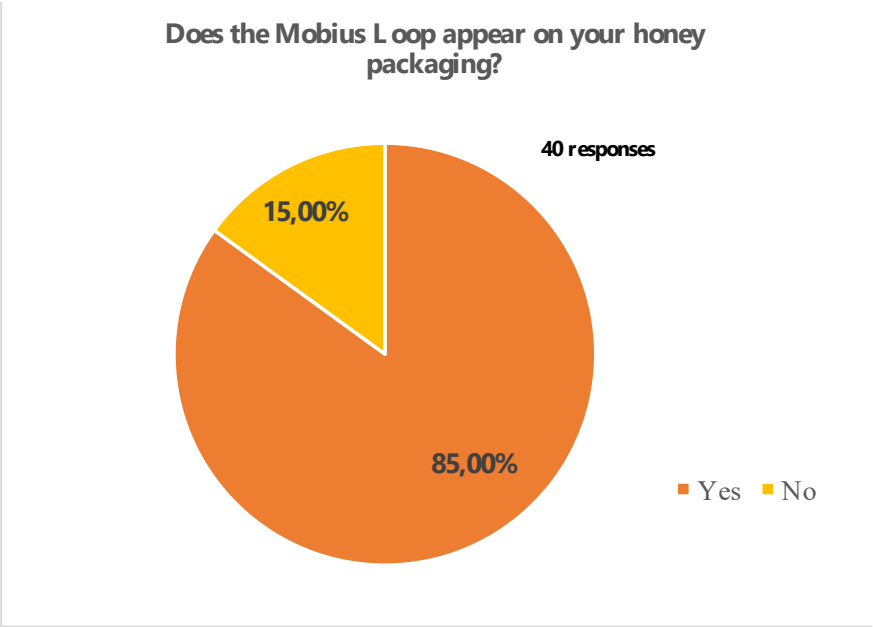


Figure 23: *Online Survey Results (percentage of respondents using the Mobius Loop)* As demonstrated by Figure 15 the majority of the respondents were not utilizing the Mobius Loop, which is a readily available and an open access label.

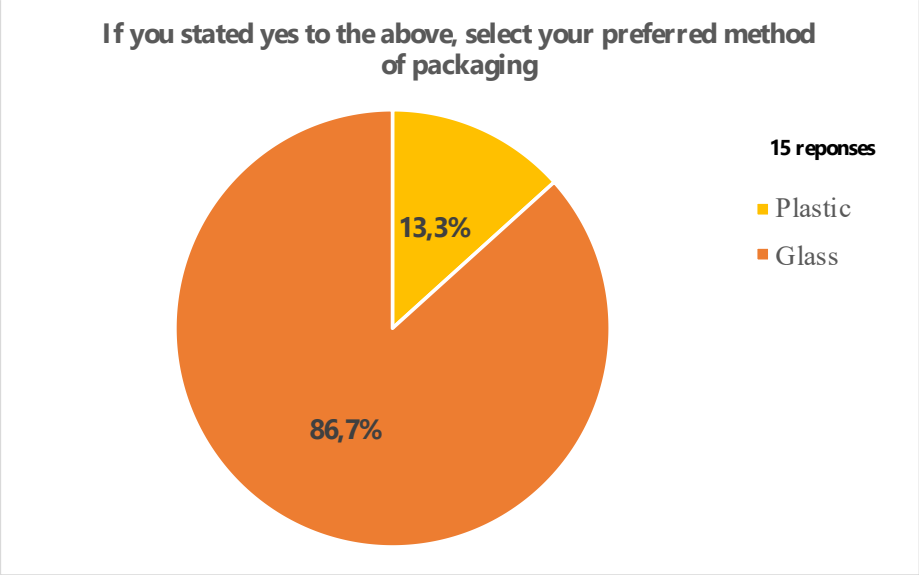


Figure 24: *Survey respondents selected methods for honey containers*

As depicted in figure 16, the respondents were all packaging their honey using recyclable materials. According to two survey respondents (i.e SR6 and SR30) they stated using glass, but have not started using the mobius loop yet, implying that it was a consideration. Ten respondents (i.e SR2, SR5, SR9, SR13, SR19, SR24, SR26, SR34, SR40, SR41) answered "No", however also stated that they are using glass. Four key informants (i.e KI2, KI4, KI9, KI11) optimizes PET plastic for their bottling, and the remaining key informants of 3, 5, 6, 7, 8 and 10 uses both glass and PET plastic. Despite not having the open-access label, research participants are all using recyclable material for their honey.

5.5 General Problems in the Industry: Implications for Beekeeping Sustainability

As part of data collection and exploring the beekeeping industry, key informants also provided their perceptions on what they believed to be the most grappling problems in the South African beekeeping industry. These key problems are discussed below from the perspectives of respondents under the themes which range from the testing procedures to vandalism, individual problems associated with people-wildlife conflict and ownership issues which involved land. Some of these aspects are highlighted below and responses from interviewees shared.

5.5.1Honey Origins for South African Markets: Adulteration

When it came to discussing honey origins, the research participants spoke mostly of honey flavour profile and the sugar content in honey, explaining how it is impacted by adulteration. Here KI8 stated *"Perfume relates to the aromatics and sugar content. When honey is tested in*

labs, they only test for hard sugar content. No higher than 18.6% moisture content to pass sugar chemistry test which pertains to enzymes and sugar chemistry (smell and taste). Honey perfumery comes from the insect; the insects itself as well as the nectar perfumery. The bees itself (insect) not the nectar, but bees physiology such as the processes of vomiting, storing and maturing so when it becomes honey in taste. Nectar perfumery is what bees forage on like to taste Eucalyptus or Citrus in the honey. Chinese honey lacks perfumery (character). Chinese bees harvest at 40% moisture dehydrated in a machine. This process results in hot air stripping perfumery, it scours odours. You are left with an odourless end product, and just sugar basically. Perfumes like to attach to dirty particles when stripped and ultrafiltered it removes particles and therefore odour. Honey ferments (sugars) through heat releasing enzyme" The respondent believed that choice grade honey had to have all the aromas/perfumery in it. The respondent added that South African Law failure and regulation failure does not recognize industrial grade, only raw or choice grade and no other grade.

When questions and the discussion turned to perceptions and insights about the respondents' views on the overall testing aspects of the industry and as a whole, there was again different views expressed as well as criticism about processed in South Africa. To these aspects the following responses were expressed:

> KI1: *"The certificate of origin comes from Intertech (Germany), but it is questionable as to how they sample and validate that it is 100% of origin. Relating to bee origin (as in country)… Seed and strip is practice where they mix pollen from a country (carbohydrate content). Honey can be stripped of pollen and ultra- filtered, making it indistinguishable and can therefore be any country of origin. A way to by-pass it if you mix. Honey is still sold as a product of place where it is not from. Honey is the second most adulterated produce."* KI5: *"No labs do C3 and C4 testing. Testing done at Intertech in Germany, some have sent their honey for testing. The only sampling at present is international. Providence for analysis in Germany."*
>
> KI9: "*No mention of C3 and C4 testing sugar in honey in both the Honey Standards Act and the Blue Book. SGS can test for sugar content such as glucose, sucrose, HMF and moisture content. In South African law sugarcane is still considered sugar"*
>
> KI3: *It is a flaw in the system as accountability is not forthcoming in South Africa, the industry is under threat. There is no control on mixing and theft/vandalism in South Africa. Beekeepers should declare the ratio of mixing and origins of honey and keep a log sheet to track the number of hives bought. The process should: harvested at date;*

tested at date; bottled at date. SABIO/DAFF checks only if registered, not audited. Enforcement by SABIO and DAFF to register should be to all retailers. Each hive and brood box (every frame and super for varroa or Scorpions) should undergo a quarterly inspection. Very transparent beekeepers should insist on selling from home, this is for consumers to hives and source. Honey should be tested where animal husbandry is occurring (mammals and vertebrates), it needs to be more regulated.

5.5.2 Vandalism

Aspects related to human-wildlife conflicts was highlighted above when the Honey badger label was discussed. When discussions attempted to highlight the key challenges experienced by beekeepers, aspects of vandalism and especially theft of hives were cited. Here respondents expressed frustration and even admitted that they believed that some of this crime was committed by people who knew of their sites and activities. This therefore speaks to the 'covert' nature of beekeeping activities and why beekeepers opt to keep their activities and even information sharing to a limit. Here respondents added:

KI2: *I do not have a badger problem, but I have a people problem who steal and vandalize my hives.*

KI5: *Theft and vandalism are problems that would work against labels such as badger-friendly as it would put beekeepers off investing any further. There needs to be traceability back to the apiary site with GPS co-ordinates on packaging.*

KI6: *Vandalism is problematic. If everyone was registered, we would be able to account for theft and vandalism. Contact numbers, bottling role players would be accessible, however keepers are not wanting to pay the levy. there is no professional recognition in South Africa. We used to lose 30% of our hives in Natal. The worst time of them is right before pollination…Vandalism and theft and the cost implication are a problem for this country. Beekeepers have to account for 30-40% extra to make up this shortfall caused by vandalism and theft."*

KI8: *The vandalism and theft is so bad in this country, it is the same as rhino poaching, I literally gave away two-hundred of my hives due to this problem. It was cheaper for me buying than to see to bees.*

KI10: *I am wary of the bee crimes in South Africa, pertaining to bee removals and swarm killings. This is process- intensive as it would take up to six hours to remove a swarm properly, so the crimes are orchestrated by people watching or knowing your sites.*

5.5.3 Adulteration

Aspects of honey adulteration was highlighted expensively in Chapter 3 and the extent of this practice is not limited to South Africa. As outlined above, as South Africa imports more honey than it produces, the market has seen internationally produced honey (which might have been subjected to adulteration practices being retailed in South Africa. Respondents included in this study were critical about these aspects and noted that as a result of the honey deficit, this problem has been exacerbated. Here respondents shared:

> KI8: *Chinese honey in South Africa is prevalent it is called playing the invoice game where all buyers purchase from the same supplier. If you hear people saying banana honey, it is a joke as bees do not collect nectar from banana plantations… Badgers, baboons and humans as well as diseases such as American Foulbrood, as in the 2017 outbreak are causes for deficits"*
>
> KI1: *Honey from China, Russia and Argentina is irradiated, which means that the good properties in the honey were stripped essentially leaving you with sugar water, or liquefied sugar. Rhodes fruit farms, the honey is from China and the additives are from China… In South Africa* we sell more local honey than produced.*"*
>
> KI6*: Tribol is a poison for ants, and for Varroa mite a strip is normally used... For bee pirates (wasps) cooking oil is used in margarine tubs, wasps see their reflection in the tub and die. Do not put bees low down or not elevated unless it is for pollination. Baboons turn hives over, but they are not that bad. Birds are problematic in winters…There are three or four big, well-known importers mixing honey with local honey. Highly filtered and heated honey with long shelf lives are being sold from reputable suppliers as pure or raw honey. If honey is imported it should have an irradiation symbol on the label"*
>
> KI9: *South Africa is a net importer of honey as there is a deficit in the market, it is already a premium product, I do not see why need to further go extra lengths to distinguish them in eco-labels if we cannot* meet the existing market. Pollination should be emphasised as a commodity to food security
>
> KI10: *We had problems with ants, so we used poison on the floor and placed the boxes on tyres, we then sprayed poison all around the tyres. There is also an overpopulation of Jack Wasps in the Western Cape, I have not experienced it though to date. Moths also try to get into the hive. Baboons also target honey. Bees and beetles also wrestle, but bees ware them off, however some beetles end up affecting the hive… If the honey*

origins states China or Argentina etc it is likely mixed with syrup and water, this loses medicinal value and the bee is the most dynamic medicine cabinet in nature."

