ANALYZING ORGANIC FARMING TRAINING IN THE CURRICULUM OF THE UNIVERSITY OF KWAZULU-NATAL, PIETERMARITZBURG

by

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DECLARATION

I declare that this research dissertation is my own work; it was undertaken by myself, except where otherwise indicated. It is submitted for the degree of Master of Agriculture (Agricultural Extension and Rural Resource Management) at the University of KwaZulu-Natal, Pietermaritzburg. It has not been submitted for any other degree at any other university.

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ABSTRACT

The study was conducted in the province of KwaZulu-Natal, in the town of Pietermaritzburg, at the University of KwaZulu-Natal. The aim of the research was to analyse to what extent organic farming is part of the curriculum at the University of KwaZulu-Natal (UKZN) in the Faculty of Science and Agriculture. The objectives of the study consisted of determining what is currently offered in terms of organic farming or sustainable agriculture; identify what the perceptions of students and lecturers are about organic farming; and identify the challenges faced by academics and stakeholders in organic farming.

The research method used to achieve the objectives was qualitative; it was done through interviews, site visits and observations. The data analysis used Microsoft Excel and SPSS (Statistical Package for Social Sciences) for interpretation and coding. This process was based on the data analysis spiral, as described by Creswell (1998) cited in Leedy and Ormrod (2005).

The research found that in the UKZN current curriculum there is a presence of modules dealing with organic farming to a small extent. The perceptions of academic staff concerning organic farming were related to sustainability, environmental protection, use of alternative methods for food production, human health protection and knowledge for future generations. Organic farming was regarded as a crucial approach on different levels, including food security, environment, economy and market.

The challenges in organic farming field are more related to costs involved in production, lack of interest or awareness, yield production (very poor and not competitive); limited career opportunities; lack of expertise in the organic domain, lack of government support and intense competition with chemical companies.

The research recommends an enhancement of organic farming training in the curriculum at UKZN/PMB; involvement of students in developing the curriculum; government support for organic agriculture; more research exploring the merits and disadvantages of organic farming; assessment of farmers' knowledge and skills in marketing; initiation of partnerships between organic farmers, processors, retailers; and government, to study a range of issues related to organic farming.

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ABBREVIATIONS

AGPS:	Agricultural Plant Science
ASC:	Soil Biology and Environment Management
ASC:	Soil Microbiology
B. Agric:	Bachelor of Agriculture
BGM:	Biochemistry, Genetics, Microbiology & Plant Pathology
BIOR:	Bioresource
BSc:	Bachelor of Science
CEAD:	Centre for Environment, Agriculture and Development
CRMS:	Community Resource Managements
CSA:	Soil fertility and fertilizer use
DRC:	Democratic Republic of Congo
FFS:	Farmer Field Schools
GM:	Genetically Modified
GMO:	Genetically Modified Organism
HACCP:	Hazard Analysis and Critical Control Points
LAN:	Local Area Network
NGO:	Non-Governmental Organisation
NRF:	National Research Foundation
PhD:	Doctor of Philosophy
PMB:	Pietermaritzburg
Postdoc:	Postdoctorate
Postgrad:	Postgraduate
PPTH:	Plant Pathology
PTD:	Participatory Technology Development
RAAKS:	Rapid Appraisal of Agricultural Knowledge Systems
SA:	South Africa
SAFS:	Introduction to farming system
SASA:	School of Agricultural Science and Agribusiness
SBCS:	School of Biological and Conservation Science
SBEEH:	School of Bioresources Engineering and Environmental Hydrology

SBGM:	School of Biochemistry, Genetics, Microbiology & Plant Pathology
SES:	School of Environmental Science
SPSS:	Statistical Package for Social Sciences
SSCI:	Sustainable Soil Fertility Management
UFPA:	Federal University of Pará
UFRRJ:	Universidade Federal Rural do Rio de Janeiro
UKU:	Livestock ecology
UKZN:	University of KwaZulu-Natal

CHAPTER ONE: PROBLEM SITUATION AND SETTING

1.1 Introduction

Knowledge is crucial and can be acquired through education that plays a fundamental role in the community. This is observed in different domains. The world is facing environmental problems such as global warming, climate change or disturbance of seasons that can hinder food production and slow down development in the coming years, if responsible measures are not taken now (Alma & Etheridge, 1993). Education, with the major role of informing people about what is happening in the world and what kind of measures to take, constitutes the primary foundation capable of providing knowledge and skills on which society can build. This is the main motivation for the present research as it is assumed that if enough effort could be invested in an academic curriculum focusing on organic farming, many people would be aware of the benefits of a safe environment and would learn how to work in a friendly manner with nature, by taking responsible measures for a better future.

There is a tendency to say that organic farming is sustainable farming which will prosper over time and benefit the whole community (UKZN, 2008). The reason for this is that organic farming works with nature and the soil is well protected (Roberts, 1995); this has made it an important alternative to conventional farming. The basic principles are to protect nature, prevent harmful influences on the environment and landscape, develop biological diversity, care for drinking-water and produce high quality food (Bavec & Bavec, 2007).

The study will inform academics and management at the University of KwaZulu-Natal involved in decision about curricula of how people with a sound knowledge of organic farming will be able to positively influence interventions and policies that are not working for the benefit of the whole community. The study may be of interest to similar stakeholders in other tertiary institutions. Currently, awareness of the state of the environment appears to be increasing as it is receiving wider and more public attention as it occurs in the news and popular journals and media. Such coverage often includes statements about the environmental crisis, its negative effects, and how the situation can be improved if new approaches are studied (at academic institutions) and adopted (in the field).

1.2 Statement of the problem

Looking at the impact of human activities on nature and the severe degradation of the environment (Saderson *et al*., 2002), there is a need to question their implication for food production, on nature conservation and on the sustainability of the whole system. It is time now for agricultural institutions to take another step forward by looking at ways of, and strategies for producing food with less, or no, adverse effect on natural environment. Organic farming is one of the best ways of producing food in a sustainable manner (Sheldon, 2008) and this should be promoted by agricultural institutions. Training at such institutions would encourage and influence people to work in a friendly manner with nature, to protect the soil, to develop biological diversity, to prevent soil erosion and minimize environmental pollution. Because of the above, it would be beneficial to analyse to what degree the University of KwaZulu-Natal is involved in organic farming training which is one of the key areas of focus of an agricultural tertiary institution, which should keep people informed about new challenges facing the environment and set new approaches to the challenges. Education plays a crucial role in this regard. The academic curriculum should be flexible, to accommodate new strategies and information that can lead to success. The current study will explore this information by looking at ways of contributing to the improvement of the situation before it is too late. For a better understanding, the following question and sub-questions will be considered in the study.

1.3 Research questions

The main question of the study is to investigate the extent to which organic farming is integrated into the curriculum in the Faculty of Science and Agriculture at UKZN/Pietermaritzburg. This question has four sub-objectives:

- To understand to what extent organic farming is included in the B.Sc. Agric. and B. Agric. programmes at UKZN.
- To identify what is offered in terms of organic farming at UKZN.
- To understand the perceptions of students and lecturers concerning organic farming training at UKZN.
- To identify the key issues and stumbling blocks of organic farming training.

1.4 Significance of the study

The study will provide relevant information about the current programme/curriculum and suggest what can be done to encourage training in organic farming at the same level as non-organic farming. This will depend on the opinions and comments of participants in the analysis of the current situation. If more effort could be invested in organic farming education, more people would be informed and tempted to adapt responsible measures to protect the environment by working with nature. Academics and management involved in decision about curricula from different academic institutions could adopt new approaches for food production and environmental protection.

1.5 Study limits

The present study is limited to the University of KwaZulu-Natal, campus of Pietermaritzburg. A sample of lecturers and students doing their postgraduate studies in the Faculty of Science and Agriculture was taken, because they were in a good position to provide relevant information as far as organic farming is concerned. External experts (stakeholders) in organic farming were visited, as they could contribute with relevant views and experiences for participatory curriculum development. The content will meet the needs of people in the field.

1.6 Clarification of concepts

Organic farming

An agricultural production system promoting biodiversity without the use of pesticides, herbicides, fertilizers or genetically modified organisms (Eicher, 2003) and enhances soil biological activity which is ecologically viable. It has a primary goal of improving the health and productivity of the soil, plants, livestock and people, for a long time (National Organic Standards Board in Delate, 2000).

Organic certification

Organic certification is a process set to give consumers of organic products a confirmation or assurance that their food is safe to eat, healthy and has been produced in a sustainable way. This process has certain types of standards, procedures and inspections, to be carried out for a product to be labelled “organic” (Smith, 2003).

Traditional agriculture

Traditional agriculture is an indigenous form of ecological agriculture that results from the co-evolution of environmental systems determining the way people were striving to get their food (Altieri, undated).

Conventional agriculture

Conventional agriculture is an industrialised agricultural system which uses inputs such as chemical pesticides and fertilizers; it is characterised by mechanisation, with emphasis on maximising productivity and profit (Eicher, 2003).

Curriculum

A curriculum consists of activities required to finish a course or a programme that can allow students to pursue and achieve their goals. It involves the content or course work that students can do in the classroom and outside in their spare time. It is provided by a training institution (Rogers *et al*., 2002).

Sustainable agriculture

Sustainable agriculture is an ecologically sound agricultural system that is socially acceptable and economically viable and can maintain productivity for a long time (Eicher, 2003).

Education

Is a teaching process that develops knowledge and skill of learners or students (Yero, 2001).

Training

Training is an educational process in which people can reinforce existing knowledge and skills, or learn new information (Salvi, undated).

Module:

A module is the basic unit of study through which credits are obtained. A normal credit load for a full-time student is 8 or 16 credits modules per year of academic study (UKZN, 2010).

Programmes:
Programme is a structured curriculum that specifies the combination of modules which will lead to the award of the qualification. This may include a number of sub-programmes or specializations (UKZN, 2010).

School:
School is the place where the teaching is undertaken through offered modules (UKZN, 2010).

1.7 Assumptions

It is assumed that a large number of people, either in academic institutions or businesses, are already aware of numerous challenges that nature is facing due to extensive use of chemicals and the release of carbon dioxide into the air (Feely *et al*., 2006). UKZN, as one of the agricultural institutions which is supposed to promote agriculture in all forms, is also aware; but does it make any changes or update its current Programme to address this adequately? The researcher, as an agricultural student at UKZN, has noted that many people feel that UKZN should include more organic farming subjects in the curriculum because of the current environmental crisis. A smaller number think that what is done now, as far as organic farming training is concerned, is fine and sufficient, because the use of chemicals in agriculture is productive compared to organic agriculture.

It is assumed, as well, that many agricultural institutions are not investing more in organic farming because of budget constraints or there is business-driven motivation (McCarney, 2002), as there is high demand for non-organic products (demand for researchers and graduates to work in companies and institutions that are promoting the use of chemicals and mechanization in agriculture).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Chapter Two is a literature review that will give a broad understanding of organic farming and education, by showing the reason why these two concepts are associated. Food production has always been the concern of many people striving to feed the growing population and at the same time protect or conserve the environment. Education is one of the ways people can acquire skills and knowledge that will help them to produce food efficiently and sustain their lives. The focus of this work will be on tertiary education, not because it is the right place to start, but because it is a level where people are about to be ready for service delivery, where they can be called to contribute positively in policy implementation and hence improve people's livelihoods.

The chapter has four main sections: the overview of organic farming (giving out the history of organic farming around the globe, the aim, advantages and disadvantages of organic farming); the debate related to food security compared to organic farming; the organic certification process and an overview for agricultural education.

2.2 Overview of organic farming

According to Kuepper and Gegner (2004), organic farming promotes and enhances biodiversity, biological cycles and the soil's natural activity. It relies on crop rotation, crop residues, animal manure, legumes, green manures, off-farm organic wastes and aspects of biological pest control to maintain soil productivity or build healthy fertile soil, to supply plant nutrients and control insects, weeds and other pests (Lampkin, 1990).

According to the FAO (2008), there are many explanations for, and definitions of organic agriculture. The most common one suggests that it is a system that demonstrates concern about potential environmental and social impacts by eliminating the use of inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation. These are replaced with site-specific management

practices that maintain and increase long-term soil fertility and prevent pest and disease damage.

Lampkin (1990) presented an alternate view; he criticized the notion of the non-use of chemicals found in most definitions of organic farming. He argued that all material, living or dead, is composed of chemical compounds, demonstrating that organic farming utilizes chemicals as well. The materials used for organic fertilizing, plant protection and livestock production are composed of chemicals. He refined the definition of organic farming as a system which seeks to avoid the direct and/or routine use of readily soluble chemicals and all biocides, whether naturally occurring or not.

In brief, organic farming is about maximizing and developing the use of natural resources to preserve and build soil fertility and to discourage pests and diseases using methods and practices that work with and within natural processes. Boland *et al.* (1999) explained that organic farming methods are often considered as natural because crops are produced within the natural processes that protect the environment. Organic farming refers to the production of food crops that exclude the use of fertilisers and pesticides as used in conventional farming. It is for this reason that the connotation of the term "organic" now has more to do with an absence of toxic chemicals than with organic matter as such (Roberts, 1995).

2.2.1 History of organic farming

According to history, the origin of "modern" organic farming coincides with the beginning of current conventional agriculture (Kristiansen *et al.*, 2006). This was prior to the green revolution (Institute of Natural Resources, 2008). People were cultivating and treating the soil in a sustainable way, using traditional methods that were natural (organic) until the arrival of chemical fertilizers, biocides, mechanisation and the use of fossil fuel, that significantly changed the approach to agriculture (Kristiansen *et al.*, 2006). Now organic agriculture has developed and it is practised commercially in 120 countries worldwide, representing 31 million hectares of certified croplands and pastures (Scialabba, 2007). The use of chemical or modern agriculture was a result of increased population, frequent famine and food shortages, hence a need to boost yields production to respond to the high demand for food. Modern science brought a new solution for agriculture to improve varieties and by the use of chemical pesticides and fertilizers (Ghosh & Varadachari, 2006). According to Lampkin (1990), organic farming arose in response to agricultural practices and the damage they cause to the

environment, which resulted in a loss of natural habitat and species. This history will be given broadly per continent.

2.2.1.1 Organic farming in Africa

According to the National Implementation Team (2006), the earliest recorded initiative in Africa to create an organic garden occurred in Tanzania in 1896, with the purpose of maintaining soil fertility (Institute of Natural Resources, 2008). The garden was initially fertilized by compost, wood, stable manure, ash and, later, by green manure. After this attempt, many organizations started similar projects, addressing organic principles. Some of these organizations are PELUM-Tz (Participatory Ecological Land Use Management-Tanzania), KIHATA (Kilimo Hai Tanzania), Sunnhemp Seed Bank, Promotion of Sustainable Agriculture, Inades Tanzania and ADP-Mbozi (Agriculture Development Programme). In 1990 the above organizations started to develop the idea of working on organic agriculture in the whole country of Tanzania (National Implementation Team, 2006).

Having a look at another country, which is situated not far from Tanzania, Taylor (2006) confirmed that formal organic agriculture in Kenya dates to the early 1980s, after establishment of the first pioneer organic institution. As in Tanzania, a few companies involved in horticulture started to grow organic vegetables for export. This initiative to promote organic agriculture was made by rural development, non-governmental organizations (NGOs), community based organizations (CBOs), faith-based organizations and individuals who were keen to help rural farmers address the problem of declining agricultural productivity due to soil degradation. The initiative helped them to face food insecurity and high levels of poverty. Organic farming was taken as the low-cost approach to palliate the above situations.

Moving to Uganda, the motivation to engage in organic farming came from the export market in 1994, as a few commercial companies had began showing an interest in organic agriculture. This situation matched the general situation in the agricultural sector aiming to develop sustainable agriculture as a way of improving livelihoods of people; but despite the involvement of NGOs, CBOs and governments, it was only a small step towards adopting organic agriculture. History shows that Ugandans have had given serious consideration to nature both culturally and in their agriculture (Taylor, 2006).

2.2.1.2 Organic farming in Europe

Organic agriculture was known in Europe around 1924, when a bio-dynamic agriculture course was held by Rudolf Steiner (Ologie & Landbau, 2002), who gave eight lectures at the Koberwitz estate on the spiritual foundation of farming, called bio-dynamic agriculture (Koepf *et al*., in Haccius & Lunzer, 2000). In the 1930s and 40s, organic agriculture was developed in Switzerland, the United Kingdom and Japan, the initial plan was not to solve environmental problems, but to increase production of high-quality food (Biao & Xiaorong, 2003). In Europe the interest in organic farming increased slowly in informal, local markets in the 1940s and 1950s (Institute of Natural Resources, 2008). Numerous farms started to convert to organic farming from the 1960s and, since the beginning of the 1990s, the development of organic agriculture has been supported by state subsidies (Biao & Xiaorong, 2003).

Another important person in the history of organic farming in Europe is the British farmer, Lady Eve Balfour, who was a pioneer in organic farming and education and a founding figure in the organic movement. She was one of the first women to study agriculture at a UK university. In 1920 she began farming, in Haughley Green, Suffolk, England. In 1939 she launched the Haughley Experiment, the first long-term, side-by-side scientific comparison of organic and chemical-based farming. She was helped by her friend and neighbour, Alice Debenham (Balfour, 2009).

2.2.1.3 Organic farming in America

In the United States of America (USA), the term “organic” was used for the first time in 1940 by Jerome Irving Rodale, in an article for publication; thereafter he launched a magazine, “Organic farming gardening”, that was published by Rodale Press. He drew his key ideas about farming from the British agronomist Albert Howard, who worked in India for a while, where he was inspired with important experiences and observations regarding agricultural practices (Kuepper & Gegner, 2004). Rodale came to the field without any agricultural experience or training, but he is known as the most influential individual who influenced the movement toward organic farming in the 20th century. He had many publications and discussions on organic farming, as he was against chemical agriculture. To demonstrate his

ideas he bought a 60-acre experimental organic farm near Emmaus, Pennsylvania (Kupfer, 2001).

Another important person is William Albrecht at the University of Missouri (1888-1974). He promoted the idea that if the soil is improved by increasing the organic matter and by fertilization, this can positively impact on the nutritive value of forage (Albrecht, 1938). He had many experiments proving that a "declining soil fertility (due to a lack of organic material, major elements and trace minerals) was responsible for poor crops and, in turn, for pathological conditions of animals**"** (Kupfer, 2001).

2.2.1.4 Organic farming in Asia

The movement towards organic agriculture in China started in 1990, when organic green tea was developed by the Zhejiang Provincial Tea Import & Export Corporation, for trade with Europe. Four years later (in October 1994), the organization called "Organic Food Development Centre (OFDC)" was created for the labelling of organic products and delivery of national certification (Biao & Xiaorong, 2003). The movement spread around the country and reached India, which is counted among those countries having a large number of NGOs working to promote organic agriculture, with great support from government. In 1995 a drive to adopt organic farming resulted in the formation of the International Federation of Organic Agriculture Movements in Asia (IFOAM-Asia) (Briones, 2004).

2.2.1.5 Organic farming in Australia

The development of organic sector in Australia was influenced by the fact that the country is generally agriculture oriented, with many exports (Wynen & Fritz, 2007).

In Australia the term "organic farming" was acknowledged in 1940 by Lord Northbourne in his book "Look to the land". It was reported in 1994 that the first organic society in the world was the one founded in Australia, the "Australian Organic Farming and Gardening Society (AOFGS)", which was based in Sydney, New South Wales (Paull, 2008). In the early 1980s the National Association for Sustainable Agriculture, Australia (NASAA), was initiated to play a crucial role in developing an organic industry in the country, by making available important information about issues faced by producers and consumers of organic products

(Wynen & Fritz, 2007). The number of organic farmers had increased in the early 1980s from about 500 in 1982 to between 950 and 1200 in 1990 (Wynen & Fritz, 2007). Australia currently takes first place in the world, having the largest area (10 million hectares) of organic farmland (Yussefi in Kristiansen *et al*., 2006).

2.2.1.6 Learning about the origin of organic farming

The foregoing debate suggests that the organic farming movement has evolved differently in different parts of the world. When conventional farming and its extensive use of fertilizers and pesticides began (*circa* 1896), Africa, at that point in time, was not sufficiently equipped to deal with that approach to farming, thus it largely continued with natural farming through traditional home garden and food production. The entire process was organic. Eventually Africa also adopted conventional farming practices particularly under government development programmes. Worldwide, it appears that organic farming as a movement (not as a continued practice of traditional farming) emerged in response to conventional farming which was perceived as damaging to the environment. By the 1990s, organic farming had established itself around the world as a part of the growing awareness of environmental concerns and as a part of preserving cultural practices of previously colonised countries. It has since emerged as a commercial activity complete with regulations and certification processes. All this highlights the fact that there is a wide diversity of understanding of the concept of organic farming and its application to agriculture.

2.2.2 Aim of organic farming

Organic farming aims to produce food while maintaining an ecological balance using fewer artificial methods to deal with issues such as soil infertility and pests. It treats problems in a preventive way, as opposed to treating problems only after they occur (FAO, 2008). Duram (2005) stated that, as a society, we must decide what we want and expect from organic agriculture. There are many possible goals, both ecological and social: improve soil resources and provide quality topsoil for future generations; protect surface and groundwater supplies, by reducing the use of chemicals in agriculture; improve landscape quality by providing visual and sensory variation in rural areas; and possibly help attract attention to rural areas and educate urban society about food production (Duram, 2005).

2.2.3 Advantages of organic farming

Organic farming promotes the healthy use of soil and air, as well as minimizing all forms of pollution that may result from agricultural practices (Duram, 2005). As the potential impact of genetically modified organisms (GMOs) on the environment and health is not fully understood, organic agriculture is taking the precautionary approach and choosing to encourage natural biodiversity (FAO, 2008), which can be increased at every level of the food chain (Randerson, 2004).The diversity is greater on organic farms in terms of land use, crops, livestock, trees, flora and sensory elements such as colour and smells (Duram, 2005). This diversity is influenced by the type of management practices used in organic agriculture, such as minimum tillage, returning crop residues to the soil, the use of cover crops and rotations and the greater integration of nitrogen-fixing legumes that increase the return of carbon to the soil and raise productivity and favour carbon storage (FAO, 2008).

2.2.3.1 Value of organic farming to improving agriculture

The contribution of organic farming to the environment is enormous, with great value to the improvement of agriculture, in a way that facilitates biological control of pests, carbon accumulation, nitrogen fixation and soil fertility needed for positive change in agriculture (Luigi, 2007). Plant breeding for organic agriculture produces cultivars with good nutritional properties and taste, enhances the potential for sound organic seed production and farming systems, and enhances biodiversity (Lammerts van Bueren *et al*., 2003). The more people appreciate the taste and positive effects of the product on their health, the higher will be the demand and more organic food will be produced. With the presence of organic produce at the markets, there is a movement towards bringing farmers and the community closer together. The underlying value here is the fact of being appreciated for a good produce on which people can rely (Dundon, 2008). All plants, both cultivated and wild, have a basic value based on respect for their integrity and autonomy. It is not only for plants, but the concept of the fundamental value applies for animals as well, indicating that animals are ethically relevant due to their utilization by human beings (Lammerts van Bueren *et al*., 2003).

2.2.4 Disadvantages of organic farming

The negative side of organic farming, according to Greeno (2006), is that people who are willing to buy organic produce today are paying artificially high prices compared to other produce. This is understandable, because there are more crop failures due to the fact that farmers cannot use pesticides, but a natural approach which is acceptable varies from product to product. Many feel that there is not enough evidence that supports the benefits of eating organic food to warrant the additional cost.

The reason for such high prices is that organic food supply is limited, compared to demand. There is a greater labour input per unit of output. Marketing and distribution chain for organic products is relatively inefficient and costs are higher because of relatively small volumes especially for processing and transportation (FAO, 2008). Producers work by taking into account all the effort involved (farm incomes) which result in higher consumer prices. This could lead to the issue of affordability for households with low incomes (Niggli *et al.*, 2008). The justification for this increase in the price of organic foods includes not only the cost of food production itself, but also a range of other factors that are not included in the price of conventional food, such as environmental enhancement and protection, higher standards for animal welfare and avoidance of health risks to farmers due to the inappropriate handling of pesticides (FAO, 2008).

Green (2008) completes the argument by showing how many people believe that organic food has "sold out", becoming a marketing publicity act. Companies are marketing more organic products, changing ingredients and altering labels in an effort to jump on the "organic band wagon", while benefiting from the higher prices, which make organic products expensive and non-affordable for many people. Dishonest farmers may try organic methods for the short-term profits they think they can earn, but those farmers will not last long, because successful organic farming requires commitment and determination (Roberts, 1995).

2.3 Food security and organic farming

According to the FAO (2007), the stability of the food supply is largely related to the environmental conditions that allow the sustainability of food production. In the food production process, farmers can improve or degrade the environment. This degradation of the

environment, specifically of agricultural land and the soil continues to be a major threat to food security and sustainable development (McHarry *et al.*, 2002). Food security of any place or region is not simply a question of producing enough food to meet demand; it is also influenced by many natural factors caused by human beings (United Nations Conference on Trade and Development, 2008). These factors can be related to farmers degrading the soil or ordinary people polluting the environment (International Trade Centre, 2007), impacting negatively on food production per unit area.

Every country and its peoples have the right to maintain and develop their own capacity to produce basic food for all, at the same time respecting environmental, productive and cultural diversity, because achieving food security must also contribute to sustainable agriculture and rural development (McHarry *et al.*, 2002).

There is now a debate concerning the question whether or not the spread of organic methods and large-scale organic farming would increase or decrease global food security. Niels *et al*. (2006) suggested that it will depend on a number of socio-economic factors, together with the relative yield levels of organic farming compared with conventional farming systems. It was confirmed by the United Nations Conference on Trade and Development (2008) that organic farming is an important contributor to food security improvement, as it leads to increased food production that can double yields in many cases and increase access to food on several levels in the sense that when there is an increase in the quantity of food produced per farm, there is greater household food security, because all members of the household will have access to sufficient food.

2.4 Organic certification process

The organic certification process is a confirmation given by the third party proving that a production or handling operation is in conformity with organic standards. This process assures the consumers of organic integrity. It consists of growing a product in an organic production system first, that put emphasis on plant and animal health, pest management, and careful use of materials; then, the product is protected from contamination starting from the field to final stage of sale (Baier, 2005). Kuepper (2010) gives more detail about this process by providing five steps to follow:

The first step consists of identifying a suitable organic certification agency that might be operated within the state agricultural department, or private entities which is accredited by the National Organic Programme. The second step is the application submission where the producer will request a copy of the certifier's organic standards accompanied by an application packet, which typically includes an organic farm plan questionnaire. The third step consists of a completeness review, meaning that the agency will review the organic farm plan application to be sure that it is complete and that the operation complies with organic standards; The fourth step consists of an inspection on-farm where all the relevant areas of farm will be looked at by an inspector who will be focusing on indications that the producer is operating according to their organic plan and is in conformity with organic standards. The last step is the final review where the organic farm plan application is reviewed by an individual or certification committee with expertise in organic farming and certification standards.

According to (Soil Association, undated), the following elements are considered in the meaning of "organic": pesticides are severely restricted, artificial chemical fertilisers are prohibited, animal cruelty is prohibited and a truly free-range life for farm animals is guaranteed, the routine use of drugs, antibiotics and wormers is disallowed, genetically modified (GM) crops and ingredients are banned under organic standard. This can be proved or verified through the process of organic certification done by the specialist certification agency.

2.5 Education overview

There is no doubt that education plays a fundamental role in the life of a person, of a nation, of a country and of the world. No matter how it is attained, education is important because it equips people with important skills to earn a living and to make a difference to the lives of others. It teaches people about themselves and their environment, so that, in acquiring this knowledge, they may live life to its fullest. It educates them about the hazards of life, so that they may know how to avoid them (Dlamini, 2003). For example, in the current situation of environmental degradation, the agricultural crisis in the world, or any other danger, the role of education would be to provide strategies and techniques to deal with the challenges and to find a better solution for all, everywhere.

In order to cope with the challenges, countries should give education first priority, to encounter fundamental changes in the form of sustainable development and social cohesion (Zgaga, 2005). Universities will produce influential graduates in various fields, ready for service delivery such as staffing, management, funding and operation of colleges, research centres, training centres and extension services (Kwarteng, 2000). These graduates will deal with different situations hindering the general improvement of living conditions.

Although there are many kinds of education, the present work will focus on agricultural education and curricula needed for organic farming.

2.5.1 Agricultural education

Agricultural education has a mission to support and prepare people for their careers, so that they can develop leadership in the production of food, natural resource systems and fibre. According to Fortier *et al*. (1998), there are different standards in education that people can reach, depending on the quality of knowledge delivered. People who will benefit from education in agriculture will acquire knowledge of food and fibre production, processing stages, food safety and how to market products locally or internationally. They will have practical knowledge of the impact of agricultural activities on the environment; they will learn about gardens, recreational areas and caring for animals; they will be influential in dealing with management, extension services, the operation of different institutions and funding (Kwarteng, 2000).

Because of agricultural education, farming activities have recorded great success, thanks to researchers, scientists, teachers and extension workers who have made important technological findings to be transmitted to farmers for the production of higher yields (Kwarteng, 2000). Educational programmes should be adjusted to meet the different needs of society (Davis *et al.*, 2007).

There are some problems and challenges faced by agricultural education. Among them are weak liaisons with other parts of the agricultural education system; isolation of agricultural universities; poor practical skills; unemployment of graduates, often due to lack of relevance of curricula and failure to attract the best students from secondary schools. These problems are barriers to effective education (Kwarteng, 2000).

2.5.1.1 Role of agricultural education

Agricultural schools have a major role in economies that are based on rural living. Two main factors need to be taken into consideration in contemporary agriculture, for a shift in the economy and social structure. They consist, firstly, of diversification of the rural economy that can boost the service sector and create more job opportunities; secondly, agricultural education is a crucial aspect of the knowledge development needed by rural society (Guðrún & Helgadóttir, 2001). Agricultural graduates will find employment in ministries of agriculture, private enterprise, universities and government departments. They can work as policy advisers, researchers, lecturers, extension workers, financial experts or business managers (Chakeredza *et al*., 2008).

According to Madukwe (2008), the target in agricultural education at the tertiary level will be to equip graduates with capabilities allowing them to respond to changing paradigms such as developing measures and solutions to the effects of climate change on agriculture. This education should be of good quality, accessible and relevant. Atchoarena and Holmes (2005) stress that all stakeholders (students, professors, farmers, entrepreneurs, policy makers and extension services) need to work together, forge a new partnership around one goal related to problems facing agriculture and find a common solution.

To be of good quality and to perform a constructive role (Atchoarena & Holmes, 2005), agricultural faculties need to re-examine their curricula and expand resources, so that students can receive the skills training and education that is urgently needed. Students will be provided with research skills enabling them to become familiar with new and emerging fields (Madukwe, 2008).

Giving opportunities to young people to gain tertiary level education is one of the missions of modern agricultural education. It will prepare them for life as they could work in the rural economy (Guðrún & Helgadóttir, 2001), focusing on agriculture, which continues to be the driver of economic growth in many countries (Chakeredza *et al*., 2008). Agricultural education targets not only the improvement of the economy but also the social and intellectual satisfaction of rural people (Guðrún & Helgadóttir, 2001).