KI11: *Drought, fires, badgers, theft, ants and Foulbrood disease ... We also had wasps attack our bees in Ottery and we used poison to control it. We had an ant problem in 2008 in the winelands, they attacked grapes and hives. We allowed the bees to carry on, but we cleaned out and took the honey away, we lost all production... The two "legged badger" is as destructive as a badger. These thieves set a cloth alight in front of the hives to keep bees inside so that it makes it easy to steal, we had 15 hives robbed in one instance, they took the hive with the super and left behind crates with stone. We know that it was a farmer who did the deed... The fire we experienced in Koeberg, we managed to salvage most of the honey apart from one hive… There is a honey deficit at this stage so we do make any other bee products."*

Some of the remaining challenges and aspects raised by respondents related to beekeeping techniques and land ownership and apiary sites. The latter was especially concerning with one respondent comparing the problem of securing an apiary site with it being like *"the mafia for beekeepers"*. Here the respondent noted that "*securing a site, comes at a premium as some of the sites are not owned by the farmers and that in some instances beekeepers have to pay rent to house their beehives on other farmers' farms."* The respondent expressed that it would be favourable if for instance, land was offered to farmers to undertake their beekeeping activities, but that this is not an easy task in the South African context.

Conclusion

This chapter has presented outcomes from the data collected in this study. Key here was to demonstrate how practices associated for the selected ecolabels are carried out and how stakeholders involved in the industry understand their required specifications and requirements. The results from the survey undertaken as well as the key informant interviews presented varied opinions and understanding of each of the eco-labels presented as well as highlighting the significance to the respondents' own activities or their general views of these labels. This chapter concluded above with a brief description of key challenges respondents viewed worthy to include as they either hinder own personal beekeeping activities or generally posed a threat to the sustainability of the industry.

CHAPTER 6: DISCUSSION

6.1 Introduction

In this chapter, beekeeping in South Africa is analysed by discussing the main findings of the study. It will highlight and discuss patterns, trends and issues that are prevalent in the industry which has broader implications for the industry and natural resource management. The study outcomes demonstrates consistency with aspects raised in the literature and the results in terms of the general industry activities in South Africa. This will be further elaborated on in this chapter where the country's beekeeping industry is discussed. Aspects raised in the data collection phases of this research and activities geared towards the success of eco-labels are also included in the discussion. A key focus of this chapter is to discuss the respective eco-labelled honey as the overall analysis of the results indicates that there are some misconceptions and misuse of the eco-labels by some industry role-players. This is emphasized here as this study's analysis concluded that not all of the research participants either fully understood or adhered to the given eco-label requirements. The last section of this chapter will draw deductions from the former two discussion points, supported with case studies from contexts in an attempt to determine what eco-labelled honey could mean for the future of agricultural sustainability and conservation for South Africa.

6.2 Beekeeping in South Africa: Implications for Agricultural Sustainability

The common themes that were forthcoming from the research analysis pertaining to the South African beekeeping industry included honey origins and adulteration (honey deficit), theft and vandalism (land ownership), and other issues related to predators, pests, diseases, and climate change (drought), where bee endangerment and extinction are symptomatic. Honey origins and adulteration (work in parallel), theft, vandalism and drought provide a reason for the beekeepers wanting to conceal their apiary sites. In the initial phase of the data collection process of the study, it became apparent that locational masking was used by the research participants. This therefore set forth a limitation in terms of meeting objective one of this study (identifying the eco-labelled apiary site or the exact location), which hindered contextualizing the geography of the apiary sites regarding climate and floral sources for foraging. As measured by the World Bank, many of the lower income countries are net food importers (2008), and despite the vast agricultural potential, Africa is a net importer of food and agricultural products (FAO, 2012). The FAO (2012) attributes some of the supply causes of rising food imports in Africa, to

availability of agricultural and arable land, low yields and productivity. Honey adulteration and origin masking also serves as a possible explanation for balancing the honey deficit. In Chapter 3, attention was drawn to environmental problems in the beekeeping industry such as climate and its related dependence on rainfall as constant source of nectar supply, which has further ramifications for honeybee populations. The honey deficit issue, can further be explained by the number of beehives around the world and the consumer demand for honey, which are both identified by Garcia (2016) as causes for fluctuating honey prices in the international market. Therefore, it is possible that honey adulteration and origin masking is driven by both climatic conditions and consumer demand. Although locational masking was a limitation in meeting objective one of this study, it conversely provided a basis for the second and third objective of the study, in that eco-labels (specifically honey) served as a tool for sustainability and conservation. Therefore, the procedures and practices in place to support the eco-label could not be traced from its origins and sequentially along the value chain, thus questioning the reliability of the claim and its lifecycle considerations. This implication therefore builds on the processes of greenwashing, but more specifically for honey in South Africa, it also supports the media attention surrounding honey adulteration and origins. Pizetti, Gatti and Seele (2021) attest that greenwashing is linked to scandals that occur at the supply-chain level, such as the point along the supply-chain where the discrepancy between “responsible words” and “irresponsible walks” occurs. This therefore implies that what is written on the labels versus what is implemented or available in the marker do not always corroborate.

As outlined in Chapter 2 of this study, initiatory information was presented, on the origin masking, and label tampering during export or transit of honey, and from the data collected in this study it was proved to be an overarching concern in the industry. The adulterated honey as indicated, contains sugar concentrates or syrup mixtures, and are then shipped internationally and passed as honey. These blended honey mixtures are then sold as pure honey and raw honey. It also raises the alarm for eco-labels such as badger-friendly honey which is supposed to be exclusively South African. This is the same as Pure Fynbos honey, a type of vegetation that is endemic to South Africa. It thus exemplifies where ecolabelling practices can become wrongful, as the origins are concealed and not forthcoming. This problem extends to other parts of the world, and is not only unique to South Africa. It compromises the integrity of the eco-label and supports greenwashing, implicating consumers. Further ecological issues in the South African beekeeping industry as indicated by the survey include predators, pests and

diseases, which have implications for eco-labels such as monofloral, organic and badger friendly. Although predators and pests are necessary for the resilience of ecosystems and promoting biodiversity, the mitigatory measures and agricultural techniques implemented by beekeepers and farmers have implications for agricultural sustainability – particularly monocropping. This will be further discussed below under their respective eco-label as these issues all impact on the sustainability of beekeeping.

\With regard to socio-economic aspects affecting honey supply, criminal activity such as hive theft and vandalism were the main drivers. It also affects the livelihoods and the bee industry's stakeholders, which according to Evans (2021) will have a serious impact on bee ecology, food security and the economy. Evan's (2021) also emphasizes the beekeepers calls for their bees to be recognized as livestock for government administration in South Africa. Hive theft and vandalism hinder bee productivity raising concerns for species population, which in turns affects the output of honey, resulting in honey deficits. In addition to adulteration, the masking of origins is also a means to prevent hive theft and vandalism from occurring. It provides a reason for beekeepers to refrain from disclosing their apiary site locations, but consequently poses challenges proving the origins of the honey and the associated eco-label claim. Evans (2021) cites habitat destruction by means of urbanization as a cause for reduced bee productivity, and that beekeepers are in dire need of people to offer potential apiary sites. This was brought to light by key informant one[1] who stated that apiary sites and beekeeping landownership are at a premium in South Africa.

6.3 Eco-labelled honey in South Africa: Sustainability and Conservation Practices

By account of an organization or individual choosing to manufacture or supply an eco-labelled product is an endorsement for sustainability. As outlined in Agenda 21, eco-labels aim for products to have lower environmental impacts throughout their lifecycle. The theoretical rationale of the selected eco-labelled honey was mostly understood by the research participants, and the results showed consistencies in practice. The research results outlined in chapter 5 provided evidence of misinterpretation and non-conformance to the prescribed requirements of the eco-labels and this is highlighted in the verbatim excerpts and photograph presented in Chapter 5. This was particularly

[1] Key Informant 1: Honeybee researcher and renowned South African author for honeybee literature. Stellenbosch, Western Cape. Interviewed May 2019.

apparent for badger-friendly, and organic and in some instances pure, raw and monofloral.

Of the eight selected eco-labels only two were Type I-like, the rest were Type II. The Badger Friendly label however reads closer to that of a Type I-like label, but differs as the third-party inclusion is not of an accredited certification body as in Eco-Cert or CERES, but rather a non-governmental conservation organization, which deems it a Type II label. The Type I-like eco-labels will be discussed first owing to its complexity, and associated requirements. The discussion provided here will also again refer back to the perceptions of the beekeepers, as none of the research participants were holders Organic nor Fairtrade for honeybee products. It was also noted by the key informants, that there are less than five certified organic beekeepers in South Africa, which was not easily verifiable by means of desktop research. A study by Burrows (2006) showed that consumers in South Africa are more aware of the food eco-labels for Organic, Fairtrade and Certified Sustainable Seafood, owing to the level of assurance which is certified by a the third-party.

This study found that the organic label is however seemingly misunderstood and or loosely used in the market as shown in the photograph in Figure 18. The credibility of an environmental claim depends on a high degree of transparency, clarity and trust (Czarnezki *et al.* 2014). Czarnezki *et al.* (2014) considers Type I more credible eco-label, and self-declared or Type II eco-labels (first-party) a riskier approach to market the environmental performance of products. This shows correlation to the results from this study for Organic and Fairtrade, where the key informants' perceptions were not as discrediting as they were for the self-declared labels such as badger-friendly.

6.3.1Badger Friendly

As highlighted earlier the badger-friendly eco-label marked the start of a conservation movement uniquely to South Africa. It also brought awareness to the consumer (Stausebach, 2016; Adendorff, 2018). Against the background of this eco-label and in terms of environmental ethics, the premise shows that it is a well-intentioned cause for protecting the honey badger against its speculated threatened conservation status. The vulnerable conservation status was notably documented in 2001 by Begg, whose primary motivation for the study on the honey-badger in the southern Kalahari, was owing to the lack of fundamental biological information of the animal in southern Africa. Stausebach (2016) drew on the Endangered Wildlife Trust, stating that since

the commencement of the eco-label, only one honey badger had been reported to be killed, arguing that the number is likely to be higher as the study found little transparency within the beekeeping community. The lack of transparency and poor reporting as argued by Stausebach (2016) adds to Begg's (2001) motivation for the study.

In a 2009 study conducted by Irlich and Davies-Mostert, it was assumed that the honey badger population had stabilized. Based on the literature review and responses captured in this research it would suggest that the conservation status of the honey badger is perhaps still unclear. However, to be cautious, beekeepers should not lose sight of the basis for the ecolabel, and continue to practice badger-friendly methods that are cruelty-free to minimize any hazards that would threaten the questioned honey badger's conservation status. The Begg's research on the conservation status of the honey badger, was a major contributing factor to the establishment of the eco-label. This was later agreed by Carter, Du Plessis, Chwalibog and Sawosz (2017) who researched the biology and conservation of the honey-badger in South Africa. Their study found that despite the limited literature available on the conservation status, the efforts for conservation, strategies and solutions have successfully been implemented in South Africa due to the reality of readily available badger-friendly products (Carter *et al.* 2017).

In Staubach's paper, it was also agreed, that the badger-friendly label runs on a sustainable model and should be better supported by consumers. Stausebach (2016) added that the badger-friendly eco-label is an exceptional example due to its accessibility to beekeepers at a low cost, providing a simple solution for preventing human-wildlife conflict. The low-cost notion was however disputed by the views of two respondents who found it not worthwhile to invest in efforts to obtain the label which other respondents believed contributed to the unwillingness of some beekeepers who were working against the label.