Education is playing a crucial role in different fields particularly in agriculture where agricultural colleges and universities were initially created to increase farm production with

the use of the updated technology and agricultural research findings . The mission of these early educational institutions was to scientifically study agriculture, with the participation of the farming community; to carry the results to a broad range of farmers who could use them; and to train farmers, extension workers, agricultural teachers and researchers, so that agricultural production could continue to increase on a sustained basis (FAO, 1997).

2.5.2 The agricultural curriculum

The agriculture curriculum is supposed to contain scientific and agricultural disciplines which would transfer valuable knowledge to students; it can also enhance the relationship that the world has with nature in general, give the scientific knowledge and practical process for agriculture (Trexler & Hikawa, 2001), for example how to work with the land in the field of science and how to farm. There are different programmes or curricula in the agriculture field. It will be better to differentiate first sustainable agriculture from organic farming. According to United States Department of Agriculture (2009) sustainable agriculture includes many different production methods, systems, and approaches that aim to meet the goals of profitability, stewardship, and quality of life. One of those approaches is organic farming. Organic farming is generally considered to be under the umbrella of sustainable agriculture. The present study will focus on the organic farming curriculum, by highlighting the range of knowledge, skills and attitudes that a student of organic agriculture could reasonably be expected to acquire.

2.5.2.1 Knowledge and skills for organic farming

Before discussing the skills and knowledge required, let us remind ourselves that agriculture is not only affected by climate change but also contributes to it. Ten to twelve percent of the global greenhouse gas emissions happen during the process of producing food. Intensive agriculture has led to overgrazing, deforestation and widespread use of practices that result in soil degradation (International Trade Centre, 2007). Organic farming practice seeks to overcome this through of adequate knowledge of managing the organic systems that include soil fertility, tillage and cultivation, propagation and transplanting, pest management and irrigation use (Charles, 2004).

Comparing to conventional farming, organic farming differs from conventional farming in a number of ways. In conventional farming, synthetic chemicals are used to improve the growth of cultivation. However, in organic farming there is use of organic wastes and compost in the form of fertilizers, which can result in increasing the nutrients supplied to the plants. To get rid of pests and weeds, a conventional farming method would make use of pesticide or insecticides. However, with organic farming, the farmers would prefer making use of birds and some insects that would destroy the harm causing insects, or by doing rotation of the crops that would prevent the particular weed from destroying a plan (Pitts, 2010). When it comes to animals, in conventional farming, animals are given antibiotics against diseases. Intensive farming methods are used to grow chicken quickly and most of the time the animals are kept indoors. However for organic farming there is a good animal husbandry standard. No antibiotics are used on animals which are handled properly and given a proper diet, and adequate exposure to the outdoors (Buzzle, 2007).

Gold (2007) suggests the following elements as the most important knowledge needed for organic farming:

- the use of cover crops, green manures, animal manures and crop rotations to fertilize the soil, maximize biological activity and maintain long-term soil health;
- the use of biological control, crop rotations and other techniques to manage weeds, insects and diseases;
- the importance of biodiversity of the agricultural system and the surrounding environment;
- the use of rotational grazing and mixed forage pastures for livestock operations and alternative health care for animal wellbeing;
- the reduction of external and off-farm inputs and elimination of synthetic pesticides and fertilizers and other materials, such as hormones and antibiotics; and
- the role of renewable resources, soil and water conservation, and management practices that restore, maintain and enhance ecological balance.

It is also important to understand soils and soil physical properties, how soil is formed and how this complex below-ground environment functions. This knowledge will provide adequate detail on physical, chemical and biological properties and management of soil fertility under organic production conditions (Charles, 2004). One needs to know that organic

production starts with the soil. It is essential to have good organic soil; to feed it so that it can feed the plant, which will then feed a person. The main purpose is to have a healthy, fertile, soil with good structure and lots of nutrients in it.

It is also essential to understand that pesticides or chemical weed killers cannot used in the production programme. Weed control should be managed through better soil management and increased introduction of organic compost and manure as you can (Fairman, 2009).

Particularly at the farmer level, skills should be developed for quality control management and proper agronomic practices. Chief among these are proper fertilization practices as well as better handling and cleaning of the produce. Within the context of certified organic production, these management skills would include the ability to implement an internal mechanism to comply with standards and certification. This includes knowledge on organic standards, technical skills in farm inspection. Farmers will also require managerial skills in soil fertility, preventive pest control and prevention of external contaminants (Santacoloma, undated).

2.5.2.2 Curriculum for sustainable agriculture

Organic farming education is a programme that promotes improvement of students' competence and knowledge or expertise in the design, implementation and evaluation of sustainable agricultural systems (GPSA, 2008); it is set up to support the training capacities that exist in higher education focusing more on the organic sector (CIAT, 2009). The required courses in the organic farming programme are: agro-ecosystem analysis, sustainable agriculture tutorial, foundation for sustainable agriculture, integrated crop and livestock production systems, ecologically based pest management strategies, organizational strategies for diversified farming systems, agro-forestry systems and organic agriculture theory practice. In this list, the first three courses are the core modules in the programme and others are additional that a student can take to meet the requirements. The learning outcome in this programme would allow graduates to be able to frame problems and ask critical questions concerning agricultural sustainability; have knowledge of biophysical as well as socioeconomic, aspects of agricultural sustainability; acquire expertise in sustainable agriculture that transcends disciplinary boundaries; attain an appreciation of the intellectual history of efforts to improve agricultural sustainability; become professionals who work

interdependently and collaboratively; address complex agricultural problems by using systems thinking and other approaches; be able to critique different problem-solving methods and approaches and recognize and display visionary leadership with moral and ethical integrity (GPSA, 2008).

According to Williams (2008), in the organic agriculture programme (sustainable agriculture), there are core courses that are the foundation of the whole programme. These courses are, firstly, "Introduction to sustainable agriculture", which is the prerequisite for all other core courses in the curriculum. It provides a broad introduction to the environmental, cultural and economic elements of sustainable food production and marketing**.** The second course is "Cultural perspectives on sustainability", which examines and analyses cultural dimensions within the concept of sustainability and finds out what the literature emphasizes about the relationship between people and nature. The third course is "Plant production systems', which gives a detailed analysis of major principles of agricultural plant production systems, highlighting the physical and chemical properties of the soil. The fourth course is called 'Apprenticeship in sustainable agriculture". It provides opportunities for practical experience with the organic community. Students receive training in organic production practices (seed germination, transplantation, maintenance of soil fertility and pest management). The fifth course is 'Integration of sustainable agriculture principles", which encourages students to consider agricultural systems as a whole, in which a change happening to one part of the system has a significant impact on all other parts of the system. The sixth course is "Research in sustainable agriculture", where students are required to conduct independent research related to some aspects of sustainable agriculture. The seventh course is called "Experiential education". It gives additional practical experience to students, by putting them through an internship programme off campus, allowing them to apply their academic knowledge in a real-world situation.

2.5.2.3 Participatory curriculum development

For the programme of organic farming to be taught, there must be a well-defined curriculum set solely for that particular programme. Taylor (1999) pointed out that there has been some recognition that trainers and teachers should contribute to what they teach, as well as how they teach it. The development of an academic programme or a curriculum should not be the responsibility of a few people, called the "elite group", located at the top of a hierarchy. The

best way is to identify a wide range of stakeholders who may contribute to the ultimate aim of education and to share with them the process of developing the curriculum (Rogers *et al*., 2002). Some stakeholders can come from inside the system, as they have knowledge of the educational system. Others can come from outside, such as extension workers, farmers, employers, policy-makers and educational experts, so that all of them can contribute with different experiences and views to the desired learning objectives. In this way the curriculum would be inclusive, not just in term of subjects being taught, but also in terms of the experiences and activities that the learners would engage in during the course (Taylor, 1999). Becker (2009) reviewed the participatory curriculum development and concluded that in this process, the involvement of key stakeholders is likely to be poor or non-existent

One can ask "why is curriculum development important?" Taylor (2001) stressed that curriculum development is crucial, as it provides an opportunity for institutionalizing a systemic approach to learning. It should be 'participatory' said Rogers *et al*. (2002) and have the aim of involving all participants in decision-making for their own education. Participants can decide on what to learn, when, how, where and in what order. This will allow students to feel that they own the programme of learning; it makes material more relevant as students will have a say in what they feel is important to learn. Taylor (2001) adds that if curriculum development is carried out efficiently and effectively, the learning needs of learners will be met, because teachers will teach more effectively by using appropriate methods and materials to achieve the aim of the training programme.

2.6 Summary

This chapter described the concept of organic farming, in general, by giving its origin and history. Organic farming was actually the former traditional way of producing food used by our ancestors. This practice was interrupted by the green revolution, which was the result of starvation during world war. The aim of green revolution was to produce more food for a very large number of people. For this reason the use of extensive machinery, with high use of fertilizer and pesticides started. The implication of this new practice was not as it was expected and meant to be, because of negative consequences on the environment. Due to this, agriculture practitioners decided to look back and take steps to restart the practice known as sustainable and environmental-friendly "organic farming" that was used before the mechanization of agriculture. The balance could thus be restored in an environment exposed

to destruction. Around the world the movement of practising organic farming started first in Tanzania in 1896 and spreading to different countries in Africa, America, Europe, Asia and Australia. Now more than 120 countries worldwide are practising organic farming. The aim of organic farming is to produce food while maintaining a balance in the ecosystem. This practice has advantages and disadvantages that need to be known through education and awareness programmes.

Four themes recur in most of the literature reviewed concerning organic farming: environment, economy, food security and markets. Organic farming has clearly been linked to issues of the environment – as an important factor is reducing the harm done to the environment by conventional agriculture. Organic farming has also been linked to food security, but the link is one of contention. There is uncertainty if food security should be pursued through organic agriculture or through conventional agriculture which currently has the more immediate potential to address food security issues. Links to the economy are less clear in literature – the link is suggested, mostly through markets, and is connected to the development of rural economies, again as a point of debate between conventional and organic farming. Marketing is a fundamental issue in agricultural production with a direct association with organic farming. The organic farming systems reviewed all show the intention of engaging in organic farming is within the context of marketing produce.
The following chapter will describe how the study was done.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The study was conducted using a qualitative research process undertaken with a well-informed sample of people to address the research question. It was a case study focusing on understanding the dynamics present within single settings (Eisenhardt, 1989). To get more insight into the research question, interviews were conducted to obtain qualitative data. The researcher was able to gain the opinions of respondents, based on their experiences and knowledge. The interviews took place after a literature search in books, journals and the internet, which had given a broad understanding of the issue. The participants were purposefully chosen. This form of selection, uses the criterion 'fit for the purpose', meaning that only respondents that are suitable for the research must be selected to be part of the study (Mthembu, 2003). For example, academics in the Faculty of Science and Agriculture of the University of KwaZulu-Natal (UKZN) were used, because they were in a good position to provide relevant information as far as organic farming training is concerned. Other respondents were similarly selected.

Table 3.1 displays the research design showing the link between the sample of participants with sub-objectives and techniques applied. For all sub-objectives, interviews were used as reliable techniques able to provide the information needed. An additional technique was used for other stakeholders, namely visit and observation as the researcher had to actually see the products that they are dealing with, either in shops or on farms (gardens).

Table 3.1: Research Design

Sub-objectives	Technique used	Sampling	Sampling size
Sub-objective 1 Understand to what extent organic farming is included in the B.Sc. Agric and B. Agric programme at UKZN	Interviews	• 1 to 7 students per programme • 1 to 3 lecturers per programme	52 students 20 lecturers
Sub-objective 2 Identify what is offered in terms of organic farming	Interviews	• 1 to 7 students per programme • 1 to 3 lecturers per programme	52 students 20 lecturers
Sub-objective 3 Get perceptions of students and lecturers about organic farming training	Interviews	• 1 to 7 students per programme • 1 to 3 lecturers per programme	52 students 20 lecturers
Sub-objective 4 Identify the key issues and stumbling blocks for organic farming training	• Interviews • Site visits/ Observation of stakeholders	• 1 to 7 students per programme • 1 to 3 lecturers per programme • 8 stakeholders	52 students 20 lecturers 8 stakeholders

This chapter will present the setting, techniques, research procedure, data analysis and limitations.

3.2 Setting

The study area is the UKZN, Pietermaritzburg Campus (see Appendix A). This university was chosen because it has a well-established agricultural, faculty where organic farming is taught.

It was easily accessible for the researcher in terms of engaging with academics for the study. As suggested by Kruepper and Gegner (2004), the field work was conducted after getting a broad understanding of organic farming concepts and what they involve to be considered as sustainable agriculture. As the study analyzes organic farming training in the curricula of the UKZN, it was appropriate to engage individuals who are involved in relevant aspects of the agricultural sector (i.e. education and business). For this reason the study identified people from the UKZN Faculty of Science and Agriculture (students and lecturers) and other stakeholders (individuals, businesses and institution involved in organic farming) from the surrounding areas.

3.3 Population and sample selection

Bearing in mind the fact that the main question or objective of the study consisted of exploring the current status of organic farming training in the UKZN programme, the participants included lecturers, students and other stakeholders dealing with organic farming in business and/or education. A sample population of 80 participants was drawn (20 lecturers, 52 students and eight other stakeholders). It was important to consider three groups for the purposes of triangulation, which is an application and combination of more than one research perspective in the study of the same phenomenon. It helps to obtain confirmation of findings through convergence of different perspectives and helps to clarify issues better that one-way or single-observed research (Beckett & Turner, 2009).

At the UKZN the study considered mostly the programmes dealing with crops, animals, soil, water and conservation.

From the total number of 345 students registered in these programmes, a sample of 52 was taken (see Table 3.2).

Table 3.2 Total number of students on different levels

Levels	Total number of registered students	Total number of students visited	% Sampling
Postgraduate Diploma	16	3	5.8%
Honours	26	13	25%
Masters	173	18	34.6%
PhD & Post-Doctorate	130	18	34.2%
Total	345	52	100%

In total, 15 programmes were considered. In each programme, students were interviewed on an average of one to seven students per programme. For lecturers, the average was one to three in each programme (Table3.3).

Table 3.3 Schools/programmes for lecturers

School/Programme	Number of lecturers interviewed	Percent (%)
Animal and Poultry Science	2	10%
Biological and Conservation Science	3	15%
Crop Science	1	5%
CEAD	2	10%
Food Security	3	15%
Horticulture	2	10%
Hydrology	1	5%
Plant Pathology/Plant Breeding	3	15%
Soil Science	3	15%
Total	**20**	100%

From a total number of 65 lecturers directly involved in agriculture (Agricultural Science and Agribusiness, Environmental Sciences and Conservation, as shown in Appendix B) a sample of 20 lecturers was considered. For the other stakeholders just one person per organisation/institution was interviewed (Table 3.4).

Table 3.4 Stakeholders visited

Stakeholders	Number	Percent (%)
Cedara Agricultural College	1	12.5%
Dovehouse	1	12.5%
Pickn'Pay	1	12.5%
Rainman Land care Foundation	1	12.5%
School of Education / UKZN	1	12.5%
Weston Agricultural College	1	12.5%
Wizzardworms	1	12.5%
Woolworths	1	12.5%
Total	8	100%

Each of these chosen organisations/institutions was represented by a person holding a position in the management unit of the organisation and able to provide relevant information to the researcher. The School of Education at UKZN appears as other stakeholder because of the expertise offered for curriculum and in organic farming education.

3.4 Techniques

Two techniques were used. Interviews were used to obtain the perspectives of the participants. Visits and observations were used to verify findings and to provide context and detail. For the purposes of triangulation these techniques were used for three categories of respondents (students, lecturers and other stakeholders) to get a broader picture of the issue from different angles.

3.4.1 Interviews

Three types of questionnaires were administered. The first one was set for 52 students (Appendix E). The second one was set for 20 lecturers (AppendixG). The last one was set for commercial stakeholders (Appendix C). Key questions were developed for semi-structured interviews with professional stakeholders (Appendix D). The main aims were to find out to what extent organic farming as described in section 1.6 is included in the programmes of the UKZN Faculty of Science and Agriculture; to identify what is offered in the curricula in terms of organic farming; to gain the perceptions of academics concerning organic farming training; and to identify the issues and stumbling blocks faced.

The student questionnaire first was comprised of two sections. The first section dealt with demographics. The second section addressed the cores of the research. It investigated the perceived importance of teaching organic farming at tertiary level, the issue of equating organic farming with conventional farming, determining which modules included organic farming, perceptions about organic farming training and the foreseen stumbling blocks.

The lecturer questionnaire focused only on the primary research issues. Demographics were not required. It identified the modules the lecturer taught and the organic content covered. It investigated perspectives on the agricultural syllabi regarding organic farming content, perceptions about organic farming as a concept and practice and its stumbling blocks.

Finally, the questionnaire for other stakeholders focused on the reasons why they were interested in organic farming activities. It investigated their views on organic farming learning, the challenges faced by them and other stakeholders involved in the field.

3.4.2 Visits and observations

The sites of some participants were visited (mainly stakeholders) to make observations on what they are doing in relation to organic farming activities. According to Nichols, in Ghebremicael (2000), "observation is a highly effective method of in-depth study in a small community". This opened the way for the researcher to obtain first-hand, practical insight, while travelling through the area and conducting interviews. This activity consisted of going into the field to look at how stakeholders are dealing with organic agriculture in practice (e.g. different techniques of cultivation used as compared to conventional agriculture) and to observe the way they are marketing and selling their organic produce. This activity was concurrently with the interviews (questionnaires).

3.5 Research procedure

All participants in the study were invited to take part in the process, in which they were free to express themselves on the issues related to organic farming within the current teaching programme at UKZN or in their own businesses. Within the university, 15 programmes were selected in the Faculty of Science and Agriculture (see Figure 4.1). Before interviews were held with lecturers, prior contacts were made to arrange suitable times to conduct the interviews. Such appointments were partially respected by the lecturers, but there were many postponements. Most postgraduate students were found in their laboratories and the LAN (Local Area Network), where questionnaires were completed. Some were left behind for later collection. In order to inform a large number of people, some secretaries of schools/programmes were required to give assistance by forwarding the questionnaire to all registered students in their particular programmes, so that they could complete it or get prepared to meet the researcher. This strategy expedited the process, in that many students were informed even before the actual visit, which led to accurate answers for different questions.

A minimum of 5 students and 2 lecturers per programme, and 1 representative/stakeholder per organisation was considered in the sampling process. Taking into account 15 programmes, the number of questionnaires delivered was 75 for students and 30 for lectures with a return rate of 76%. (Appendix K). Student questionnaires were administered without interviews because of the narrow focus of the issues being investigated. The questionnaires for the lecturers and other stakeholders were administered with interview because of the more expansive nature of the investigation and their stated preference for interviews.

Interviews with the other stakeholders were done face-to-face, after making appointments. There were two types of questionnaires. One was a structured questionnaire (see Appendix C) and the other was a question guide (see Appendix D) to conduct a semi-structured interview, which is a fairly conducted communication in an open framework allowing conversation between two parts (FAO, 1990). Open-ended questions were "designed to encourage a full, meaningful answer using the subject's own knowledge and/or feelings" (Mugo, 2007). The questionnaires for stakeholders in business were completed by the researcher in front of the interviewees as they were responding to different questions asked.

The data collected assisted in verifying the organic content of modules in the handbook of Science and Agriculture (UKZN, 2009). Respondents were asked to identify undergraduate and postgraduate modules with organic content and to identify the organic content of those modules. The researcher used the information from the respondents in conjunction with a detailed review of the module descriptions in the UKZN 2009 Handbook for the Faculty of Science and Agriculture to establish the organic content of relevant modules. The tables containing the outcomes of calculations are in Appendix F and I. The calculations in Appendix F were done to identify how many agricultural modules are offered in total, per degree, and per their respective credits to determine their relative organic content. These calculations aimed to see how much organic farming is covered in B.Sc. Agric and B. Agric programmes, taking into account what was indicated by students and lecturers as modules covering organic farming.

To formulate the calculations in Appendix I, each module's content was reviewed to find the number of major sections the module has and to identify which one is more closely related to organic farming, after comparison with the content [Graduate Programme in Sustainable Agriculture (2008) and Williams (2008)]. The organic content from the total was compared,

to give the percentage of organic content in the whole module. This process allowed for gaining an idea of real figures of organic concentration in different modules identified as having organic farming content.

3.6 Data analysis

After covering the sample population, data were analysed in Microsoft Excel and SPSS (Statistical Package for Social Sciences) for interpretation. The coding system was developed by counting the number of questionnaire sheets in hand from a collection of data (raw data) which was organised, studied carefully, similar answers identified and classified into themes which correlated with the main research question. The summary was then presented in tables, graphs and paragraphs to give the actual write-up. This process was based on the data analysis spiral described by Creswell (1998) in Leedy & Ormrod (2005) in Figure 3.1.

Each group of answers was translated in numeric terms expressed as percentages (%), to show how strongly participants agreed or disagreed with a particular issue (question); this process facilitated a good flow in the result presentation and discussion, by making it clear and simple to interpret.

A detailed analysis of each identified module was done at UKZN to generate a more accurate approximation of study credits to organic farming content. For each module identified as having any organic content a simple calculation was done to establish the extent of that content as a percentage of the total credits carried by the relevant module. In reality, the modules identified do not cover organic farming exclusively, and thus only the credits covering organic farming should be considered.

Handbook calculations consisted of taking all the chosen programmes in the Faculty of Science and Agriculture, identifying the modules comprising organic farming (as pointed by respondents and checked by the researcher), then representing the respective credits as a percentage of a degree per year. Each module's content was compared to the selected standard set in the study to identify how much organic material is included. After looking how many sections the modules comprises and how many sections matched with the standard, a rate of organic content was set and compared to the total credit of the module to come up with the actual credit covered by organic farming (Details on Appendices F and I).

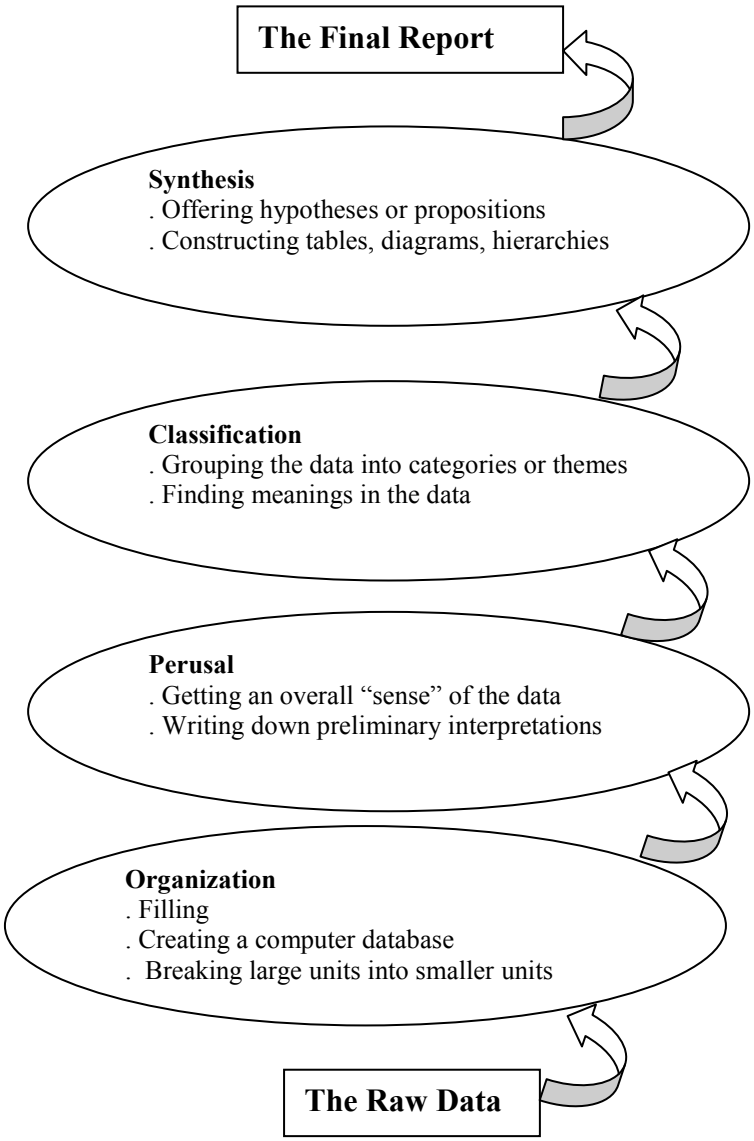

Figure 3.1 Data analysis spiral (Creswell, 1998 in Leedy & Ormrod, 2005)

3.7 Limitations

The present section will display the problems and challenges encountered during the research process (specifically during data collection). The study was focused only on the Faculty of Science and Agriculture, where a sample was drawn which seemed to be statistically not representative and therefore the views of participants may not represent the majority's opinions within the UKZN. During the field work, there was a delay by some respondents in answering the questionnaires (mostly by lecturers) and there were many postponements of appointments due to their busy schedules. As shown in Appendix K, some students (23) and

lecturers (10) were reluctant to participate in the study due to their busy schedule or for other reasons that were not revealed. It was not easy to associate some students with their particular schools or programmes because some of the programmes overlap and their structures were not clearly articulated. As stated above, the researcher intended to interview five students and three lecturers in each programme, but this turned out to be one to seven students and one to three lecturers as some programmes did not have enough students and some lecturers were not available to participate in the study.

3.8 Summary

The chapter described the methods and methodologies used in the study. It highlighted two steps taken to collect the information. The secondary data consisted of the literature review and the primary data consisted of interviews, visits and observations in the field. The literature review was crucial, in that it gave a good background and definition of concepts related to organic farming as an activity in the field or as a course taught in class. It had assisted strongly in describing the problem and developing the objectives of the study. The work in the field (interviews, visits and observations) was important, as it helped to gain the perceptions of academics and understand the issues concerning organic farming, as seen by stakeholders and academics.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the results of the field work, which involved interviews with lecturers and postgraduate students in the Faculty of Science and Agriculture at the University of KwaZulu-Natal, as well as with other stakeholders considered as experts in organic farming. Eighty interviews were conducted; 52 with students, 20 with lecturers and eight with other stakeholders. Three types of questionnaires were formulated (Appendix E, B & C) to gather relevant information. There was no need to translate the questionnaires, as the targeted population was able to speak and write in English. The findings will be discussed in the following sections:

1. Demographic results.
2. Inclusion of organic farming is in the BSc. Agric and B. Agric programmes.
3. Modules offered at UKZN covering organic farming.
4. Perceptions of lecturers and students concerning organic farming training.
5. Key issues and stumbling blocks faced in organic farming.

4.2 Demographic results

As stipulated above, the targeted population consisted of lecturers, students and other stakeholders (people involved in organic farming business and teaching from outside the University/Faculty of Science and Agriculture). Figure 4.1 displays the total number of people (80) who participated in the study. Fifty-two (65%) consisted of postgraduate students, twenty (25%) were lecturers and eight (10%) were other stakeholders.

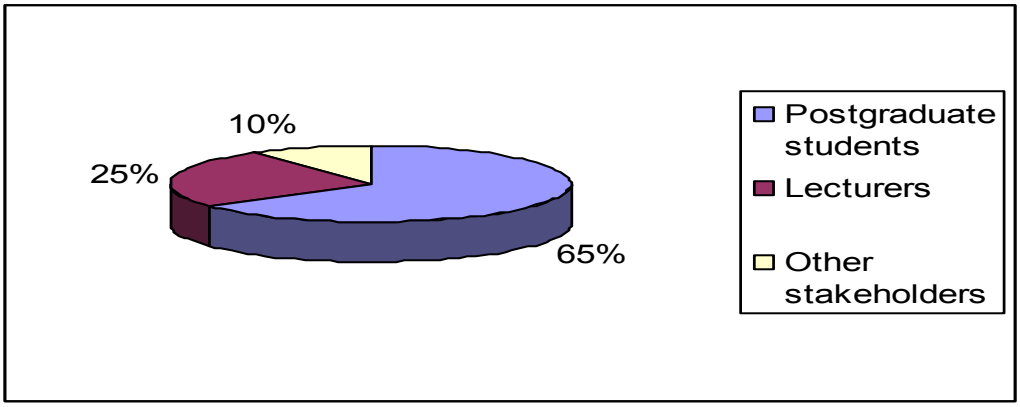

Figure 4.1 Participants in the study

The details for each group will be given in the following sections starting with the students, lecturers and then other stakeholders.

4.2.1 Postgraduate students

The postgraduate students were from 15 programmes in the Faculty of Science and Agriculture, representing five Schools. Table 4.1 displays the number of students interviewed in each programme, in each school. These programmes were chosen because they fall under the Faculty of Science and Agriculture; and are directly related with agricultural production.

In the School of Agricultural Science and Agribusiness (SASA), 22 students (42%) from seven programmes were interviewed. Five (9.6%) were from Plant Pathology; five (9.6%) from Plant Breeding; four (7.7%) were from Horticultural Science; three (5.8%) were from Crop Science; two (3.8%) were from Animal and Poultry Science; two (3.8) were from Forestry; and 1 (1.9%) was from Human Nutrition.

In the School of Biological and Conservation Science (SBCS) three programmes were considered: Entomology; Grassland Science; and Conservation. Twenty-seven percent (27%) of the respondents were from SBCS.

The School of Biochemistry, Genetics and Microbiology (SBGM) represented 13% and the School of Environmental Science (SES) 12%, consisting of Soil Science and the Centre for Environment, Agriculture and Development (CEAD).

Table 4.1 Postgraduate students interviewed in each programme

	Programme Name	Frequencies	Percentage of student sample
SASA programmes			
1	Plant Breeding	5	9.6%
2	Plant Pathology	5	9.6%
3	Horticultural Science	4	7.7%
4	Crop Science	3	5.8%
5	Animal & Poultry	2	3.8%
6	Forestry	2	3.8%
7	Human Nutrition	1	1.9%
	Sub-total	22	42.3%
SBCS			
8	Conservation	6	11.5%
9	Entomology	4	7.7%
10	Grassland	4	7.7%
	Sub-total	14	26.9%
SBEEH			
11	Hydrology	3	5.8%
BGM			
12	Biochemistry, Genetics, Microbiology & Plant Pathology	7	13.5%
SES			
13	Agricultural Extension and Rural Resource Management	2	3.8%
14	Environment and Development	2	3.8%
15	Soil Science	2	3.8%
	Sub-total	6	11.5%
Total		**52**	**100%**

In the School of Bioresources, Engineering and Environmental Hydrology (SBEEH), three students (5.8%) were interviewed. All of them came from the Hydrology programme.
In the School of Environmental Science (SES) four students were interviewed, two were from Agricultural Extension and Rural Resource Management and the other two from Environment and Development.

Student respondents were from different qualifications or levels, as shown in Figure 4.2. The largest groups were Masters and PhD students, respectively 34% and 33%. Twenty-five (25%) were Honours students, 6% were Postgraduate Diploma students and 2% were Post-doctoral students.