Noteworthy to highlight is that based on the badger-friendly label requirement that results from this study shows contradictions in the attainment of and the implementation of the ecolabel. Here respondents claimed that some beekeepers are printing their own stickers, environmental organizations are not rejecting or refusing to issue the badger-friendly ecolabel and that the label holders also have not undergone third-party audits in a decade. The claims made concerning the printing of stickers by

the beekeepers was observed in this study with the absent third-party party audit confirmed. These inadequacies related to the label was also confirmed by a respondent revealed to not have been audited in ten years. Aspects raised by respondents related to the integrity of the third-party inspection is therefore valid. Additionally aspects raised about the feasibility of the auditing process is impractical as all the hives at the apiary sites could not reasonably be accounted for, and the method of the inspection would therefore be a sample audit or "merely a paper exercise" (KI1). This was explained in the context of a apiary landscape (commercial scale), where there would be multiple apiary sites (hosting a number of hives) and a separate manufacturing facility, serving as a collection point for incoming honey from the producer beekeeper.

Respondents validated this argument by stating that the honey is only being audited at the supplier's manufacturing facilities, and not at all of the producer beekeeper's apiary sites due to its impracticality. Others argued that, their producer-beekeepers work for themselves, and that it is difficult to monitor their (producer-beekeeper) social conditions as all their honey is sourced. One respondent (KI7)[2] is a beekeeper supplier and holders of the badger-friendly label, and made it known that keeping track of the conditions where their honey is originating from is a difficult task. Which could mean that locational masking also bears limitations to the label as conservation measure of these sites could not truly be known. From the results outlined in Chapter 6 there were respondents who argued against the integrity of the badger-friendly claim, finding it untrue as the label is not being audited as it originally set-out to be, as funding was an issue to sustain the label. Here respondents believed that beekeepers are also to blame for this practice – and not and not only suppliers, which corresponds to the fundamentals of an eco-label in terms of the lifecycle requirements. However, there were respondents such as KI7 who indicated that their audits were all done in accordance to the label requirements and that they would have their respective producer beekeeper (that supplies them with honey), certification removed if they were found to be non-compliant by the third-party auditor. Here it was stated by the respondent that the auditor would inform them if one of the producer-beekeepers responsible for their honey supply to be in contravention of the badger-friendly label requirements.

[2] KI7: Commercial Supplier to: Multinational Retail Company (with a Sustainability Division) and Major Rooibos Wholesaler. Western Cape, West Coast. Interview date: May 2019.

There were responses captured that reflected on the label as being limiting. Here the argument was made in relation to urban beekeeping sites, that would not necessarily have honey-badgers. This therefore implies that urban beekeeping could qualify for the label despite inherently being badger friendly. This therefore is in line with KI1's sentiments, that badger-friendly honey could still be labelled that "by proxy", which does not account for imported honey and their related beekeeping conservation methods against predators. Honey by proxy could also mean that adulterated honey is labelled as "badger friendly." The conservation measures implemented for the origin of the blended portion of honey would be unknown, due to the locational masking, as evidenced throughout the study, and the application form omits requesting the address or coordinates of the honey that is sourced from a beekeeper-producer.

Based on the above, the badger-friendly eco-label is still vague and inconclusive, particularly pertaining to some of its procedural elements such as the third-party audits, and that urban beekeeping and adulterated honey could also potentially pass as badger-friendly despite the absence of honey badgers. This is related to the fact that the badger-friendly application does not request information or details pertaining to the location or origins of the sourced honey. The data regarding the conservation status of the honey badger is also seemingly limited, requiring research to investigate aspects related to its population dynamics.

6.3.2 Fairtrade

Certified Fairtrade honey has not taken off in South African markets as of yet, but has for other products such as coffee and cocoa which are sold at supermarkets and artisanal stores. The Fairtrade label combines conventional farming with best practice techniques (refer to Appendix 3). For example, the label allows for feeding bees sugar, but only at an absolute minimum and only during non-productive season, when bees are dormant. Best practice is suitable for developing nations, as it provides an opportunity for growth and improvement based on their existing techniques, without placing pressure on their resources and operations. Best practice refers to the most efficient method and prudent course of action that suits the commercial needs (Hayes, 2021), it enables reasonably practicable measures for beekeepers, which are realistic and attainable. The Fairtrade requirements (refer Appendix 5). Further to the voluntary best practice method in the standard that applies to all honey traders involves the action taken to support producers to mitigates weather-related risks. Traders are

encouraged to support beekeepers who face climatic risks in four proposed practices, which are; to provide relevant training and capacity building to producers on mitigatory measures for the effects of variable and inclement weather. To support producers with the relocation of their beehive during these weather spells. As well as sharing insurance costs (if available) and or sharing the risks with the producer by paying the producer a higher price or sharing the costs of any losses of harvest.

True to the label claim "Fairtrade," in its literal sense encompasses beekeepers in the context of farming methods (ecological) as well in the context of their livelihoods (socio-economic) owing to the provisions and resource availability, thus making it a sustainable eco-label in a South African context. The selected case studies aim to extrapolate information from similar developing countries as a gauge for South Africa. Where problems such as drought, poverty, limited modern agricultural technologies and rural livelihoods are common.

Fairtrade is chiefly targeted at developing countries, and in Latin America seven countries formed a honey producer network "PAUAL," uniting small-scale producer beekeepers of Latin America, on Fairtrade codes of conduct (CLAC Fairtrade, 2018). The honey network recognizes challenges faced by beekeepers in Latin America, which threaten the future sustainability of honey production. Small-scale producers have been working towards developing adaptation methods, to mitigate the effects of climate change, which is seen to be one of the greatest challenges to honey production (CLAC, Fairtrade, 2018). The honey network acknowledged that land and sea temperatures are greater now than in the preindustrial era, causing rainfall to become more variable and extreme. This compromises agricultural production as it disturbs floral cycles and the subsequent health or conditions of beehives. The honey network supports the climate change battle, through information sharing on best practices, involving strategic feeding, reforestation, beehive migration, and planting melliferous flora (producing honey) in their native regions, the network also urges beekeepers to continually monitor the changing landscape and weather patterns (CLAC Fairtrade, 2018). The beekeepers in the network are adequately informed on the dependence and relationship that exists between a healthy ecosystem and bee productivity.

Small producer organizations are required to meet a set of detailed Fairtrade Standards for environmental development. However, the joint Fairtrade-Organic certification is becoming increasingly common for environmental development, particularly for

coffee and has led to many improved production practices. This was exemplified by Nelson and Smith (2011) who found positive impacts on production in Mali, Senegal and Cameroon, where pesticides are widespread and viewed as a major environmental hazard. The Fairtrade-Organic certification resulted in these countries modifying their practices to include fewer pesticides that are of a low toxicity. Fairtrade certification demonstrated superior quality and higher yields compared to non-certified Fairtrade production. This evidenced in two separate studies in southern Mexico for coffee producers and in India for cotton.

Similarly, to organic, this includes pest management practices, handling hazardous chemicals, soil management which includes fertilizers and the prohibition of GM seeds, sustainable use of water and maintenance of water sources, as well as waste treatment. According to the standard, protected areas or areas of high conservation value and are demarcated as off-limits, this is to uphold biodiversity. Additionally, the Fairtrade Standard for hired labour organizations requires companies to make provisions for energy efficiency and reduce greenhouse gas emissions.

Fairtrade honey is required to be pure; adulteration is not permissible whatsoever, not in terms of aromatics, consistency or sugar (foreign sugar). It is also required to be free of foreign matter and residues caused by medical application to guard against bee diseases. To ensure prevention from adulteration, strict quality control prior to shipment is enforced by independent agencies and only new export barrels are cleared for shipment. Fairtrade has demonstrated success stories in developing countries for a variety of crops and for apiculture, and is safe to say that this could also be adopted in South Africa as it has incorporated both social and ecological considerations in the standard.

6.3.3Raw and Pure Honey

For labels such as raw and pure emphasis is placed on the manufacturing process and not the primary activities such as beekeeping. This is in compliance with the Agricultural product Standards Act (also called Honey Standards Act as evidenced in the results), where raw and additives are defined. The application of these eco-labels demonstrates implications for resource management as raw and pure honey refer to heating, filtration, straining and the use of additives during production. This corresponds to the foundation of an eco-label for activities undertaken at the manufacturing facility to have the lowest environmental impact. If mismanaged, it

increases the carbon footprint of an organization, for environmental aspects such as water and energy consumption, atmospheric emissions and waste generation and potentially poses risks to legal compliance, particularly for "raw" honey, which has to conform to a grade in South African legislation. If the manufacturing plant is ISO 14001:2015 certified (the parent standard of eco-labels) all the said environmental aspects would need to be a consideration. This contributes clearly to a DAFF (2021) article, where it is stated that good agricultural as well as good manufacturing practices are critical in order to sustain the crucial industry that of beekeeping. For these labels it is important to note that honey may be subjected to various laboratory tests to determine the composition, quality and ripeness (DAFF, 2021). The tests applicable to honey include moisture, HMF, GMO, colour, acidity, sugars (sugar, fructose, glucose), as well as pesticide and medical residues *inter alia* (Arbro Pharmaceuticals, 2021; Contract Laboratory, 2021). Failure to meet these tests means that the honey is not conforming to the standards pertaining to the quality of honey.

DAFF maintains that food safety quality measures should be a priority in all honey and mixtures of bee products. From this study respondents made mention of general problems in the industry and highlighted laboratory testing, more notably sugar testing for honey quality. Here an informant explained the three types of sugar testing to prove authenticity (for pure honey) are ranged from C3-C5, where C3 relates to plant sugar; C4 to sugarcane or grasses and C5 to the biomass produced by bees. The informant further added that the odour or aroma is paramount in honey, as opposed to sugar which is basic. This compromises the integrity of "pure" honey. As there is no definition in the Agricultural Products Standards Act for "pure", however "additives" is enlisted to relate to food additives, and in this definition, it makes reference to the Foodstuffs, Cosmetics and Disinfectants Act No 54 of 1972 for the definition of "food additives". The Cosmetics and Disinfectant Act defines "food additive" as any substance, irrespective of its nutritive value, that is not normally consumed as a food by itself, and not normally used as a typical ingredient of the food, which is added intentionally to a food. The definition further reasons that these food additives may directly or indirectly result in affecting the natural characteristics of such foods, hindering the quality, and therefore labelling as "pure" honey.

Respondents in this study added that, raw honey is not heated, which technically means that it is unripened and still "raw" from bees. Respondents added that the way to test honey quality for the uncooked or raw state, is through HMF testing

(Hydroxymethylfurfural), which is an organic compound that that forms from sugar in acidic environments during heat treatment (White, 1994). The parameters for raw honey as stipulated in the Agricultural Product Standards Act, is the same as Choice Grade liquid honey – if so processed. For Choice Grade honey, the quality factors (parameters) include colour, clarity, taste, and visibility in insoluble particles. As evidenced by the survey results there were respondents who believed that "choice grade" means the same as "raw honey." However KI1 added that if the results show high levels of HMF, it means that honey has been heated or stored for an excessive period of time, freshly extracted honey (straight out of the hive) will display low levels of HMF. Another respondent added that for it to be called "raw," it cannot surpass a moisture content of twenty percent (20%), and has retained all the floral perfumery. From the survey conducted claims were made that prominent commercial retailers are selling "raw honey", which fails the HMF test, thus not meeting the requirements to call it raw honey.

Respondents surveyed in the study were of the opinion that the issue of honey adulteration, which has implications for the raw and pure labels in terms of the sustainability especially during the manufacturing process. Adulteration requires manpower to blend the low-cost, sugar syrups, which increases the production costs (Elflein and Raezke, 2008). The most common adulterants used in honey include cane sugar, high fructose corn syrup, inverted sugar and corn sugar syrup (Elflein and Raezke, 2008). These increased production costs to cover the overhead and operational requirements would in turn increase pressure on resources for water and energy consumption, which would generate waste and potentially atmospheric emissions from the heat application.