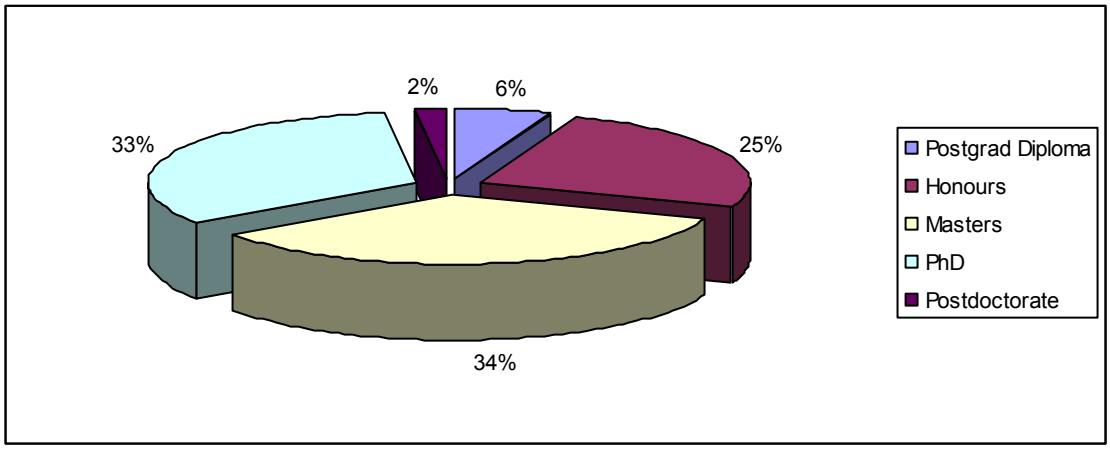

Figure 4.2 Levels of students

The number of years spent at the UKZN by these students varied from one to 10, as shown in Table 4.2. A concentrated number (53.9%) is found in the range of four to six years. This is consistent with where a student should be while doing postgraduate studies, if he/she had followed a normal academic performance at UKZN. The students who had been at UKZN for 10 years were Postdoctoral students.

Table 4.2 Number of years spent by students at UKZN

Number of years	Frequency	Percentage
1	6	11.5%
2	8	15.4%
3	2	3.8%
4	11	21.2%
5	8	15.4%
6	9	17.3%
7	3	5.8%
8	3	5.8%
9	0	0%
10	2	3.8%
Total	**52**	**100%**

Table 4.3 shows where the student respondents completed their undergraduate studies. Thirty-one (59.6%) of the student respondents completed their undergraduate studies at the UKZN. The others came from different universities scattered around the world, namely University of Zimbabwe (5.8%), University of Nairobi (3.8%), Federal University of Pará (UFPA)-Brazil (3.8%) and the rest, representing 1.9% each, from Charles Sturt University, Eritrea University, Harvard University, Khartoum University, Makerere University, University of Antananarivo, University of Eduardo Mondlane, University of Malawi, University of Namibia, University of Pretoria, University of Stellenbosh, University of Zambia, University of Zululand and Wageningen University. That so many of the student respondents had done their undergraduate work at universities other than UKZN clearly skewed the findings of those questions that relied on knowledge of the undergraduate curriculum. As will be discussed in Section 4.3 a significant portion of the respondents were unsure of organic content; this was related to only one question. Further, their experience in other curricula where organic content is higher than at UKZN enabled them to provide a broader perspective on curriculum and organic farming training when asked for what curriculum should cover.

Table 4.3 Place of undergraduate study

Name of University	Frequency	Percentage
University of KwaZulu-Natal	31	59.6%
University of Zimbabwe	3	5.8%
UFPA-Brazil	2	3.8%
University of Nairobi	2	3.8%
Charles Sturt University	1	1.9%
Eritrea University	1	1.9%
Harvard University	1	1.9%
Khartoum University	1	1.9%
Makerere University	1	1.9%
University of Antananarivo	1	1.9%
University of Eduardo Mondlane	1	1.9%
University of Malawi	1	1.9%
University of Namibia	1	1.9%
University of Pretoria	1	1.9%
University of Stellenbosh	1	1.9%
University of Zambia	1	1.9%
University of Zululand	1	1.9%
Wageningen University	1	1.9%
Total	**52**	**100%**

Table 4.4 shows that 18 home languages were spoken by the student respondents. The most common was English (42.3%), followed by Zulu (11.5%), Shona and Portuguese (5.8% each) and French and Nyanja (3.8% each). These were followed by Afrikaans, Amharic, Arabic, Chichewa, Luganda, Malagasy, Otjiherero Runyankole, Setswana, siSwati, Swahili and Tigrigna with a frequency of 1.9% each.

Table 4.4 Local languages of students

Local language	Frequency	Percentage
English	22	42.3%
Zulu	6	11.5%
Portuguese	3	5.8%
Shona	3	5.8%
French	2	3.8%
Nyanja	2	3.8%
Afrikaans	1	1.9%
Amharic	1	1.9%
Arabic	1	1.9%
Chichewa	1	1.9%
Luganda	1	1.9%
Malagasy	1	1.9%
Otjiherero	1	1.9%
Runyankole	1	1.9%
Setswana	1	1.9%
SiSwati	1	1.9%
Swahili	1	1.9%
Tigrigna	1	1.9%
Other	2	3.8%
Total	**52**	**100%**

Their countries of origin were diverse (see the Table 4.5) with a majority coming from South Africa (48.1%) and Zimbabwe (9.6%), followed by Zambia, Mozambique, DRC, Kenya, Uganda and others.

Table 4.5 Countries of origin for postgraduate students

Name of the Country		Frequency	Percentage
1	South Africa	25	48.1%
4	Zimbabwe	5	9.6%
2	Mozambique	2	3.8%
3	Zambia	2	3.8%
5	Democratic Republic of Congo	2	3.8%
9	Kenya	2	3.8%
10	Uganda	2	3.8%
6	Malawi	1	1.9%
7	Ethiopia	1	1.9%
8	Eritrea	1	1.9%
11	Canada	1	1.9%
12	Madagascar	1	1.9%
13	Brazil	1	1.9%
14	Botswana	1	1.9%
15	Australia	1	1.9%
16	Sudan	1	1.9%
17	Namibia	1	1.9%
18	Others	2	3.8%
Total		**52**	**100%**

4.2.2 Lecturers

Twenty lecturers were interviewed, from different schools/programmes in the Faculty of Science and Agriculture, with an average number of one to three people interviewed per programme (Table3.3)

4.2.3 Other stakeholders

To get a broader picture of the issue as a result of triangulation, it was important to engage with people from outside the academic arena considered as experts in organic farming. A number of stakeholders was visited and interviewed (see Table 3.4) to analyze what they consider to be the key issues and stumbling blocks for organic farming in education and business.

4.3 Presence of organic farming in UKZN curriculum

This section presents the findings regarding first sub-objective of the study: the extent to which organic farming is included in the Bachelor of Science and Agriculture (B.Sc. Agric.) and the Bachelor of Agriculture (B. Agric.) curricula. These are the two main programmes in which organic farming can be found. Students and lecturers were asked to what extent they thought organic farming featured in the current UKZN agricultural curricula. Their responses correlate closely (see Figures 4.3 and 4.4). Four percent (4%) of student participants indicated that it was not covered at all in the current curriculum; 38% were not sure; 39% confirmed that organic farming is covered in the curriculum to a small extent; 13% indicated it was covered to a moderate extent and 6% indicated that it is covered to a large extent. None of the respondents indicated that organic farming features to a very large extent in UKZN's agricultural programmes. Those who were uncertain (19 student participants) generally indicated that they were not familiar with the curriculum at UKZN. Most of these respondents had done their previous studies outside South Africa; some were simply not aware of the content of UKZN's agricultural programmes.

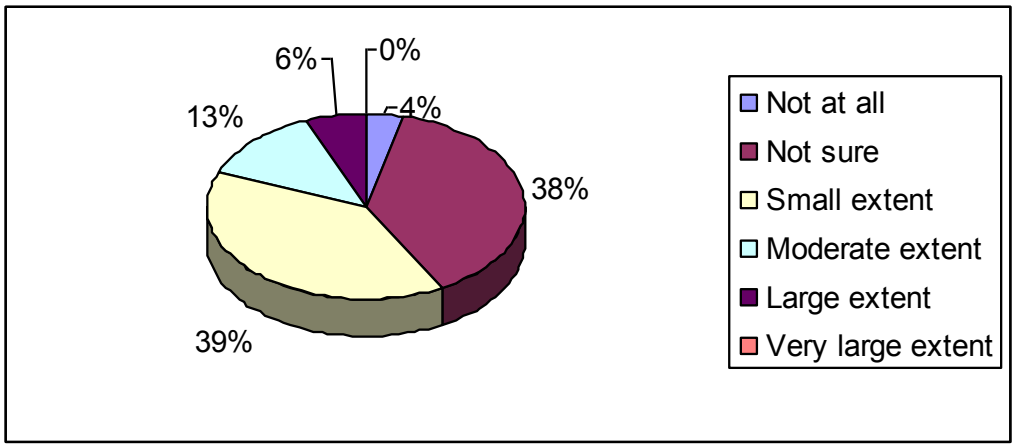

Figure 4.3 Presence of organic farming in the curriculum (from students)

The responses from lecturers regarding the presence of organic farming in the curriculum were similar to those of students. Figure 4.4 shows that 5% indicated that organic farming does not occur at all in the curricula; 30% were uncertain; almost half (45%) of the respondents found that organic farming features to a small extent; 20% found it to a moderate extent and none of them pointed to a very large or large extent.

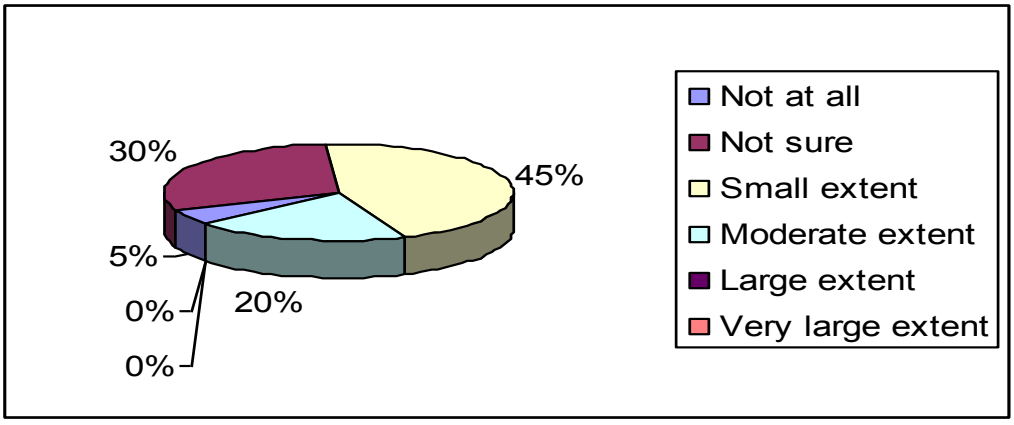

Figure 4.4 Presence of organic farming in the curriculum (from lecturers)

Student and lecturer respondents who had indicated that organic farming was addressed to a small extent were asked to identify the specific modules in which they felt organic farming was covered. They were further asked to identify the organic farming content in those modules. The student respondents in this case had not necessarily taken modules they identified, but were aware of their content. The lecturer respondents were specifically asked to exclude any module that they themselves taught as this was covered in the previous question and could have indicated the extent of their awareness of the agricultural syllabi.

The modules and the organic farming content identified by the respondents are shown in Table 4.8.

Table 4.8 Modules perceived by respondents as having organic farming content

Module Name	Module Code	Organic farming content in the module
Sustainable Community Agriculture	AGPS210	Introduction into different cropping systems, principles of agro-ecology, traditional farming and use of manures
Greenhouse Management	AGPS304	Influence of environment on plant growth
Field Crop Management	AGPS305	Mulching, residue management, weed and pest control.
Orchard Management	AGPS307	Variation of the plant environment, soil management
Crop Protection	AGPS308	Field trip to an organic farming farm to see the principles of crop protection and herbicides and pesticides to understand the differences
Field Plant Pathology	PPTH745	Visit to a hydroponics farmer
Sustainable Soil Fertility Management	SSCI770	Gives an understanding for soils management, role of soil organic matter in sustainable agriculture, benefits of organic farming, alternative farming systems and environmental degradation.

Table 4.8 gives an indication of the perception of the respondents concerning the presence of organic farming in the UKZN agricultural syllabi. Table 4.9 presents a more empirical overview of the actual offerings in the curriculum that cover organic farming. This data was compiled from responses from student and lecturer respondents based on modules actually taken by the student respondents and modules taught by the lecturer respondents. The criteria used by the researcher to identify “organic” in the syllabi were taken from the standards set for the study given in Appendix J.

Tables 4.9 and 4.10 give details of the modules in the agricultural syllabi that were identified by student and lecturer respondents as having organic farming content in undergraduate and postgraduate courses respectively. In addition to the module name and code, the Table presents the module content, learning outcomes, means of assessment and the school and programme(s) in which it is offered. None of the modules identified address Animal Science or Animal Production. One initial indication about the presence of organic farming in the UKZN agricultural programmes is that the only place it occurs is in Crop Production

modules; there is no organic farming learned with regard to Animal Production. This is a major gap in learning, as much of South Africa's agriculture involves livestock.

Comparing Table 4.8 with Tables 4.9 and 4.10 it appears that there are more modules concerning organic farming at UKZN than people are aware of. Table 4.8 identifies only seven modules, while Tables 4.9 and 4.10 together identify ten modules; all seven of the modules identified in Table 4.8 are also found in Tables 4.9 and 4.10. Two of the modules (BIOR118 [Introduction to the Environment] and CRMS350 [Food Security]) can be said to fall outside the traditional concept of an agricultural module. It would stand to reason that these modules were not considered (Table 4.8), except by those respondents who had either taken them or taught them as reflected in Table 4.9. That the honours level module AGPS711 (Field Crop Production) was overlooked in the responses shown in Table 4.8 cannot be explained.

Table 4.9 Undergraduate modules offered at UKZN known by respondents to cover organic farming in undergraduate years

Module Name	Module Code	Organic Content	Module Outcome	Module Assessment	School
Sustainable Community Agriculture	AGPS 210	Mainly on different principles of agro-ecology, traditional farming and organic farming	Understand the importance of sustainable agriculture, use of compost, crops rotation and manure	Test, assignment and exam	SASA
Greenhouse Management	AGPS304	The focus is on the influence of the environment on plant growth, artificial lighting and day length control, greenhouse structures, climate control, irrigation and growing systems.	---	Tests, practical assessment and exam	SASA
Field Crop Management	AGPS305	Focus on soil fertilization, liming, tillage, residue management, crop improvement techniques, mulching, forage preservation, grain storage, weed and pest control.	Know different techniques to protect crops, the mulching process and be aware of the downfall of organic farming.	Test, research project, Practical evaluation and exam	SASA
Orchard Management	AGPS307	Climate and its modification, variation of the plant environment, how to manage orchard soils and floor, plant manipulation in orchard, crop protection.	To understand the concept of orchard management	Theory tests, Practical assessment and Exam	SASA
Crop Protection	AGPS308	Principles linked to soil disturbance, environment, agriculture production and protection, pest management.	Get knowledge on pest control with reduced reliance on chemical pesticides; awareness of the negative effect of chemical pesticides	Tests, practicals, project and exam	SASA Entomology
Introduction to the Environment	BIOR118	Introduction to organic farming compared with conventional farming; pros & cons of both	Get an understanding of organic and other farming methods	Test and exam	School of Environmental Sciences (BSc)
Food Security	CRMS350	Crop rotation, green manure, biological pest control for soil productivity. The main focus is on access, availability and vulnerability of food, conceptual framework for nutrition and development. Food security measurement, policy making and nutrition policies.	Knowledge of macroeconomic impact, food quality in term of nutrition and safety and soil conservation as answer to climate change	Test, assignments and exam	SASA BSc Human Nutrition

Table 4.10 Postgraduate modules offered at UKZN known by respondents to cover organic farming in postgraduate

Module Name	Module Code	Organic Content	Module Outcome	Module Assessment	School
Field Crop Production	AGPS711	The impact of environmental variables, such as stress on crop production, management to sustain productivity. A study of management and production of selected field crops (sugar, cereal, oil and protein, and fibre crops); harvesting, grading and storage of crop products. Benefits and challenges for organic farming	Get an understanding of how to make the system economically feasible considering extra effort needed(e.g. certification require)	Theory tests, Project and Exam	SASA Horticulture
Field plant pathology	PPTH745	Visits to farms, nurseries and other locations of plant pathological interest, where control measures and applied disease diagnosis are developed.	---	Field practical reports	School of Biochemistry, Genetics, Microbiology & Plant Pathology
Sustainable Soil Fertility Management	SSCI770	Benefits of organic farming. Management of acid soils and its nature; effects of aluminium on soil and plants; effects of tillage practice and crop rotations on soil fertility. Nature of subsoil acidity. Role of soil organic matter in sustainable agriculture.	Understanding of benefits of organic approaches, deciding if these approaches are applicable at commercial level, are the 'extreme' forms viable (small or large scale), what approaches can be used to promote organic farming principles.	Theory test, laboratory project report and Exam	School of Environmental Sciences (B.Sc. Honours)

As explained in Chapter 3, a calculation was done to identify how many agricultural modules are offered in total per degree and their respective credits in undergraduate, honours, postgraduate diploma and Masters stages. These calculations were done to determine how much organic farming is covered in B.Sc. Agric and B. Agric programmes taking into account what was indicated by students and lecturers as modules covering organic farming. Details concerning these calculations are displayed in Appendix F. Below is the summary, showing agricultural streams with their related total credits per degree (Table 4.11).