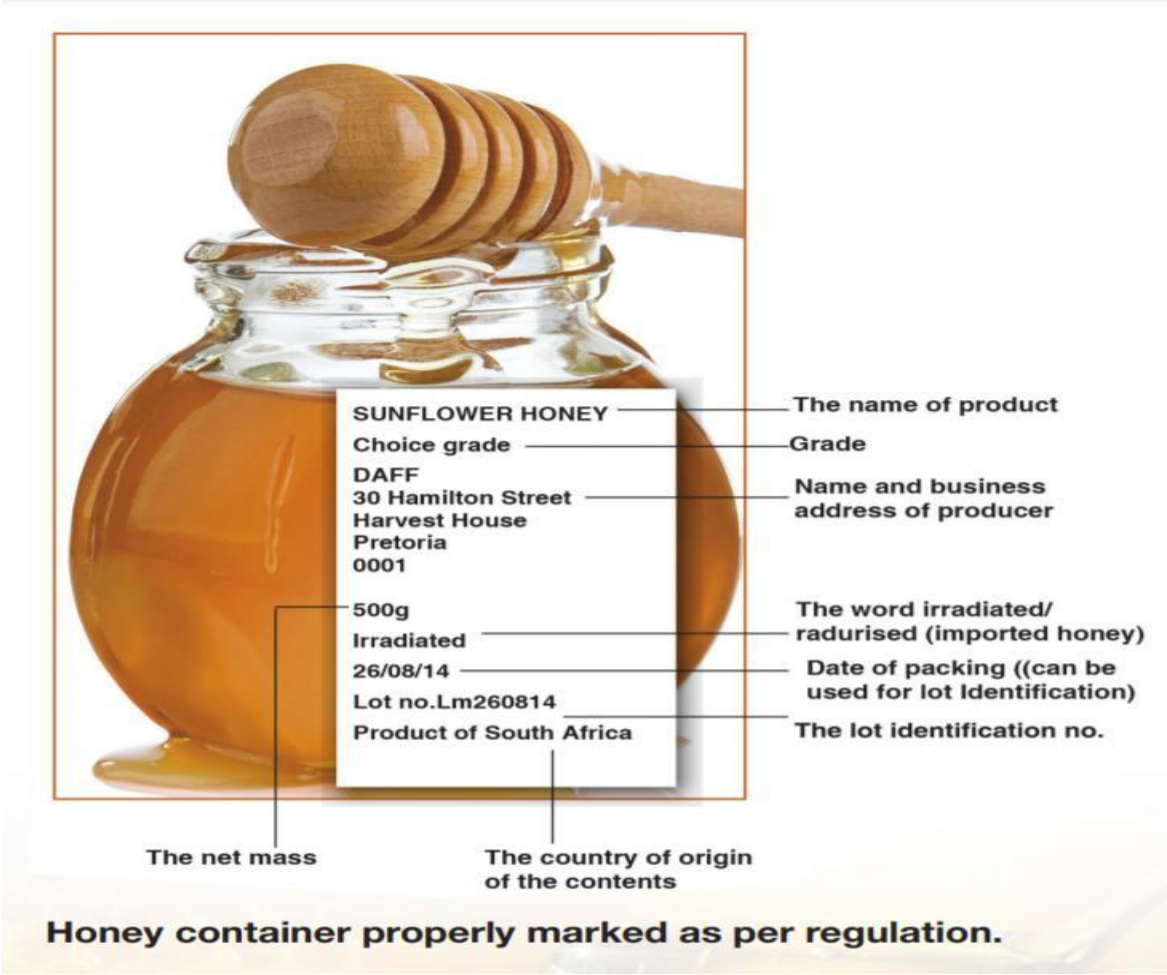


Figure 25: Honey container correctly marked as per Agricultural Product Standards Act, 1990 (Act No. 119 of 1990) Regulation No. R 835

The figure above is extracted from DAFF (2021), to demonstrate the compliant way of labelling South African honey as per the cited regulations. On the label, the name of the product would indicate whether it is "multifloral" or "monofloral", the grade would determine whether it is "raw", the wording for heating assists with identifying adulteration, packing date would also determine whether it is "raw" due to the duration of the storage time, and the country of origin would detect the types of floral honey as said or adulteration. Honey adulteration may only be a short-term solution to the global and local honey deficit problem, and to support the commercial beekeepers economy, but long-term it will have implications on sustainability due to the poor manufacturing practices which are critical to sustain beekeeping. It was observed during the study that only the small-scale, small-holder and hobbyist beekeeper's process methods for raw and pure, shows an inclination to honey authenticity rather than adulteration, implying that small-scale beekeeping in South Africa is still

relatively compliant with the requirements of "raw" and "pure." This is supplemented KI1 who stated that *"South Africa remains exclusively raw honey, less exposure to residue pesticide and fungicide unlike everywhere else in the world where antibiotics inside beehives accumulate in honey."*

6.3.4 Organic

For this eco-label it places both the apiary site and the honeybee species on a pedestal, as there are stringent requirements to optimize both, but it excludes the socio-economic dimension. To elaborate on KI9[3] , who stated that it is very costly and yields small amounts of honey, means that the eco-label allows for fallow and recovery periods for both the site and species, but at the same time is not a lucrative business model, particularly not for a commercial beekeeper in South Africa – that has been steadily declining in the last decade. Organic techniques are agriculturally sound, and is seemingly better suited to a small scale and small holder beekeeper in South Africa. An instance, where it could perhaps suit commercial beekeeping is in the Karoo, but with due diligence in place as per the standard requirements. To extend on KI8[4] who stated that organic honey would do well in the Karoo or bushveld regions of South Africa, where exposure to intruders and influences such as pollution are minimal. So the eco-label in this instance would adapt well spatially and temporally – geographically.

Intensive farming practices decreases the sustainability of beekeeping, this is in addition to urbanization and the consequent habitat loss as aforementioned (Evans, 2021). The intensified farming practices are fuelled by consumer demands as a result of a growing population. This poses a challenge to the organic honey label, as the premise is modelled on extensive farming practices, showing the transitions in agriculture that occurred during the revolution. Organic farming, essentially mimics nature, in that it uses natural ecological processes and biodiversity cycles, and adapts the local conditions to organic (IFOAM,). Certified organic honey is a subsection of the greater certified organic agriculture. As highlighted in chapter three, the certified organic label has explicit conditions for apiary sites, it requests the locations either GPS co-ordinates or an exact address, for any company applying for certification as

[3] KI9: Commercial beekeeper, trainer and supplier to: popular South African online for Organic Lifestyle and SA's largest health, wellness and organic food retailer. Cape Town, Western Cape. Interview date: February 2020

[4] KI8: Prominent industry role-players and manufacturers of mead and mead beers. George, Western Cape. February 2020

well as the subcontractors that are involved at any stage of the lifecycle. This assists the third-party auditor to identify if there are any non- compliances to the standard at any phase of the value chain. Of which would include the usage of pesticides, fertilizer, and veterinary treatments such as anti-biotics and growth hormones, which would be in contravention of the standard and negatively impact biodiversity.

The certified organic eco-label fosters high level of biodiversity as it covers the three levels of attainment; genetic, species and on an ecosystem level. Genetic biodiversity is addressed by the use and implementation of traditional seeds, offering resilience to both diseases and climatic stress (Stausebach, 2015). Of relevance to this study, organic farming improves pollination success on certain crops as found in a study undertaken in 2015 on strawberry crops (Andersson, Rundlof and Smith). It prohibits the use of Genetically Modified Organisms (GMOs), acting as a precautionary measure to any adverse effects that may be encountered through the use of GMOs (FAO, 2014). Bee colonies are equipped to survive winter, and recover post harvesting season. Ultimately supporting higher biodiversity – greater than any conventional farming method (Rahmann 2011).

On a species level, organic honey supports species endemism as preference is given to the use of local ecotypes. Organic farming combines a wide variety of plants and animal species in a given area which also promotes nutrient and energy cycling (Stausebach, 2015). Additionally, for new apiaries applications, the eco-label requires the origin of organic bees to be established by a clear division, as a means to maintain organic hives within an area. The elimination of synthetic chemicals and use of organic composts and manures promotes biodiversity on an ecosystem level, it also reduces the risk of groundwater pollution by leachate, and cultivates favourable habitats to support colonies. It also does not deter pollination, pests or predators to the site (FAO, 2014) which are critical to maintain a healthy ecosystem.

The National Policy on Organic Production (DAFF, 2010) envisages organic farming to become an alternative production system in South Africa that will contribute toward the realization of a green economy whilst also remaining compliant to agendas related to sustainable agriculture. IFOAM also acknowledges organic farming for encompassing traditional, scientific and innovation, benefitting the sharing of natural resources. Overall certified organic ensures food security and preserves biodiversity by

means of simpler and natural farming systems, and from the responses provided by the respondents it refers to taking it back to basics.

6.3.5 Monofloral

Floral honey is defined in the Agricultural Products Standards Act as honey derived essentially from the nectar of flowers. However, monofloral is not gazetted nor part of any convention in South Africa, particularly in terms of the ratio or percentage of the main floral source. To reflect on the results from this study, it is understood to have a minimum of 40-45% of the particular floral or plant source as stated on the label. Respondents in this research also cited another approach to produce monofloral honey which sees bees concentrated in one geographic region, where hives are centred around a five kilometre radius of only that particular floral source. The eco-labels (with reference to monofloral) identified in this study included Orange blossom, Pure Fynbos and Blue Gum/Eucalyptus, of which were used by five of the key informants. A key informant also added that Fynbos honey refers to a type of vast shrubland vegetation containing floral variety, rather than specific plant or tree species such as orange blossom and Blue Gum. There was a varied understanding and interpretation of what monofloral constituted as KI9 for instance stated that monofloral honey is harvested in an area of abundance, allowing for a seasonal flow of honey. This the respondent explained that if there is only sunflower or canola growing, it would be bountiful and readily available and accessible to bees – in other words they would not be attracted to other sources of nectar. Other responses (SR28)[5] stated that monocrops are "mono-seasonal" and that honeybees would therefore struggle in the "off-season," the respondent further added that diversity is better for the colony.

Respondents also explained the effects of monocultures on the quality and of honey flavour, adding that if honey lacks perfumery, it lacks the character that gives it the distinct flavour of the floral source, such as citrus honey or eucalyptus honey. This then compromises the integrity of harvested honey. Survey respondents argued against monocultures, stating that although bees are small organisms, they are also very complex and need a multiplicity of chemicals in their diet, which can only be derived from a floral diversity (nectar, pollen, water). Respondents stated that monocropping

[5] SR28: Hobbyist beekeeper, Wilderness, Western Cape.

agricultural techniques is only beneficial to the farmer as the bee colony declines due to the lack of variety. However, another survey respondent argued that monocropping is not a sustainable way to farm as it creates the need for pesticides and genetically modified seeds in order to sustain it. The concerns surrounding the bee's health surfaced considerably in the results, regarding nutritional deficiencies, pesticide usage, pest resistance and diseases that emanate from this method of farming. Therefore Clair *et al*. (2020) notes that honeybees kept at diversified farms showed increased colony weight and greater nutritional state over winter and therefore benefitted the overall production process.

Citrus and blueberry farms in the Eastern Cape were reported by two key informants surrounding concerns on the extensive use of pesticides causing ill health for the bee. KI5 [6]accounted for the high pesticide concentration on citrus farms as a means to prevent bee pollination, to disenable the formation of seeds – as dispersed by bee pollination. Beekeepers generally avoid keeping beehives near citrus farms owing to the high toxicity of the pesticides. There are however counter environmental labels to this, such as "Tango Gold," which claims to be bee-friendly, promoting a seedless protected variety of citrus fruit. This label was developed under the auspices of the University of California, but was ruled by South Africa's Advertising Regulatory Board to be misleading and inaccurate (Chambers, 2019).

The application of eco-labelled honey such as organic, wild and monofloral in an agricultural context confirms that that large-scale transitions brought about by industrial agriculture has negative impacts on apiculture and other productive activities, which are heavily dependent on a variety of floral resources and the responsible management of agrochemicals (de Groot, Aizen, Saez, Morales, 2021). The aforementioned study on these particular eco-labels showed a strong focus on pesticide use and forage availability.

6.3.6 Wild honey

In a rural and natural landscape such a forest environment wild honey is a favourable, as it supports livelihoods and it maintains tree endemism and floral variety through the regulating services of pollination. Migratory beekeeping (one locality to another to take advantage of honey flows) is more productive and the beekeepers target discrete

[6] KI5: Commercial beekeeper and supplier to a notable South African snack brand. Overberg, Western Cape. Interview date December 2019.

forage species. So in that context it is a socio-ecological favourable practice. Wild honey mimics nature, as it promotes homeostasis particularly of a forest ecosystem, enabling floral variety (as a food source for bees) and supporting biodiversity. However, in terms of urban beekeeping drawing on what the KI6[7] said of finding hives in buildings and manholes it is a pest removal concern and not be fit for commercial consumption, owing to the polluted surrounds, which bees would be exposed to in their forage. In an urban context it is likely better suited to hobbyist beekeepers to institute melliferous gardens to attract bees and promote beekeeping for conservation. The one negative aspect of wild honey however is that it disturbs the colony, causing destruction or partial thereof to the nest. If honey bees are kept in Langstroth hives by beekeepers, it is easier for them to extract honey without handling too much and disrupting the colony. It also enables the fitting of more supers to harvest more honey.

Wild honey follows the fundamental ideals of organic honey, allowing for natural processes. However, wild honey specifically refers to bees that are not managed by beekeepers. Bradbear (2009) also describes bees that are kept by beekeepers are basically wild animals and not domesticated in the way of other livestock species. This was also evident from the survey undertaken when respondent twenty-two also stated that beekeepers cannot command a bee to the type of tree or bush it should visit in order to forage especially if there is a large diversity. Wild honey is not a formalized eco-label, but rather self-declared. In this study seven key informants and majority of the survey respondents (87.8%) confirmed to either practice this method of beekeeping or to labelling their honey as “Wild Flower,” “Wild Hive,” “Multifloral” or simply “Wild Honey.” This is a colloquially accepted term. However, some of the responses recorded in the results disagreed with these terms, stating that it is not implying much calling it multifloral when it is common practice, and that irrespective of their surrounding environment bees are only attracted to nectar content. Other responses captured echoed this reasoning, by stating that bees “are in charge” or they “fly as they wish” inferring that there is no other alternative method of beekeeping and that bees are inherently “free-range” insects.

The floral variety in forests provide subsistence for honeybees and the tree cover provides shelter for hives (Hill and Webster, 1995). This shows symbiosis between bees and trees. Forests provide a source of organic nectar, as there is no direct

[7] KI6: Chairman of a South African Beekeeping Organization and owner of a generational beekeeping ecotourism establishment. Commercial beekeeper. Interview date March 2020.

agricultural activity (Agera, 2011). Pollination services are an immediate response for the conservation of forests and necessary for sustainable forest resource management, as many plants and trees have been conserved through beekeeping (Agera, 2011). Ultimately wild honeybees conserves biodiversity through afforestation and ensures food security by the provision of pollination services. This also shows a positive relationship and favourable trends for honey production. For rural livelihoods, honey is an important NTFP for the local inhabitants as it provides a source of income and food - from pollination and honey (Croft-Cusworth, 2017). Forest beekeeping and honey harvesting, also has low environmental impacts as it does not involve tree felling for the sale of honey. Deforestation however or blanket clearing for commercial and intensive farming causes declines in the pollinator populations and is negatively impactful to both livelihoods and plant biodiversity (Chanthayod *et al.* 2020). This weakens the species, increasing susceptibility to diseases which has consequences for maintaining the health of ecosystems (Chanthayod *et al.* 2020).

From this study it was noted that "exposure to a range of food sources, strengthens immune responses", implying resilience and promoting biodiversity. A study by Seeley (2017) on wild honeybee colonies (in trees and buildings) also found that that wild colonies possess defences against diseases such as Varroa destructor. A further study that compared the impact of pesticides on domesticated European honeybees and the widely distributed Asian honeybee colonies, found that pesticides acts uniformly on all honeybees, implying that greater consideration and beekeeping management strategies are required to conserve populations (Yasuda *et al.* 2017).

From this study, survey respondents made reference to UJBEE in the context of wild honey. The rationale behind this movement was an attempt to "breed less aggressive and a more productive race of bees" (Tribe, 2017). The endeavour however, failed as the European honeybee species in South Africa were unable to establish, owing to the competition of the indigenous African honeybee, during shipping and transportation of hives were also catalysts (Tribe, 2017) as bees do not like to be handled and moved around (prefer a common base) which was widely cited by the respondents regarding their techniques. A study published in Environmental Entomology suggested that the incorporation of natural habitat, rather than diversified farming, may be a better choice for wild bee conservation status (Clair *et al.*

2020).

6.3.7Mobius loop

Of the selected eco-labelled honey; Fairtrade, Organic, Wild, Monofloral and badger friendly correlates directly to beekeeping, covering the primary activities such as resource extraction, as per the first stages of the eco-label lifecycle. This is followed by the secondary activities of production and manufacturing, which covers raw and pure. The mobius loop accounts for waste management which in accordance with the eco-label lifecycle is last stage completing the lifecycle, occurring after consumption, it is also explicitly indicated as a Type II label throughout literature. The mobius loop adds value to the recycling economy, due to the recyclable income (rebate from glass or plastic) and limits environmental pollution by means of deviating from landfilling and minimizing littering, due to recycling. The study found the beekeepers were mostly using glass or PET plastic, not realizing the value-add from recycling to sustainability, which minimizes waste generation and consequent pollution.

6.4 Farming for the Future: An outlook of the Eco-labels for South African Apiculture

The discussions above pertaining to the respective eco-labels, are drawn on in this concluding section to determine the significance, it holds for future agricultural sustainability in South Africa. Ecosystem services such as pollination is also included, as it is significant for food security, which is a pertinent motivation for agricultural sustainability. The recommendations here draws from a systems approach and integrated management, on how eco-labels can be viewed in terms of reliability, conformance, recognition and the contribution of eco-labels to agricultural sustainability.

Of all the selected eco-labelled honey under study Wild, Organic, Fairtrade and Badger Friendly directly support agricultural sustainability in South Africa, whereas Raw, Pure and the Mobius loop support environmental sustainability within a broader sense. Monofloral was not generally perceived to be a favourable practice for beekeeping despite enabling good flowering periods of targeted forage. In instances where resources are insufficient for the honey bees to forage, monofloral honey may

not be as unfavourable. If honey bees struggle to find forage it will not produce honey due to limited resources. So in the event of good flowering periods, beekeepers fit supers to their hives to harvest more honey, this shows that honeybees are productive and storing lots of honey. Organic and Fairtrade appeared most credible due to its third-party audit which was discussed above, external audits and compliance inspections are useful monitoring measures for overseeing operational requirements and keeping record of non-conformances to the requirements of the standard. This presents the holder of the eco-label or the organization with opportunities to improve their systems so that it minimizes the environmental impact. It also provides record retention for environmental organizations conducting the third-party audits. Although badger-friendly is not technically a Type I-like eco-label as Fairtrade and Organic, the principles of the third-party audit are still applicable. The locational masking however will still remain challenging in this regard, and this is why honey quality testing is a vital tool for dissecting honey chemical composition.

With reference to agricultural sustainability; agriculture is also identified as primary destructive force of biodiversity (Gemmill and Varela, 2004; Vandermeer and Perfecto, 1997). This is apparent in monocropping, which employs commercial or industrial factory method of farming. Monofloral honey was also perceived to be a poor method of beekeeping, owing to the implications it has for bee health and ecology. As it reduces diversity to increase productivity (Pagiola *et al.* 1998). In terms of conservation strategies and sustainable beekeeping practices Hill and Webster (1995) argue that adjustments to the use of ecosystems and management of natural resources can improve farm biodiversity conservation, without acceptable decreases in the output of other agricultural services (Pagiola, et al.., 2004; Perrings, 2007). Rickets *et al.* (2004) maintains that well-targeted conservation investments in human dominated landscapes have potential to yield benefits to both biodiversity and agriculture. The concern however is that ecological conservation goals are unlikely to be met if farmers will incur any economic loss (Kiss, 2004; Huntley and Peterson, 2005; Common and Stagl, 2005; di Faclo &Perrings, 2005). This is where an eco-label such as Fartrade would work well as it incorporates all of these aspects.

With South Africa being participatory and signatory to global conventions, assists with economic reform and policy-making for the sustainability of the beekeeping sector. These conventions provide a strong motivation for South Africa to remain party to, as it improves social well-being and simultaneously achieves biodiversity protection

(Najam *et al.*, 2002). Being party to international pledges and conventions places emphasis on the linkages between natural resource conservation and economic development, which is relevant for sustainability principles (WSSD, 2002). With reference to global sustainability goals set and target for 2030, of the seventeen proposed SDGs eco-labels particularly contribute to accomplishing several goals that relates to agriculture and food (OECD, 2016)

Gemmill and Varela (2004) studied natural ecosystems and intensive cropland agricultural landscapes in the context of biodiversity and sustainable agriculture. Their paper considered aspects such as crop production, forest production, preserving habitats and landscapes, water flow regulation, water quality regulation, infectious disease mediation, regional climate and air quality regulation, and lastly carbon sequestration (Gemill and Varela, 2004). Of the eight listed aspects their paper showed that in terms of an intensive cropland landscape, only crop production is successful, the other aspects for biodiversity and sustainable agriculture were unsuccessful in this landscape. This exemplifies why monocropping be it pollination services, or monofloral honey has negative implications for agriculture and sustainability. It is also not a long-term solution to the sustainability for food security, because of the resilience to pests, usage of pesticides as discussed above (refer monofloral honey).

Wild honey, organic and the Fairtrade eco-labels directly support afforestation programmes which both have positive outcomes for the sustainability of beekeeping. The importance of NTFP, wild honey and the rural livelihood considerations on natural ecosystems was demonstrated by Gemmill and Varela (2004), where their study considered a natural ecosystem landscape to be the successful for forest production, preserving habitat and biodiversity, infectious diseases mediation and a few others; their study however found natural ecosystems to be unfavourable for crop productions, which is a counterargument against Hill and Webster (1995) and Smith (2015), however if adjustments to the use of the natural ecosystems and resource management is employed as per Pagiola *et al.*, (2004) as well as Pascal and Perrings, (2007) above, as it could have a nominal impact on agricultural output.

Economic reforms in the agricultural sector to regulate the Payment for Ecosystem Services (PES) and to commodify bees as livestock could also serve the industry favourably and which could potentially incentivize beekeepers and sustain their industry. Specific market mechanisms are instrumental in conserving biodiversity,

such market mechanisms include eco-labels for its correlation to sustainability and biodiversity (Bridgman, 2009). At the close of this study this sentiment was true for eco-labelled honey such as Organic honey and Fairtrade and even the Mobius loop based on the level of assurance that is attached to these labels, or the physical composition as per the mobius loop. The theoretical underpinning for eco-labels such as badger-friendly and wild honey support sustainable methods of agriculture and conservation. The figure below provides a simple scoresheet showing the label considerations, highlighting the focus of each. This figure provides a summary for the most suitable labels towards promoting sustainable agriculture.