Table 4.11 Summary of handbook calculations showing the organic content and total credits per degree

Degree	Streams	Total Credits	Total credit with organic	% Organic
BSc. Agric	Crop Science	512	72	14.1%
	Horticulture	512	64	12.5%
	Plant Breeding	512	72	14.1%
	Animal and Poultry	512	8	1.6%
	Grassland Science	512	8	1.6%
	Plant Pathology	512	72	14.1%
	Soil Science	512	16	3.1%
B. Agric	Agriculture	384	80	19.8%
Postgrad Diploma	Community Nutrition	152	0	0.0%
	Rural Resource Management	128	0	0.0%
	Food Security	128	0	0.0%
BSc. Agric. Honours	Crop Science	128	8	6.3%
	Horticulture	128	0	0%
	Animal and Poultry	128	0	0%
	Plant Pathology	144	16	11.1%
	Soil Science	128	8	6.3%
B. Agric. Honours	Agriculture	128	0	0%
Masters	Environmental Management	128	0	0%
	Food Security	128	0	0%
	Science in Agriculture	Research	Research	Research
	Rural Resource Management	Research	Research	Research

Most of the modules identified as covering organic farming are also core (required) modules in the streams/programmes presented in Table 4.12. Apart from in the mentioned streams, the modules can be taken as electives by students in others streams, depending on preferences. The tick (√) indicates the programme where the module is required (core). The content of Table 4.12 was derived from a detailed review of the UKZN 2009 Handbook for the Faculty of Science and Agriculture (UKZN, 2009).

Table 4.12 identification of core modules and their streams

Stream / Programme	Core Modules									
	AGPS 210	AGPS 304	AGPS 305	AGPS 307	AGPS 308	AGPS 711	BIOR 118	CRMS 350	SSCI 770	PPTH 745
Animal & Poultry							√			
B. Agric		√	√	√			√	√		
Crop Science	√	√	√	√	√		√			
Horticulture		√	√	√	√		√			
Human Nutrition								√		
Plant Breeding		√	√	√	√		√			
Plant Pathology		√			√		√			√
Soil Science							√		√	

It is of interest to note that based on Tables 4.9, 4.10, 4.11 and 4.12 it can be seen that, if a student were to take all the modules in which organic farming is found, 29 of the 112 credits (26%) would cover organic farming (See Table 4.13 and Appendix I.).

To understand the practical implications of the organic farming credit allocations, this information (in Table 4.13) has to be applied to the actual agricultural qualifications at UKZN and their curriculum make-up. It will give the result displayed in Table 4.14 and Figure 4.5 presenting the organic farming content of the various specialisations of the BSc Agric, the B Agric, Postgraduate Diplomas and Honours qualification at UKZN.

Table 4.13: Approximation of organic farming study credits in UKZN agricultural modules

Module	Total Credit	Organic Credit
AGPS210	8	5
AGPS304	8	1
AGPS305	16	7
AGPS307	16	2
AGPS308	16	2
BIOR 118	8	2
CRMS350 (FDSC350)	8	1
AGPS711	8	2
PPTH745	16	5
SSCI770	8	2
Total	112	29

Table 4.14 Organic farming content of agricultural qualifications at UKZN

Qualification	Streams	Total Credits	Organic Farming Content	
			Approximate Credits	%
BSc Agric	Plant Pathology	512	18	3.5%
	Crop Science	512	16	3.1%
	Plant Breeding	512	16	3.1%
	Horticulture	512	15	2.9%
	Soil Science	512	4	0.8%
	Animal and Poultry	512	2	0.4%
	Grassland Science	512	2	0.4%
B. Agric	Agriculture	384	21	5.5%
Post. Diploma	Community Nutrition	152	0	0%
	Food Security	128	0	0%
	Rural Resource Management	128	0	0%
BSc. Agric. Honours	Animal and Poultry	128	0	0%
	Crop Science	128	2	1.6%
	Horticulture	128	0	0%
	Plant Pathology	144	5	3.5%
	Soil Science	128	2.18	1.6%
B. Agric. Honours	Agriculture	128	0	0%

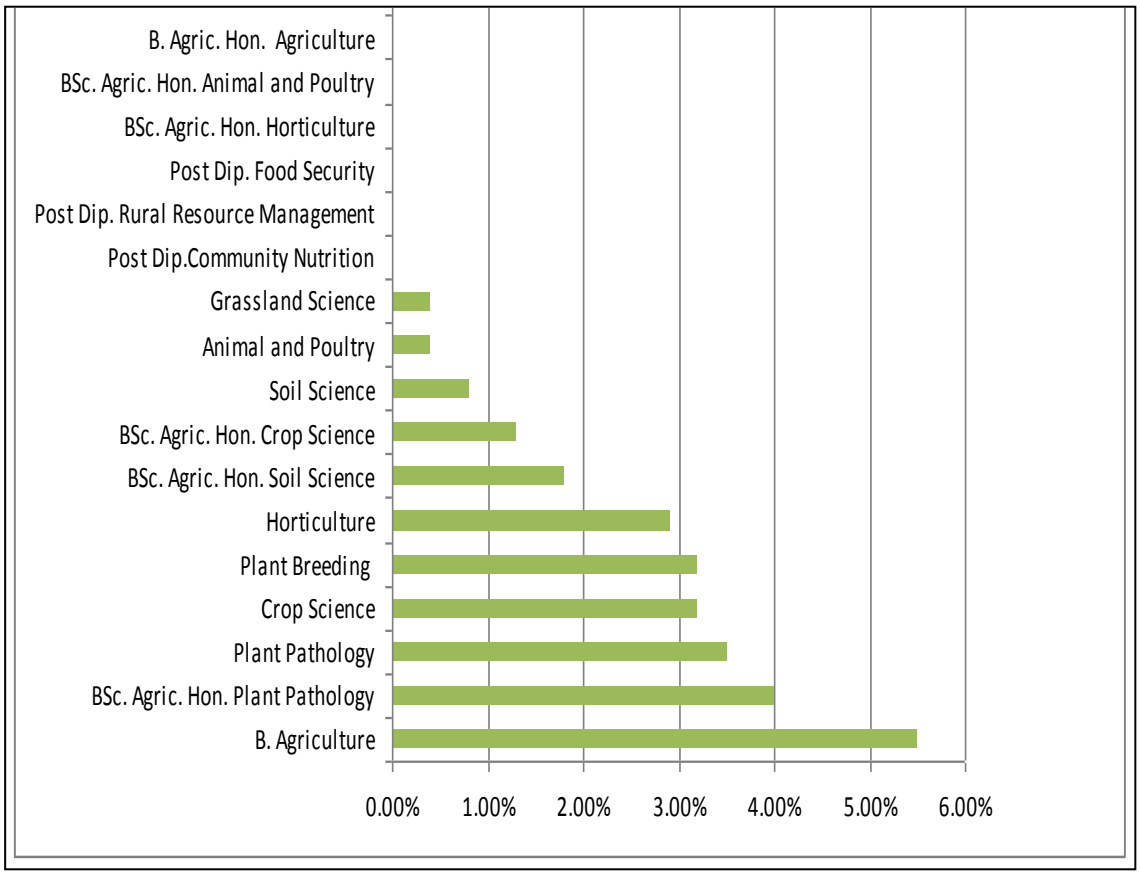

Figure 4.5 Organic content found in BSc. Agric and B. Agric at UKZN/PMB

At undergraduate level, the highest rate of organic content concentration is in B. Agric, with 5.5%. In B.Sc. Agric, organic farming content is even less, with only three streams having more than 3% organic farming content: Plant Pathology (3.5%), Crop Science and Plant Breeding (3.2%). At Postgraduate and Honours level, it is only the Plant Pathology major that has any significant content (3.5%).

These percentages are maximum possibilities. Not all the modules that cover organic farming are required or core subjects for a degree; some are core and some electives (see Table 4.12). Thus the organic farming content of the final qualification could be less than the potential content shown in Table 4.14, because students are not obliged to choose them if they are electives.

What emerged was that whatever organic farming is in the curriculum, it is generally only found in the crop-related modules. It occurs in animal science modules only as part of a

common first year, eight credit module (BIOR118), which covers organic farming only as a concept to be considered as an alternative to "traditional" farming.

Since Masters and Doctoral degrees are research qualifications, organic content would be determined by the choice of research field a student is likely to take. This did not form part of the present study. It is evident that a student who completes any primary or secondary agricultural qualification at UKZN will not have had any appreciable exposure to, or training in organic farming.

These findings are consistent with the perceptions of students and academics who indicated that the University has been supported by companies which have little interest in organic farming, but which are more interested in conventional agriculture in which they have vested interests (e.g. fertilizer companies and seed breeders). This support influences curricular content and research agendas.

4.4 Prior exposure to organic farming curricula

Figure 4.6 shows that 42% of the student respondents had, and 58% of the student respondents had not, previously received some exposure to organic farming as part of their undergraduate qualification. However, the 42% is comprised of 23% of the student respondents confirming that they have received the course at UKZN, and 19% indicating that they studied organic farming at other universities: Asmara University; Khartoum University; University of Malawi; University of Nairobi; University of Pretoria; University of Zimbabwe; and University of Zululand. This result of 23% confirms the low coverage of organic farming in UKZN undergraduate modules as discussed earlier.

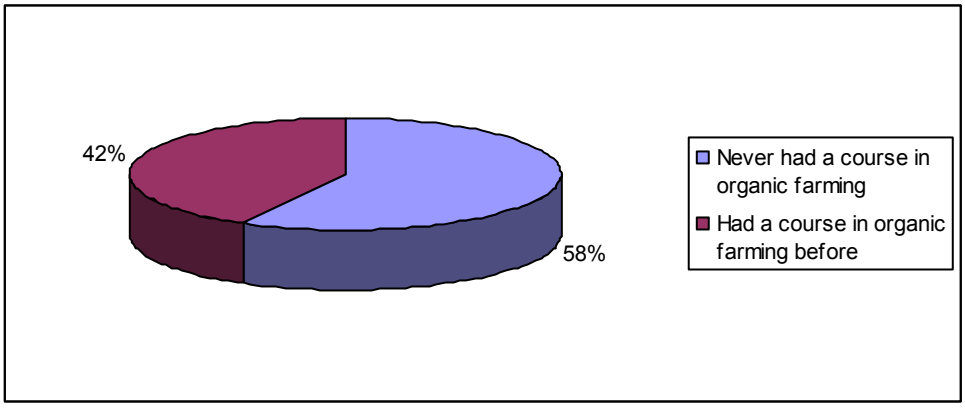

Figure 4.6 Students who have/have not received organic courses previously

Table 4.15 shows the recollection of the organic farming content in modules taken by student respondents who had done their undergraduate qualifications at a university other than the UKZN. Where possible, these respondents provided some information on the organic content of the modules they took. The table sets out the modules, the organic farming content (as recalled by the respondents), the university, the country and the qualification in which the module is found.

This means that some of the UKZN students have received a background in organic farming from other universities which can be considered as a reference as far as the organic farming curriculum is concerned.

Table 4.15 Courses covering organic farming delivered at other universities

Module Code	Module Name	Module Organic Farming Content	University	Country	Qualification
CSA503-2001	Soil fertility and fertilizer use	—	University of Nairobi	Kenya	Master in Agronomy
ASC 404-1998	Soil biology and environment management	—	University of Nairobi	Kenya	BSc Agriculture
ASC 203	Soil microbiology	—	University of Nairobi	Kenya	BSc Agriculture
SAFS023	Introduction to farming systems	The use of green manure, compost, crop rotation, pest control, farm size.	University of Zululand	South Africa	BSc Agriculture (Agronomy)
UKU 361	Livestock ecology	—	University of Pretoria	South Africa	Animal Science

Module Code	Module Name	Module Organic Farming Content	University	Country	Qualification
—	Agricultural geog.	—	Khartoum University	Sudan	Bachelor
—	—	Cropping systems, crop rotation, quality seed (seed technology)	Asmara	Eritrea	—
—	—	Production of vegetables organically	University. Of Malawi	Malawi	—
—	—	Sustainable agriculture	University of Zimbabwe	Zimbabwe	—
SL 203	—	Definitions of concepts, different systems, examples	—	Zimbabwe	—
—	Crop production	Crop rotation, compost, biological control, use of green manure.	University of Zimbabwe	Zimbabwe	BSc Agric

4.5 Perceptions of students about organic farming training

Having heard what students and lecturers reported in terms of what is currently delivered in connection with organic farming, it was necessary to find out how they feel about the whole issue. To get their perceptions, different questions were asked to both groups. From students it was necessary to find out how they see the importance of teaching organic farming at tertiary level; get their views on the idea of allocating equal importance to both organic and conventional farming; and lastly how they would score the relationship of organic farming with the environment, the economy, food security and markets. On the lecturers' side, the aim was to solicit their perceptions of the relationship of organic farming with the other four factors; and their perceptions of how important it is that organic farming features in the curriculum at UKZN. Their responses will be presented in the following sections.

Students were asked to rate, using a Likert Scale, how important it is to teach organic farming at UKZN. The majority of the students (88%) agreed that it is important, at least to some degree, to teach organic farming at UKZN; 50% indicated that they strongly agreed, 33% indicated that they moderately agreed and 5% indicated that they slightly agreed. The balance of the students was equally divided; 6 % of participants indicated that it was not

important at all that organic farming is in the curriculum and 6% were not sure. In addition to the assessment, the students justified their answers.

4.5.1 Student arguments not in favour of organic farming training

Three students did not think it was important to include organic farming in the UKZN curriculum. It is nevertheless important to hear their views. They felt that organic farming would never feed the exponentially growing population of the world. They argued that, as we are in under-developed countries, where most of the people are living below the poverty line, boosting production and productivity is the first priority, through any means.

4.5.2 Student arguments in favour of organic farming training

The responses of those who agreed were related to the need for necessary knowledge for future generations (31%), issues of productivity via alternative methods (21%), human health protection (15%), the notion of sustainability (13%) and environmental protection (10%). The details of these justifications are presented briefly.

Necessary knowledge for future generations: Thirty-one (31%) of those who confirmed the importance of organic farming training supported their view in the context of the benefits of education in the field of agriculture (not just organic agriculture) as crucial for the future. They suggested that by teaching organic farming, countries will be provided with highly trained and qualified agriculturalists that can face the challenges of food quality and environmental safety, which have a vital impact on human lives. These agriculturalists – having training in both conventional and organic farming – will be able to lead the necessary changes on our planet, by gaining essential knowledge that could then be transmitted to others for greater impact.

The students noted that as organic food is highly recommended nowadays and its demand is increasing on the market, tertiary institutions should teach about it, because qualified people will soon be required in the field. Connected to this was the concern raised about the way the world is changing; training in organic farming was linked to this broader issue of creating a safer place for all, in the context of issues such as global warming, increased population, increased demand for food and for safe food.

Finally, students indicated that through teaching organic farming at tertiary level people will learn to be more critical and gain knowledge about the physical, chemical and biological properties of soil. They can also develop research skills which are essential when studying complex related issues. One participant said: "If organic farming is taught at tertiary level, it will compel more people to do research on the subject so that it can become as economically viable as conventional agriculture".

Productivity via alternative methods: The issues of productivity and use of alternative methods to grow food were highlighted by 21% of participants supporting the importance of organic farming training. Their thoughts were based on the fact that organic farming was a successful way of producing food, in their words "since Adam and Eve". Therefore teaching it as an alternative method today would be beneficial and can allow better production. If it is taught, students would start to identify, appreciate and understand the differences among available alternatives and decide which one is suitable. They indicated that it is important for students to know every sphere of agriculture; "same thing like a doctor, he has to study general medicine before he can get specialized", added one interviewee. This will give students exposure to various ways/methods of crop production, other than sophisticated and complex methods that over-use chemicals. They argued that to reduce the amount of chemicals in the soil, we should slow down and look at other alternative ways of producing or dealing with the land components.

Regarding production yields, in general, it was pointed out that organic farming is good in theory, but in practice the yields are not high enough and it cannot be applied on a large scale. Respondents indicated that it will be better if organic matter can be incorporated to support conventional fertilizer and maintain good soil structure and texture.

Human health protection: Taking care of people's health should be another concern for academic institutions; this was raised by 15% of respondents who have agreed that organic farming should be taught. The idea is that UKZN, as a tertiary institution, has a responsibility to enable students to make better choices about themselves and the environment so that healthy food can be produced. The students indicated that, as a part of teaching organic farming, it is important to promote farmers not using genetically modified products, which are arguably not good for human health. Students indicated that viable alternatives and

healthier options need to be available, so that people can start to make informed decisions when buying food. Students observed that, although organic products are healthy, they can be more costly to produce, but with more research in this domain the production costs can be reduced.

Sustainability: In their different responses to the question of whether or not it is important to teach organic farming at tertiary level, 13% raised the issue of sustainability, by stating that the future of farming is in doing it organically and that, therefore, tertiary education in this field should support this facet of agriculture, even if, thus far, the yields are not high enough to meet the high demand of the population. As commercial farmers are now recognising that, for more sustainability, organic farming is important, UKZN should "pioneer" the way forward by teaching sustainable agriculture (organic farming) and not merely perpetuate old technology.

Environmental protection: Of the respondents who agreed to the importance of organic farming training, 10% justified their responses with reasons related to environmental protection. They emphasized that it would be much safer for the environment if agricultural practices shifted to organic methods. This would impact positively on the global warming faced by the world. They indicated that it is better that students learn other agricultural methods which are environmentally friendly. The issue of the exponential increase of the world's population was raised, as well as noting that this constitutes a challenge to the success of organic production.

4.5.3 The extent of organic farming and conventional farming in the curriculum

In addition to understanding the students' perceptions about whether or not organic farming training should be included in the curriculum, the study also sought to examine the extent to which it should be included, compared to conventional farming. Figure 4.7 shows that 82% of the students agreed that organic farming and conventional farming should be given equal attention in the curriculum; 12% felt they should not be treated equally and 6% were unsure.

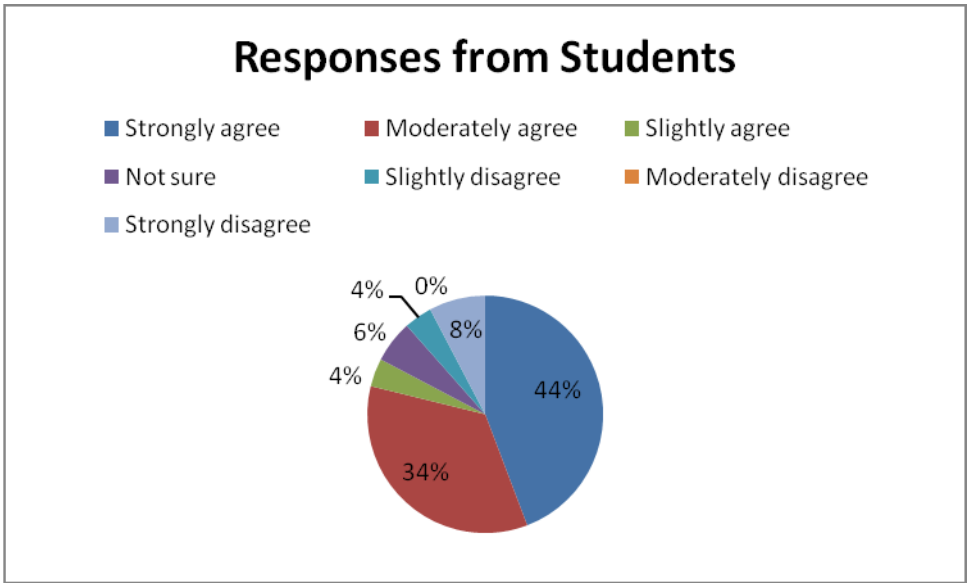

Figure 4.7 Responses to the statement that in agricultural education, equal attention should be allocated in the curriculum to organic and conventional methods

Those that felt the two approaches should be treated equally defended their views with a range of arguments. They stated that there is a need to learn other alternatives of cultivation to solve the food crisis and to face poverty without neglecting the environment. Furthermore, different types of methods create a wide range of knowledge. The students linked this to consumer choices who, they said, should be given the right to choose what is valuable for them; having knowledge about other methods will give them the option to choose. They stated that if appropriate methods and techniques are developed, it might be possible that organic agriculture could become as competitive as conventional methods. Finally, they indicated that food preferences are now diverse, with more people becoming concerned with safety requirements. This can open a wide market for organic products.

In a set of broader responses, students indicated that agricultural education, by definition, includes both organic and conventional methods. They identified an imperative: students are required (once they are in the workplace) to know every aspect of agriculture, to glean important knowledge and differentiate the advantages from the disadvantages of both methods. Students need to know why the idea of organic farming is said to be difficult for some people to grasp and apply. They suggested that perhaps at postgraduate level there could be some students who would want to do more research on organic farming, which can advance it further. They pointed out that the integration of both methods is a good strategy, as

people become conscious of pollution and other environmental damage responsible for global warming. They indicated that, in this regard, organic farming is becoming increasingly vital.

Twelve percent (12%) of the students did not agree that equal attention should be allocated to organic and conventional agriculture. They felt that more attention should go to conventional agriculture. They argued that conventional agriculture is more productive and that conventional agriculture has a large profit return compared to organic. Equal attention in the curriculum was linked to agricultural practice in the real world. They felt that it was unwise to promote a method of farming (i.e. organic farming) that would demand equal allocation of resources from farmers, but through which less profit would be made; it might be accepted mainly on health terms, but conventional farming remains more important to the economy. They stated that conventional farming should be regarded as the optimal approach and that students may study it exclusively if they want to, i.e. not be required to study organic farming, as organic production will never feed the exponentially growing population of the world.

4.5.4 Student perceptions of the significance of organic farming

Students were asked to consider the importance or significance of organic farming to four different aspects: the environment, the economy, food security and markets. They were not asked to rank these, but simply to rate the importance of organic farming to each aspect.

The environment: 87% of the students indicated that organic farming is important to the environment. They noted that it reduces the use of dangerous chemicals, herbicides and pesticides and leaves nature the power to restore itself. They explained that organic farming does not harm the environment and can contribute to reducing global warming. Organic farming produces healthy food and improves biodiversity.

Two percent (2%) of the students indicated that organic farming is “less important” to the environment, because it is more demanding to carry out. This answer implies that these students were comparing the importance of organic farming in relation to its importance to other issues raised in the same questions (i.e. the economy, food security and markets).
The rest of the students (11%) were not sure about the importance of organic farming to the environment. They gave no reasons.

The economy and markets: These two aspects are presented together, because the responses from the students were very similar for each aspect. Some 58% and 44% of the students considered organic farming important to the economy and the markets, respectively. For both aspects they indicated that organic farming gives all people the opportunity to engage in farming, that everyone can do it and that there is a long-term stability which they identify with sustainability. It encourages diversification, responding to an increasing demand for organic products both inside and outside the country, but especially on the export market. They pointed out that organic farming would increase the economy by reducing the enormous amount of money spent on chemicals. Through the increased awareness for organic products, the more people are conscious of healthy products, the more they would be willing to spend.

Twenty-one percent and 17% of the students indicated that organic farming is less important for the economy and markets, respectively. Regarding the economy, these students reasoned that organic farming is not easily commercialized and serves only a small number of people and it may not meet the increasing demand to feed the world population, unless governments step in. In terms of the market, these students stressed that prices of organic products are not affordable by all. The rest of the students (21%) and (39%) were not sure and did not comment, respectively.

Food security: 50% of the students considered organic farming important to food security. Their main reasoning was that organic farming provides healthy food to people; it addresses poverty and does not use harmful chemicals. Organic produce can be grown on subsistence and commercial level, with endless production, even if there is a scarcity of fertilizers. This determines its long-term stability or sustainability.

Thirty-one percent of the students did not find organic farming as important for food security. They argued that organic farming is less productive, while there is a need for mass production to meet population demands. The use of manure increases yield slightly giving a limited quantity of food that cannot be relied on. It is not an intensive form of farming and it is not applicable to people without sufficient resources (poor farmers), as it is a less efficient use of their limited resources. The students imply that resource-poor farmers cannot afford the lower productivity associated with organic farming; they state that using conventional methods will produce more products from the same resource base. They suggested that organic farming should be experimental in the beginning, because conventional agriculture works well.

The rest of the respondents (19%) were not sure of the importance of organic farming to food security. They did not provide any comments.

4.6 Perceptions of lecturers to the importance of organic farming training

Figure 4.8 shows the responses of lecturers to the importance of organic farming in the curriculum at UKZN. Seventy-five percent (75%) of the respondents indicated that it is important. Their reasons were based on the fact that organic farming is in demand now by many clients of agricultural products (animals and crops); it has a favourable impact on the environment and can be accepted as a good alternative for land use. It is suitable for emerging farmers, as there is a perceived economic benefit that can manifest on a small scale, because the applicability on a commercial scale remains an issue. Training of agriculture students should therefore cover the above aspects in different modules, but producing students that can see the uses of different approaches and adapt these can be a good indicator that more sustainable systems are likely to evolve. Students should be able to make an informed decision on all aspects of different farming practices.

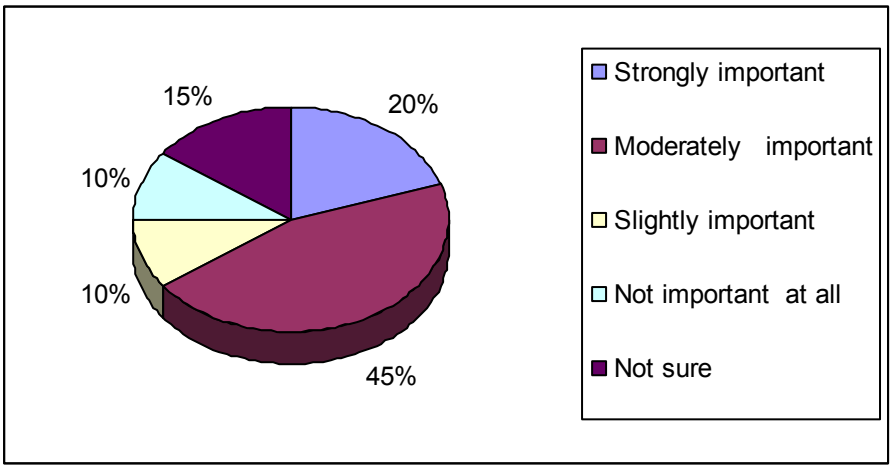

Figure 4.8 Responses of lecturers to the importance of organic farming in the curriculum at UKZN

It was reasoned that the world is moving toward organically produced food and there is an increased number of consumers who are concerned about the consequences of pesticides, genetically modified crops and agricultural additives that may leave residues in food. Organic farming is one of the most sustainable agricultural practices and is well recognised.

Ten percent (10%) of the respondents indicated that they did not find it important at all that organic farming be part of the agricultural curriculum at UKZN. They indicated they did not believe that it is productive and that there is no interest at the University in it. Concerning this latter point, one respondent stated: "if you speak organic farming in this building you are considered a nutter". They argued that at the UKZN there is no association or link drawn between human health and agriculture and thus the focus is not on better food, but more food. The idea behind organic agriculture is not well understood and therefore there is big misinterpretation by many people. Others overestimate its importance. These responses suggest not that these respondents were opposed to organic farming, but that they saw its inclusion in the curriculum as pointless, unless there is a significant change in attitude on the part of the majority of academics in agriculture at the UKZN.

Fifteen percent (15%) indicated they were not sure about the importance of organic farming training. They gave no reasons or comments.

4.6.1 The perception of lecturers on the significance of organic farming

As with students, lecturers were asked about the significance of organic farming to the environment, food security, the economy and the market.

The environment: 70% of lecturer respondents confirmed that it is important; they gave almost the same reasons as the students. They recognised that the soil needs to be re-built through the process of organic farming, which does not cause any damage to the environment as there is no use of chemicals. It reduces reliance on pesticides and reduces air pollution – both of which influence global warming. Finally, they noted that organic farming preserves natural resources. These latter two points were presented as the fundamental reasons why organic farming should be considered.

Five percent (5%) of the lecturers indicated that organic farming was not very important and 25% were not sure. In both cases, no reasons were given.

Food security: 45% of participants indicated that organic farming is important to food security. The main reason is that it makes healthy food produced in a sustainable environment available and accessible. It is good because it does not consider GM foods. However, 35% of

respondents found organic farming less important for food security. These respondents felt that organic farming cannot feed the huge number of consumers, as the yield is always poor. The rest of the participants (20%) were not sure and gave no reasons.

Economy and market: The results for the economy and the market were identical; 40% of the respondents indicated that organic farming is important to both the economy and the market because it is sustainable, with better use of resources, and can be upgraded to more intensive production; the latter being good for the economy. Organic farming can provide more varieties of foods in response to the specific needs of selective consumers. Organic farming is suitable for household and small-scale production selling on more local markets and requiring less long storage. This would encourage people to remain in their communities. It can be useful for the economy if marketed well (e.g. through high-end niche retailers), because of the perception that goes with it; consumers have preferences for organic products and want choices. Thirty percent (30%) of the respondents indicated that organic farming is of little importance to the economy and markets. They stated that organic farming is unable to feed a large number of consumers. It is not commercially viable, as the economic return is critical. Rather than needing expensive speciality foods, many people need cheap foods; these are best produced by conventional agriculture. The rest of the participants (30%) were not sure and gave no reasons.

4.7 Themes for future organic farming content

To get an idea of what they would like to see appear in the curriculum, all the respondents (students and lecturers) were asked to make suggestions about modules, content, material, activities and related issues that would be valuable in organic farming learning and which should be part of the curriculum. Table 4.16 tabulate the responses by level/year of study, means of learning and by respondent group (i.e. student or lecturer).