Eco-label	Socio-economic	Environmental
	NO	YES
	YES	YES
	YES (commercial gain)	NO (only if lacking processing i.e additives)
	NO	YES
	YES (commercial gain)	NO (only if lacking processing i.e. heat application)
	YES (consumer preferance)	NO (bee health) / YES (pollination)
	YES (rural/forest)	YES
	YES (recycling economy)	YES

. ***Figure 26:*** *Considerations of selected eco-labels*

6.5 Conclusion

Approximately one third (29.2%) of the Earth's surface is covered in land, and in terms of the land-use, agriculture occupies thirty seven percent of this total. The land-use for agriculture is broken down further into grazing land, arable land (animal feed)

and cropland, of which thirty five percent is pollinated by bees. In stark contrast, the average worker bee measures a mere 15 mm in length, so small and lifespan so fleeting, but is responsible for contributing to global land-use for food production. The figure below captures this analogy of the influence of the a nearly microscopic insect on a global macroeconomic level for agriculture. Pollination for global food production and maintaining plant biodiversity, are both fulfilled by bees. This feeds the demands of the growing population and balances ecosystems to support a high level of biodiversity. This provides sound reason for the continued marketing of eco-labelled honey to support agricultural sustainability strategies in South Africa.

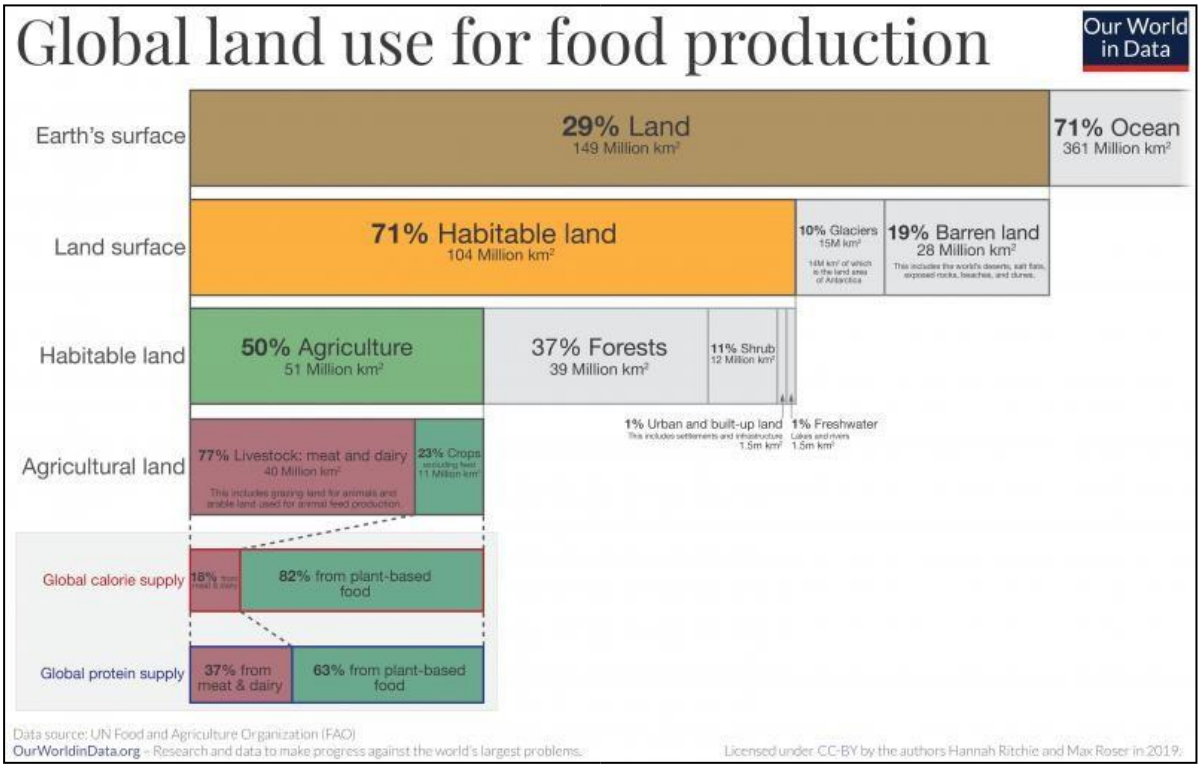


Figure 27: UN FAO (2019) Global Land-use for agriculture

CHAPTER 7 CONCLUSION

This chapter sets out to revisit the study's main aim and research objectives. It continues with a summary outlining the value of bees and the ecosystem services they provide. This aspect cannot be understated as bees provide an invaluable service which affects the very agricultural systems, that we as humans depend. This aspect has been emphasised in this study as it is not only important for the beekeeping industry, but for other interconnected local and global systems. The chapter concludes by highlighting some key limitations that was present during this investigation and concludes with recommendations for future research studies.

7.1 Revisiting the objectives

The implications of eco-labelled honey on agricultural sustainability was explored and analysed by engaging and interacting with the beekeeping community in South Africa (Objective 1). This formed the major aim and objectives of the study. Eco-labels such as Badger-Friendly, Fairtrade, Raw, Pure, Organic, Monofloral, Wild and the Mobius loop were investigated and analysed (Objective 2 and 3). It demonstrated how manufacturing processes associated with raw and pure; as well as agricultural and beekeeping techniques for Organic and Fairtrade and Badger Friendly, support sustainable practices and conservation (Objective 4). As highlighted in the literature review, in principle eco-labels are environmentally ethical as they are guided by standards (Objective 5). However, in the hands of people along the honey trade supply chain, the implementation and practice of these standards (and related requirements) is dubious for eco-labels such as Badger-Friendly, Raw, and Pure where issues such as adulteration and procedural flaws are prevalent. To remove this uncertainty, some of the eco-labels are verified by third party audits, which are carried out by accredited certification bodies. This was applicable to ecolabels such as Fairtrade and Organic, which are only received through this formality. This level of verification is also relevant to Badger-Friendly honey, which is modelled on a similar principle and procedure, but is however less credible because it is not certified in the exact same manner as the former two. Another method for verification is by enforcement of government regulations for eco-labels such as raw, floral and pure – and Organic in the global North. These regulations promulgates what may labelled or stipulated on honey products in South Africa. In a rural context, where forest beekeeping or wild

harvesting honey practices are adopted, eco-labels such as Fairtrade serves and supports beekeeping.

Some of the key constraints and challenges associated with eco-labels were also identified in addressing the study's aims. The first is related to costs as some of these eco-labels, as indicated in the study, are costly to carry out in South Africa. This again, was evident for eco-labels such as Fairtrade and Organic where there were less than five Organic beekeepers included in this study and no Fairtrade beekeepers. Fairtrade could potentially consider conservation compatible, holistic management of the production part of the honey bee industry, but as stated this is too costly and the price of honey cannot be increased to cover the beekeeper's cost of using the label. This aspect may have implications for greater and prevailing concerns such as honey deficits due to theft and rainfall variability. As eco-labels are based on a set of guiding principles for sustainable natural resource use and management for environmental protection, they are proposed either by voluntary best practice in the case of Fairtrade, promotes the lowest environmental impact. Badger-Friendly honey, which is a South African initiative has adopted cruelty-free and environmentally ethical measures to promote the longevity of honey badgers, which sparked conservation awareness to consumers. This therefore emphasises the role and value eco-labels can play in beekeeping activities as it aims to contribute to sustainable practices.

7.2 Value of bees for human activities and sustainability aspects

The study demonstrated the importance of pollination for both socio-economic and ecological gain. This was done by highlighting the leading role bees play for the planet and its inhabitants. As a regulating ecosystem service, pollination contributes to the productivity of farms and forests, supporting crop cultivation, tree regeneration and endemism, which in both instances conserves all three levels of biodiversity. Many species of plants (and animals) would face endangerment without pollination, due to the dependence on fruits, nuts, seeds and berries for forage (FAO,2014). The agricultural output provided by pollination is a direct contributor to food security. Pollination therefore shows direct contribution to sustainable development and biodiversity conservation.

As demonstrated in this study, beekeeping and honey harvesting sustains livelihoods, promotes conservation (and awareness), considers the working conditions of farmers, serves market demands for consumption, fosters biodiversity, is a source of ecotourism,

and as a NTFP is of high value to rural dwellers. The decline in beekeepers and reports of species extinction is a cause of concern to the longevity of the industry, ecosystems and the livelihoods that depend on it. Honeybee products such as honey, propolis, royal jelly, bee venom, pollen and beeswax have historically been sustained through the practice of beekeeping. The importance of bees to Earth and society is therefore inconceivable, in terms provisions for food and medicinal properties, which are essential for human survival. The perceived value-add is however poor in contrast, and market instruments such as eco-labels are therefore needed to assist with sustainable agriculture and natural resource management.

7.3 Limitations

During the fieldwork phase of the study it was apparent that there was a general sense of secrecy and omission of the beekeeper's apiary sites and harvesting activities. The lack of transparency in the industry, was also detected in Stausebach's (2016), Hutton-Squire's paper (2014), Masehela's paper (2017) as well as in the Badger-Friendly meeting minutes from the early 2000s (ARC, 2020). It hindered understanding the geographical context of the apiary sites as well the honey harvesting techniques in accordance with the lifecycle of the eco-labels.

7.4 Future research considerations and suggestions

This study's aims and objectives were addressed but there are still gaps in current research on eco-labels that warrants mention. In relation to the Badger Friendly label and activities associated with these practices, it is recommended that further research is required on a national level and therefore beyond the geographic boundaries of the Western Cape. This is important in terms of establishing the status of the badger species. Another research aspect worth exploring relates to the Fairtrade label which shows success stories for Wild honey is an important contributor to rural livelihoods in terms of forest beekeeping which is a novel area in resource geography. A recent investigation by Rickets and Shackleton (2019) emphasised the integration of livelihoods and forest conservation through beekeeping practices in KwaZulu-Natal . This needs further exploring in other rural contexts. Lastly, the valuation and payment for ecosystem services fulfilled by pollination should be realized and commodified to incentivize farmers. These activities aids and supports food security and also regulates ecological processes and therefore DAFF should engage with SABIO and the related provincial beekeeping associations to promote and support the growth and

sustainability of the industry in South Africa. As beekeeping is seemingly the only branch of agriculture that is truly altruistic in nature and is needed to manage natural resources, sustain agricultural development and conserve biodiversity it is essential to safe guard and sustainably promote these activities.

[Word count: 51 101]

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APPENDIX 1

NOTICE OF APPROVAL

REC Humanities New

9 November Application Form

2018

Project number:

7641

Project Title: "Eco-labelled products harvested at selected farms in South Africa: the effects on natural resource management and conservation"

Dear Ms Lindi Hendricks

Your REC Humanities New Application Form submitted on 8 October 2018 was reviewed and approved by the REC: Humanities. Please note the following for your approved submission:

Ethics approval period:

Protocolapprovaldate (Humanities)	Protocolexpirationdate (Humanities)
9November2018	8November2021

GENERAL COMMENTS:

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: Humanities, the researcher must notify the REC of these changes.

Please use your SU project number (7641) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

FOR CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

Please note that a progress report should be submitted to the Research Ethics Committee: Humanities before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary) **Included Documents:**

Document Type	File Name	Date	Version
Research Protocol/Proposal	LL Hendricks MA Proposal	10/08/2018	2
Data collection tool	Initial Draft of Key Informant Interviews	10/08/2018	1
Informed Consent Form	SU HUMANITIES Consent form template_Written rev2	07/10/2018	2
Informed Consent Form	SU HUMANITIES Consent template_electronic survey	07/10/2018	2
Data collection tool	Observation Framework	07/10/2018	2
Request for permission	SU HUMANITIES Request for data sharing from Gate Keeper	07/10/2018	2

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za. Sincerely,

Clarissa Graham REC Coordinator: Research Ethics Committee: Human Research (Humanities)

National Health Research Ethics Committee (NHREC) registration number: REC-050411-032.

The Research Ethics Committee: Humanities complies with the SA National Health Act No.61 2003 as it pertains to health research. In addition, this committee abides by the ethical norms and principles for

research established by the Declaration of Helsinki (2013) and the Department of Health Guidelines for Ethical Research: Principles Structures and Processes (2nd Ed.) 2015. *Annually a number of projects may be selected randomly for an external audit.*

Investigator Responsibilities

Protection of Human Research Participants

Some of the general responsibilities investigators have when conducting research involving human participants are listed below:

1. **Conducting the Research**. You are responsible for making sure that the research is conducted according to the REC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research. You must also ensure that the research is conducted within the standards of your field ofresearch.

2. **Participant Enrollment.** You may not recruit or enroll participants prior to the REC approval date or after the expiration date of REC approval. All recruitment materials for any form of media must be approved by the REC prior to their use.

3. **Informed Consent.** You are responsible for obtaining and documenting effective informed consent using **only** the REC-approved consent documents/process, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least five (5) years.

4. **Continuing Review.** The REC must review and approve all REC-approved research proposals at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period.** Prior to the date on which the REC approval of the research expires, **it is your responsibility to submit the progress report in a timely fashion to ensure a lapse in REC approval does not occur.** If REC approval of your research lapses, you must stop new participant enrollment, and contact the REC office immediately.

5. **Amendments and Changes.** If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the REC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written REC review and approval. The **only exception** is when it is

necessary to eliminate apparent immediate hazards to participants and the REC should be immediately informed of this necessity.

6. **Adverse or Unanticipated Events.** Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research related injuries, occurring at this institution or at other performance sites must be reported to Malene Fouche within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the RECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch University Research Ethics Committee Standard Operating Procedures. All reportable events should be submitted to the REC using the Serious Adverse Event Report Form.

7. **Research Record Keeping.** You must keep the following research related records, at a minimum, in a secure location for a minimum of five years: the REC approved research proposal and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the REC

8. **Provision of Counselling or emergency support.** When a dedicated counsellor or psychologist provides support to a participant without prior REC review and approval, to the extent permitted by law, such activities will not be recognised as research nor the data used in support of research. Such cases should be indicated in the progress report or final report.

9. **Final reports.** When you have completed (no further participant enrollment, interactions or interventions) or stopped work on your research, you must submit a Final Report to the REC.

10. **On-Site Evaluations, Inspections, or Audits.** If you are notified that your research will be reviewed or audited by the sponsor or any other external agency or any internal group, you must inform the REC immediately of the impending audit/evaluation.

APPENDIX 2

Dear prospective participant

My name is Lindi Leela Hendricks, a student at the University of Stellenbosch, and I would like to invite you to take part in a survey, the results of which will contribute to a research project in order to complete my Master's degree.

Please take some time to read the information presented here, which will explain the details of the project. Your participation is entirely voluntary, and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part. Please note that this survey will not ask for any identifiable information, therefore ensuring your identity remains anonymous throughout the entire research project.

The purpose of this study is to establish and document beekeepers and relevant stakeholders perceptions of beekeeping practices in South Africa, with particular reference to the use of packaging and labels that appear on honey in markets.

If you agree to take part in this study, you will be asked to complete a survey comprising of three sections. The survey consists of 11 pages (including this page). Some questions are multiple choice.

•Section A requests bureaucratic information, such as registrations/affiliations, location and beekeeping type/scale.

•Section B has a list of several statements/claims/labels regarding honey to which you are asked to tick applicability and provide your opinion/knowledge and/or understanding.

•Section C requires opinion and experiential input of beekeeping and harvesting methods, relevant to your type of honey

The survey will take approximately 20--25 minutes to complete. There are no right or wrong answers. The success of this project greatly depends on your co-operation and it is important for the accuracy of this study that you give honest assessment towards each statement.

RIGHTS OF RESEARCH PARTICIPANTS:

You have the right to decline answering any questions and you can exit the survey at any time without giving a reason. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact Mrs Maléne Fouché fouche@sun.ac.za; 021 808 4622 at the Division for Research Development.

Any information shared during this survey that could possibly identify you as a participant will be protected. This will be done by ensuring that all your responses will remain anonymous and confidential.

If you have any questions or concerns about the research, please feel free to contact the researcher Lindi Hendricks 22395210@sun.ac.za and/or the supervisor Dr Samantha Williams samanthawilliams@sun.ac.za

1.

Mark only one oval.

Option

2. *I agree to take part in this survey. An answer is required.

Mark only one oval.

- Yes
- No

Other: _____

Section A: Bureaucratic Information

Registration with the following governmental/organs of state/associations:

3. 1.1 Department of Agriculture, Fisheries and Forestry:

Mark only one oval.

- Yes
- No
- N/A
- I choose not to disclose this
- Other: _____

5. 1.1.1 Registration (optional):

_____

6. 1.2 The South African Beekeeping Organization:

Mark only one oval.

- Yes
- No
- N/

A

Ichoose to not disclose this Other:

_____

7. 1.2.1 Registration (optional)

_____

8. 1.3 Registered or signatory to any other affiliations/associations to beekeeping in South Africa:

Mark only one oval.

- Yes
- No
- N/

A

Ichoose to not disclose this ◯ Other:

_____

9. 1.3.1. Name of beekeeping association:

_____

10. 1.3.2 Membership/registration number(optional):

_____

11. 2. Is/are your site/s subject to audits by the following:

Mark only one oval.

- Government
- Parastatals
- Organs of state
-
- Environmental auditors/consultants
- N/A

choose to not disclose this

3. Location

12. 3.1 Kindly state the province/s in which your apiary sites are situated

13. 3.2 Kindly state the city or nearest city to your apiary site/s

14. 3.3. Kindly state the number of apiary sites that you have in total

15. 3.4. Kindly state your total number of apiaries (estimate):

16. 3.5. If you import honey, kindly state its origins:

17. 3.6. I would not like to disclose the aforementioned

Check all that apply.

- [ ] Check

18. 4. Kindly tick your scale of beekeeping:

Check all that apply.

- [ ] Commercial/ Corporation
- [ ]
- [ ]
- [ ]
- [ ]

Subsistence/ livelihood

On call/demand

Hobby

Dear prospective participant

19.

Mark only one oval.

Option 1

20. *I confirm that I have read and understood the information provided for the current study. An answer is required.

Mark only one oval.

Ye

No

Other: _____

21. *I agree to take part in this survey. An answer is required.

Mark only one oval.

Ye

No

Other: _____

Section A: Bureaucratic Information

Registration with the following governmental/organs of state/associations:

22. 1.1 Department of Agriculture, Fisheries and Forestry:

Mark only one oval.

Yes

No

N/

A

Ichoose not to disclose this Other: _____

23. 1.1.1 Registration (optional):

_____

24. 1.2 The South African Beekeeping Organization:

Mark only one oval.

- Yes
- No
- N/

A

Ichoose to not disclose this Other:

_____

25. 1.2.1 Registration (optional)

_____

26. 1.3 Registered or signatory to any other affiliations/associations to beekeeping in South Africa:

Mark only one oval.

- Yes
- No
- N/

A

Ichoose to not disclose this Other:

_____

27. 1.3.1. Name of beekeeping association:

28. 1.3.2 Membership/registration number(optional):

29. 2. Is/are your site/s subject to audits by the following:

Mark only one oval.

- Government
- Parastatals
- Organs of state
-
- Environmental auditors/consultants
- N/A

Ichoose to not disclose this

3. Location

30. 3.1 Kindly state the province/s in which your apiary sites are situated

31. 3.2 Kindly state the city or nearest city to your apiary site/s

32. 3.3. Kindly state the number of apiary sites that you have in total

33. 3.4. Kindly state your total number of apiaries (estimate):

34. 3.5. If you import honey, kindly state its origins:

35. 3.6. I would not like to disclose the aforementioned

Check all that apply.

- [ ] Check

36. 4. Kindly tick your scale of beekeeping:

Check all that apply.

- [ ] Commercial/ Corporation
- [ ]
- [ ]
- [ ]
- [ ]

Subsistence/ livelihood

On call/demand

Hobby

Section B: Eco-labels

5. Eco-labels

(a statement or graphical representation that appears on a product to assist buyers in making more "environmentally-friendly" purchases).

* * From the list below only select what is applicable and relevant to your honey/honey you supply OR the Eco-label/s that you are most knowledgeable of **

Badger Friendly Honey

37. 5.1.1. What is Badger Friendly Honey:

Mark only one oval.

- No traps or snares were used at any point to block hive access (e.g. leg-hold/gin traps/ cages/razor wire fences)
- Hives are kept elevated from the ground
- Hives are fastened to the ground and lid bolted down
- No chemical or toxic substances are used as a control method
- All of the above
- None of the above

38. 5.1.2. If the last point above was selected (none of the above), kindly describe your method/s:

39. 5.1.3. How did you obtain the Badger Friendly label/statement:

Mark only one oval.

- I went through an Environmental Organization I received governmental authorization
- behalf It is self-declared
- None of the above

40. 5.1.4. If the last point above was selected (none of the above), kindly describe your process:

The Mobius Loop (recycling)

41. 5.2.1. Does the Mobius Loop appear on your honey packaging (i.e. jars, bottles etc.) *Mark only one oval.*

Ye

No

42. 5.2.2. If you stated yes to the above, select your packaging/container material:

Mark only one oval.

Cardboard d

Plastic

Glass

Tin Tetraspace

k Other

43. 5.2.3. If you selected other kindly state your packaging composition:

Monofloral Honey (e.g. Pure Fynbos Honey)

44. 5.3.1. If you practice monofloral honey methods, select from the list below your predominant forage source:

Mark only one oval.

- Berry
- Blue gum
- Citrus
- Deciduous
- fruitFynbos
- Tropical fruit
- None of the above

45. 5.3.2. Please specify below if you selected none of the above

46. 5.3.3. From the list above, what percentage is your predominant source of forage:

Mark only one oval.

- 0-20%
- 20-40%
- 40-60%
- 60-80%
- 80-100%

47. 5.3.4. Kindly describe the methods adopted in your beekeeping to manage bees mobility/migration and to ensure monofloral crops:

Raw, Pure and Organic Honey

5.4.a) Raw honey

5.4.b) Pure Honey

5.4.c) 100% Organic Honey

48. 5.4.1. ABC are all the same, the terms are however used interchangeably:

Mark only one oval.

1 2 3 4 5

Strongly disagree Strongly agree

49. 5.4.2. ABC are all different:

Mark only one oval.

1 2 3 4 5

Strongly disagree Strongly agree

50. 5.4.3. Only two are the same

Mark only one oval.

1 2 3 4 5

Strongly disagree Strongly agree

51. 5.4.4. If you selected 2 (ABC are all different) to the above, kindly distinguish them below:

52. 5.4.5. In your opinion is monocropping/monofloral crops favourable:

Mark only one oval.

Yes, I am forit No, I am against it

53. 5.4.6 Kindly state why for either of the above:

Genetically Modified Organisms

54. 5.5.1 Do you make use of GM seeds in your crops or plantations?

Mark only one oval.

- Yes
- No

50/50

55. 5.5.2 In your opinion is GM favourable agricultural practice for beekeeping?

Mark only one oval.

- Ye
- No

56. 5.5.2.1 Please state why for either of the above:

Wild Honey

57. 5.6.1 Do you allow your bees to forage on any type of vegetation:

Mark only one oval.

- Ye
-
-
- No

50/50 (seasonality and availability dependent)

58. 5.6.2 In your opinion is “feral” beekeeping or allowing free range favourable practice?

Fairtrade (social and ethical label aimed at developing countries, taking working conditions, interests and rights of the producer [farmer and worker] into consideration) **It has not quite taken-off in South Africa for honey as yet, only a few have this label.

59. 5.7.1 How did you obtain this label?

Mark only one oval.

- I went through Fairtrade South Africa
- My retailer attained it on my behalf
- Through an environmental auditor/consultant
- It is self-declared

None of the above (please specify below)

60. 5.7.2. Specify if none of the above was selected:

61. 5.7.3. What considerations were taken into account for your workers, in order to meet these standards:

Section C: Experiential knowledge

62. 6. In your opinion, do you think that these aforementioned eco-labels are reliable in terms of beekeeping practices in South Africa?

Mark only one oval.

- Ye
-

No

63. 6.1. Please state why to either of the above:

64. 7.Do you use any pesticides / herbicides/fungicides/poisons on or around your crops?

Mark only one oval.

Ye

No

65. 7a.) If yes please specify below and why

66. 7b.) No kindly state why

67. 7.1 Overall, what do you think of the use of any of the above in beekeeping (un/necessary or in/effective)?

68. 8. Have you encountered diseases? If yes state the name and the year it occurred.

69. 9. If you have ever had your honey recalled, please provide the reason as to why it happened:

70. 10. If you have encountered raider/invader species (of any kind) to your hives, kindly explain what happened, and what you did to mitigate it:

71. 11. From the list below what are your primary concerns (maximum of two) around bees and beekeeping:

Check all that apply.

- [ ] Endangerment/extinctionofbees
- [ ] Climate change
- [ ] agriculture
- [ ] Use of pesticides
- [ ] No concerns

Other

72. 11.1. If you selected other, please specify below:

73. 12. If there could be an eco-label for bees and bee conservation, what do you think would be the best type of label?

74. 13. What in your opinion is best practice to conserve or rehabilitate an ailing apiary site (that was once thriving)? If you have an existing rehabilitation programme please include this.

75. 14.Whatinyouropinionisthemostsustainablebeekeepingmethodsand practice?

76. 15. What are your preferred primary sources of forage for your bees? Name at least five:

APPENDIX 3

Requirements

In this standard you will find two different types of requirements:

- **Core requirements** which reflect Fairtrade principles and must be complied with. These are indicated with the term 'Core' found in the column on the left throughout the standard.
- **Voluntary Best Practices (VBP)** which refer to the additional steps that all supply chain actors can take to foster even fairer trading conditions. They serve as your reference point for achieving best practise and contribute to greater sustainability in the entire supply chain. These practices are voluntary and not required in order for you to be in compliance with the Fairtrade Honey Standard. They will be however monitored on a regular basis in order to identify those actors that go beyond minimum compliance. These are indicated with the term 'VBP' found in the column on the left throughout the standard.

4.4.1 NEW Weather-related risks

Applies to: All traders	
VBP	You take action to support producers to mitigate weather-related risks.
Year 0	

Guidance: Honey production is dependent on regular weather patterns and, especially with the impacts of climate change, producers face the risk of their production being affected by irregular rainfall, drought, frosts etc.

You are encouraged to support producers who face these risks. Ways in which you can do this include:

- providing relevant training/capacity building to producers on how they can mitigate the effects of irregular weather,
- supporting producers to relocate their beehives,
- sharing insurance costs (if available), or
- sharing the risks with the producer by paying the producer a higher price or sharing the costs of any losses of harvest.

1. General Requirements

Intent and scope

All operators taking ownership of Fairtrade certified products and/or handling the Fairtrade Price and Premium are audited and certified.

This chapter applies to the certificate holder.

This standard covers the purchase and sale of honey. For the sections under certification and traceability (only), the standard also covers any processed products and derivatives.

The standard also covers its secondary products and their derivatives. The definition of secondary products is included in Annex 1 of the Generic Trade Standards.

A non-exhaustive list of products fitting the secondary products definition is published on the Fairtrade International website.

1.4 Other product requirements

1.4.1 Quality: The honey must fulfil EU and Swiss quality standards.

It must not have any objectionable flavour, aroma or taint absorbed from foreign matter during the processing and storage. It must not have begun to ferment or be effervescent. Honey must be free of any residues caused by medical application against bee illness (e.g. varroasis, foulbrood, etc.). Honey must not contain any foreign sugar.

The honey should be free of foreign matters such as mould, insects, insect debris, sand, etc.

Eventual feeding of sugar must be limited strictly to the non-productive season and in addition must be kept at the absolute minimum necessary.

Quality control prior to shipment must be carried out through an independent agent unless otherwise agreed between seller and Fairtrade Payer.

Only new export quality barrels should be used for bulk shipment.

Definition of the quality standards for honey:

Honey traded under Fairtrade conditions will be classified into two categories, according to its quality. Two criteria standards are defined as being relevant for determining the quality, namely water content and Hydroxymethylfulfural (HMF) content. For each category, points are given according to the following scheme:

Table 1: Assessing the water content in honey

Water content (% Chataway)	Points	Factor	Max. points
16.9 % or less	5	4	20

APPENDIX 4

Application Form for Organic Certification

In order to help us estimate the cost of inspection and certification, please supply the following information, by indicating as many details as possible and omitting items that do not apply.

1	**Company Name** and legal form of the company:		
	VAT number (for EU member countries outside Germany only):		
	General Manager or other responsible person:		
	Street and N°:	PO Box:	
	Post Code:	City:	
	Country:	Phone:	
	Fax:	Mobile:	
	Contact person for certification:	Contact person's Email:	

2	**Type of Operation to be Certified** (more than one can be ticked):		
	Farm (Crop Production) ☐	**Farmer Group** ☐	
	Food Processing ☐	**Wild Collection** ☐	
	Farm (Livestock) ☐	**Beekeeping** ☐	
	Trade / Export ☐	**Other:**	

2.5	**Beekeeping:**		
	Location of colonies:	N° beekeepers:	
	N° of apiaries:	N° of colonies:	
	N° of postharvest units:	Migration? Yes ☐ No ☐	
	Location of apiaries (please provide detailed address and/or GPS coordinates):		
	Location of migratory site for apiaries (please provide detailed address and/or GPS coordinates):		
	Distance from apiaries to address indicated under (1) above:	km	

3	**Are (sub)contractors involved at any stage?**		
	No (sub)contractors involved, all the units described under 2.1 through 2.6 belong to the company indicated in Section (1) above: ☐		
	The following (**sub)contractors** (not belonging to your company) **are involved**:		
	Entity	**Activity**	**Location (please provide detailed address and/or GPS coordinates)**

4	**Standards for which you request certification:** Please refer to: http://www.ceres-cert.com/portal/index.php?id=29&L=1	
	CERES standard equivalent to Regulation (EC) 834/07 outside the EU*	☐
	Regulation (EC) 834/07 on organic farming in EU member countries**	☐
	NOP (National Organic Program) for the organic US market	☐
	JAS (Japanese Agricultural Standard) for the organic market in Japan	☐
	Other organic standard (please specify):	

** Please tick this option if you are based **outside** the European Union and want to export organic products to the EU. Please refer to Policy 4.1.1 at http://www.ceres-cert.com/portal/index.php?id=30&L=1*

*** Please tick this option if you are based **inside** the European Union. For the time being, CERES can offer organic certification inside the EU only in Bulgaria and Romania .*

5	**Certification history:**	
	Do you have a copy of the standard(s) according to which you request certification?	Hardcopy ☐ No copy ☐ Access through internet ☐
	Which of the following statements is correct?	
	This is the first time I apply for certification according to the above mentioned standards	☐
	I am currently certified by but I am considering to change	☐
	I am currently certified by , but want to be certified by two agencies	☐
	My certificate issued by has expired	☐
	My certificate issued by was suspended or revoked	☐

6	**Any other relevant information:**

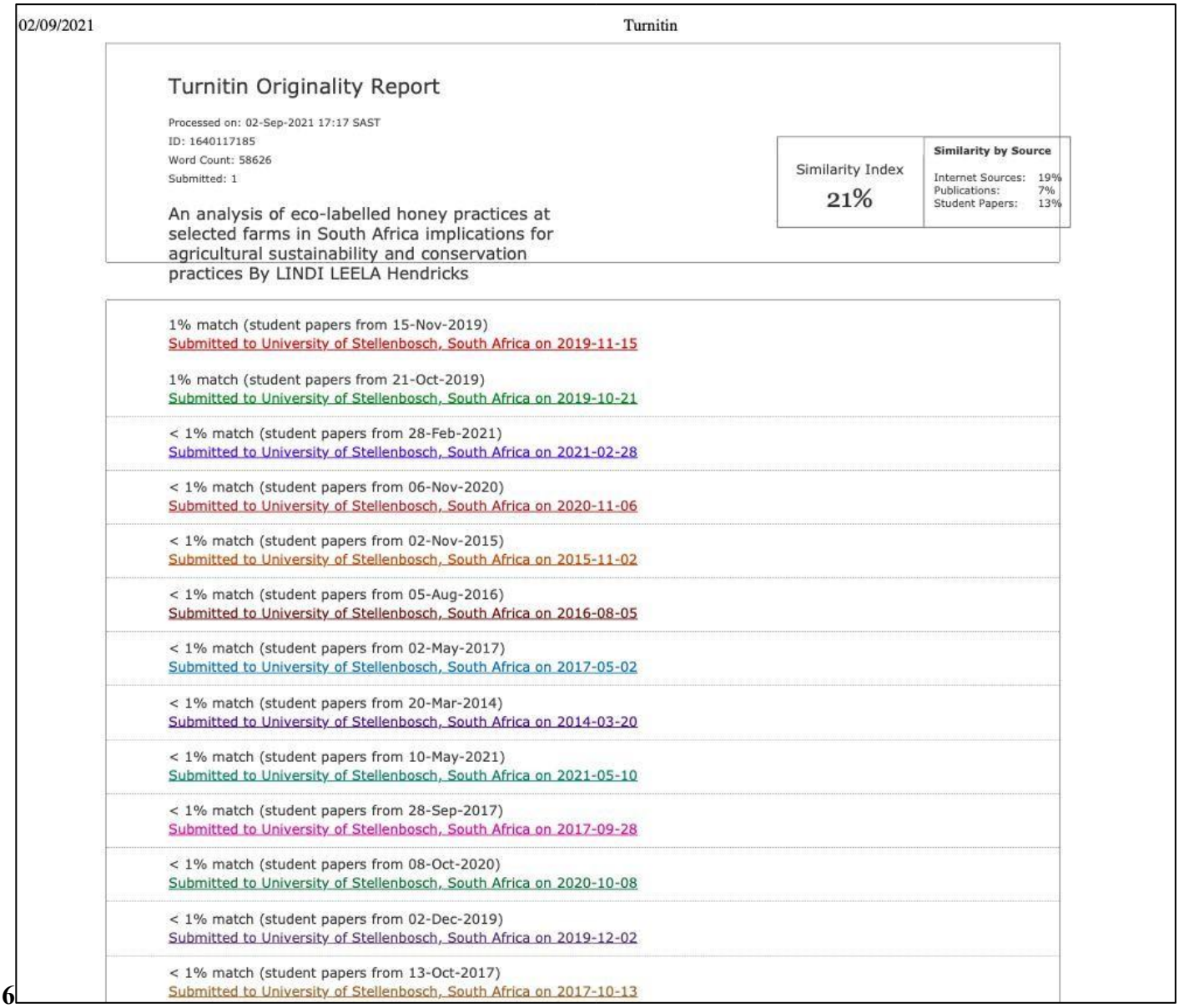
APPENDIX 5

KEY INFORMANT INTERVIEW (Fieldwork Journal)

1. Name and Surname

2. Background: How long have you been in the industry for? When did you start?
3. Bureaucratic: DAFF Registration and SABIO Membership
4. Trading name/Name of Business?
5. Training: Self-taught, passed from parents or formal training?
6. Scale of beekeeping: hobbyist; small-holder, small-scale, commercial?
7. Samples of honey
8. Understanding and perception of: Badger-Friendly, Fairtrade, Organic, Wild honey, Monofloral honey, Mobius Loop, Raw and Pure
9. Labels/sticks/terms/statements/graphics on honey?
10. Location of apiary sites (closest town, city)
11. Honey harvesting; pollination or bee removal services?
12. Predominant Floral Source?
13. Beekeeping Techniques
14. Processing Methodology
15. Overhead Costs: Transport, Labour, Equipment
16. Problems in the industry
17. Insight to international beekeeping practices
18. Recommendations to improve the industry (if any)
19. Referrals: stake-holders; literature
20. Closing / General

APPENDIX



02/09/2021 Turnitin

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