Table 4.16 Suggested content to be part of the curriculum

Level	Content to offer as given by students	Content to offer as given by lecturers
Year 2		
Taught	• Concept of organic farming • Principles and applications • Introduction to what organic farming is • Soil management and mechanical cultivation • Soil microbiology; approaches of organic farming • Farming; introduction to the needs • Importance with valuable evidence	• Basic principles for organic farming (micro-organism relationships, philosophy of conservation farming, composting, organics and agri-food chains, pest management, soil management) • Crop production • Benefits of organic matter • Principles/philosophies in organic farming methods.
Research	• General reading • Students can compare the money used to buy fertilizers • The practice of soil tillage • Soil micro-organisms and decomposition • Issue about organic crop and livestock production • Soil science and implication to organic farming • Practical based.	• Basic principles

Level	Content to offer as given by students	Content to offer as given by lecturers
Year 3		
Taught	• General principles • How to start organic farming-business plan • High agriculture production, protection and environment • The value of organic farming, health • Green manure and compost • Visits to farmers • Strong practical component • Advantages and disadvantages of organic farming • Sustainable agriculture methods • Organic farming as an answer to climate change • Different types of organic farming • More complex concepts such as how organic matter can benefit the soil and find challenges in organic farming.	• Challenges of the production systems for small-scale to the global environment • Application of principles • In-depth look at organic matter in soil, incorporation of organic farming principles into more traditional forms of agriculture • Philosophical approach to human health and agriculture.
Research	• General reading (research under literature review) • The use and effect of green manure • Essays to find more information about organic farming • Impact of global warming on agriculture • Small project for organic farming • Practical	• Application of principles • Reflection • Attitudes and behaviour

Level	Content to offer as given by students	Content to offer as given by lecturers
Year 4/Honours		
Taught	• The cycle involved in biodegradation • Biological pest control • Commercial production via organic farming • Soil biology and environment management • Visual indicators of land degradation • Improve food security, irrigation • Field trip to organic farmer • Project related to benefits and short-falls of organic farming.	• Organic farming benefits compared with current status • In-depth look at the philosophy and principles of organic farming.
Research	• General reading • The importance of biological pest control • Small research projects comparing GMO, conventional and organic • Commercial production via organic farming • Soil fertility testing • Organic matter composting • Irrigation systems • How organic food differs from non-organic • Side effects of organic foods • Mini project on a small scale organic farming plot.	• Research on potential options in organic agriculture • Basic community level projects to investigate use and understanding of organic systems.

Level	Content to offer as given by students	Content to offer as given by lecturers
Masters		
Taught	• Productivity and profitability of organic food; • Commercialisation components; • Fundamental principles of organic agriculture, organic farming management; • Cost benefit analysis of organic farming.	• Organic farming concepts and their benefit to the environment and people's health
Research	• General reading • Research into perceptions of organic & conventional farming • Compare nutrition of GMO, conventional and organic produce • Soil testing and plant analysis • Commercialisation components for organic products • Contribution of organic methods to food security/economy • Long-term effect of organic farming • Masters degree projects on organic farming.	• Application of organic farming on the farm • Projects on science behind organic in farming systems (nutrient turnover, effects on crops, etc) • Social studies on how communities use and view organic farming

Level	Content to offer as given by students	Content to offer as given by lecturers
PhD		
Taught	• Macroeconomic impact of organic farming • Advanced organic farming • Sustainability in organic farming	• Development of resistant varieties to reduce spraying against diseases/pests
Research	• General reading • The contribution of organic farming in our economy • Genetic modification to prevent devastating plant diseases • Experiments on organic farming • Compare commercial organic farming and communal farming (analysis-assessment), opportunities for organic producers • How do organically grown crops impact on human health, economy, market (action research) • Organic farming in dry areas like Africa • Research project	• Development of low input-tolerant varieties, integrated approach (resistant varieties, application of specific insecticides, use of natural-based pesticides, biological control) • Government interventions for organic farming • Aspects of sustainability.

Looking outside the University arena, other stakeholders suggested the additional content that would be valuable for organic farming training:

- Production process for organic products
- Community awareness of, and consumer behaviour towards, organic products
- Recycling process, including waste, leaves, grass, kitchen waste, fruit, vegetables, woody material and paper
- Management of organic farms and gardens
- Funding and support for organic agriculture
- Research on NGO and Government involvement in organic agriculture
- Research on policy implementation for organic agriculture
- Research on environmental factors and sustainable agriculture
- Business and marketing of organic products
- Distribution channels for organic products
- Control for food safety involving Hazard Analysis and Critical Control Points (HACCP)

4.8 Key issues and stumbling blocks for organic farming training

In addition to investigating the importance of organic farming in different contexts, the study investigated what lecturers, students and other stakeholders in organic farming saw as stumbling blocks or challenges to organic farming in general.

4.8.1 Stumbling blocks identified by students

Thirty percent (30%) of the students indicated that finance was a key stumbling block. They said that people perceive organic farming as a costly venture that only a few can afford and finance for it is difficult to obtain. The focus of UKZN research is on creating cheaper methods of crop production and there is not enough funding allocated to research in organic farming.

A third (33%) of the respondents answered that lack of interest and awareness was a key challenge. They warned that organic farming is still being investigated. There is virtually no good scientific information available to be part of a curriculum and there is a lack of

acceptance by academic staff who are supposed to promote it. They suggested that the problem could be that there is no one specialized in organic farming willing to offer the course, or that possibly it has simply been ignored as part of the curriculum at UKZN.

Seventeen percent (17%) of the respondents identified the fact that organic farming is not yet competitive. There is not yet enough research in organic farming and there is uncertainty or fear of a drastic decline in yield, should there be a shift from conventional to organic farming. People are not willing to adopt new methods, they resist change and some of them are not sensitive to environmental factors.

Twenty percent (20%) identified productivity as another major problem. Organic farming produces very limited yields, while many producers are looking at high yields to earn a reasonable marginal return (profit). They respond positively to the very high demand for food, a demand which keeps growing at an exponential rate.

4.8.2 Stumbling blocks identified by lecturers

Sixty-five percent (65%) of the lecturer respondents said the problem is that, on the ground, farmers have difficulty accepting organic farming as a reliable practice. They believe it leads to low yield and it is not viewed to be viable on a commercial scale. Farmers are driven by economics and this influences the University to concentrate on conventional commercial production. This is reinforced by the fact that most of the funding for research comes from the industries dealing with commercial/conventional farming.

Twenty percent (20%) pointed out that there is not enough awareness of organic farming. Little literature is available. There are no qualified or skilled staff in this field. Together these comprise a significant challenge.

Fifteen percent (15%) stated that students often choose study areas that they believe will open doors for job opportunities when they complete their studies. Without big companies working with organic farming, students will not be attracted to organic agriculture.

4.8.3 Stumbling blocks identified by other stakeholders

The following stakeholders were visited: Rainman Land Care Foundation, Wizzardworms, Woolworths, Pick n' Pay, Weston Agricultural College, Cedara Agricultural College, Dovehouse and the School of Education at UKZN. The perceived problems or stumbling blocks regarding the organic farming industry were formulated in different ways, depending on the particular stakeholders' place in organic farming. However, there was a great deal of commonality of thought among these stakeholders. Table 4.17 sets out the key issues raised by these stakeholders. The issues fall into five categories:

- Academic resistance
- Limited awareness
- Farm management challenges
- Retailing challenges
- Policy challenges and common opinion

Table 4.17: Key challenges to organic farming identified by other stakeholders

Academic resistance

- UKZN has been focused on commercial farming because of lack of expertise on organic farming by lecturers
- There is no interest from the University
- Academics are reluctant
- Some academic say that it is unscientific
- Academics believe that organic farming does not provide high yields to feed people and is unreliable

Limited awareness

- There are many uneducated customers; lack of knowledge among customers; many customers are not informed about the product; there is less awareness by consumers, rendering the product unknown
- Researchers' culture is anti-organic; they do not realize the opportunity given by this field of agriculture; scientists are not aware of research results

Farm management challenges

- Access to markets
- Difficulties in achieving production standards
- Hard work involved to farm correctly
- A lot of work involved

Retailing challenges

- Too much variation in stock supplied
- Uncertainty on market
- Customers complain that prices of organic prices are too high (this discourages sales)
- Business people working with organic products fear the unknown from a commercial point of view

Policy challenges and common opinion

- There is no support from government
- Policies do not put emphasis on organic farming
- Bias in terms of job opportunities and funding encourages the training of researchers for conventional farming companies
- General belief that organic farming cannot address food security issues

Academic resistance: Stakeholders believed that academic institutions (including UKZN) have been concentrating on commercial farming because of lack of expertise by lecturers in organic farming. They indicated that the lack of expertise is mostly attributed to the persistent view that 'organic' is unscientific, leading to their reluctance to look at it seriously. The belief on the part of academics that organic farming does not provide more yields to feed people was cited as another reason why the University is not very interested in organic farming training.

Limited awareness: Stakeholders felt that many people are still not aware of organic products. This is reinforced by the lack of education of many consumers, which leads to consumers not understanding organic products as being different from conventional farming products. Stakeholders added that training for many researchers has been supported by chemical companies, where the expertise is; as a result the culture of researchers is anti-organic and they do not realize the opportunity and potential presented by organic farming.

Farm management challenges: Stakeholders indicated that it is not easy to access and successfully penetrate organic markets, because of competition with conventional farming products and lack of awareness. There are other challenges concerning achieving production standards required by consumers. The whole process involves a lot of work – people must work very hard to get a good result.

The research found that current organic producers struggled to make profits, due to limited sales which were, in turn, affected by the high prices of organic products. Consumers are

hesitant to pay more for organic products. Although this was expressed as an issue of awareness, it can also be seen as an indication that the organic producers need to take matters more directly in hand and develop and implement a strong marketing strategy to change consumer views so that they will buy the higher-priced organic products. These stakeholders seemed to want the State to take the lead in what is actually their own work. While it is useful to have government support for organic farming, the farmers themselves are running businesses with products that need to be marketed.

Retailing challenges: Stakeholders pointed out that retailers dealing with organic products are working in uncertainty and fear, as they cannot predict stock availability. There is too much variation in the stock supplied. In addition, they indicated that the price for organic products is still high compared to their conventional substitutes on the market. This discourages consumers from buying.

Policy challenges and common opinion: Stakeholders stated that the organic industry is not progressing because there is no support from government and the policies do not put emphasis on it. As a result, the industry is crumbling. Another challenge raised was related to job opportunities; currently there are fewer job opportunities in the organic product value chain than in the conventional product value chain. Government's focus is more on chemical companies, where more funding is available and training encouraged. The stakeholders felt that this occurred because many people assume that organic farming cannot solve food security issues or feed the world.

4.9 Summary

The research examined UKZN agricultural curricula and surveyed students, academics and other stakeholders in organic farming. The examination of curricula showed that modules dealing with organic farming exist in the UKZN curriculum, but it is only to a small extent. Further, the curriculum tends to equate organic farming with sustainable agriculture, that is, it does not differentiate between them, while organic farming is generally considered to be under the umbrella of sustainable agriculture. Thus if a module addresses sustainable agriculture it is taken to have addressed organic farming. Most of the materials on sustainable agriculture are delivered modules in the following disciplines: AGPS (Agricultural Plant Science), CRMS (Community Resource Managements), SSCI (Sustainable Soil Fertility

Management), PPTH (Plant Pathology) and BIOR (Bioresource), with the greatest concentration being in Agricultural Plant Science.

The findings from students demonstrate their perceptions about organic farming training. They found it is important (88%) to be taught at UKZN because it is crucial knowledge for future generations which addresses important issues such as the use of alternative methods in food production, human health protection, sustainability, and environmental protection. Those students who did not think it was important to include organic farming in the UKZN curriculum (6%) argued that organic farming would never feed the exponentially growing population of the world, so production and productivity is the first priority.

Students also were asked to consider the importance or significance of organic farming to the environment, the economy, food security and markets. The environment took the highest rate with 87% as students were convinced that organic farming reduces the use of dangerous chemicals and leaves to nature the power to restore itself. The economy and markets followed with 58% and 44% respectively. Their reasons highlighted the opportunity given by organic farming to everyone willing to practice agriculture on domestic level, which would influence positively the economy by reducing the amount of money spent for chemicals in conventional production. However, not all student respondents were in favour of organic farming as far as economy and market are concerned; respectively 21% and 17% of the students indicated that organic farming is less important for the economy and markets because it is not easily commercialized and serves only a small number of people who can afford it without responding to the increasing demand to feed the world population. Regarding food security, 50% of the student respondents considered organic farming important because it provides healthy food to people, addresses poverty and does not harm the environment. On the other hand 31% of the students did not find organic farming as important for food security because it is less productive.

The challenges or stumbling blocks for organic farming training identified by students were more related to finance (30%), as it is a costly venture; lack of awareness (33%); not competitive (17%) and with very limited yield (20%).

The findings from academic staff illustrated that the perceptions of lecturers concerning organic farming training were similar to the perceptions of students, but with a slight

difference. Seventy-five percent (75%) of lecturers indicated that organic farming is important because of the current demand for it from consumers and its good impact on the environment. Ten percent (10%) of them pointed out that it was not important at all, because they do not believe that it is productive. They saw its inclusion in the curriculum as meaningless.

Concerning the significance of organic farming to the environment, the economy, food security and markets, 70% of lecturers were in favour of environmental effects, giving the reasons of soil protection and nature conservation through the process of organic farming. Five percent (5%) of the lecturer respondents indicated that organic farming was not very important. Concerning food security, 45% of lecturer participants indicated that organic farming is important to food security because it provides healthy food produced in a sustainable environment. Thirty-five percent of lecturer respondents found it less important for food security, saying that it cannot feed a large number of consumers, as the yield is always poor.

Results from academic staff concerning organic farming in relation to both the economy and market were: 40% of lecturers indicated that organic farming is important to the economy and market because it is sustainable, with better use of resources, and can be taken to more intensive production if marketed well. Thirty percent of lecturers replied that organic farming is of little importance to the economy and markets. Reasons given were almost the same reasons as students', namely that organic farming is unable to feed a large number of consumers and is not commercially profitable.

The stumbling blocks identified by lecturers for organic farming are related to the difficulty of accepting organic farming as a reliable practice (this was indicated by 65% of lecturer respondents). They believe it leads to poor yield and it is not viewed to be viable on a commercial scale. Twenty percent pointed out that there is not enough awareness of organic farming and 15% raised the issue of scarcity of job opportunities in the field of organic farming.

Other stakeholders in the study (people from outside the university arena, considered as experts in organic farming) were expected to be positive about organic farming as they are

already actively supporting it. They were asked about the challenges to organic farming and its place in university curricula.

These respondents felt strongly that the fact that people have committed themselves to business ventures in organic farming is a good indication of the viability of organic farming. They noted that these entities operate despite the challenges and the perceptions of many about organic farming.

The drawbacks identified by other stakeholders were related to academic resistance (the persistent view that 'organic' is unscientific), limited awareness (lack of education), farm management challenges, retailing challenges and policy challenges.

They recommended that some additional content could be part of the UKZN curriculum as they considered organic farming to be important. They suggested it is evident that, in addition to dealing with some of the unique issues concerning organic farming, the curriculum should treat organic farming as it would treat any other method of production and cover the essentials such as production, marketing and management.

It was indicated that organic farming features in the UKZN curriculum to a small extent. The rate of uncertainty about the content was significant (> 30%), which indicates that many students and academics are not well-informed about what is offered in the curriculum. All of the respondents, including other stakeholders, suggested some material as additional content in the agricultural curriculum at UKZN. This could improve the current curriculum and would, in the view of the present researcher, meet the standard of sustainable agricultural programmes such as that suggested by the GPSA. They found organic farming training to be important because of its economic and environmental value and its contribution to arming future generations with valuable knowledge to protect the environment. They perceive organic farming as a good approach, as far as the environment is concerned, but not reliable for the production of sufficient food to feed the world. The capacity of organic farming to feed the masses is a debatable issue centred on whether to produce more food and harm the environment or produce less but healthy food and protect nature. Throughout the interviews this debate emerged, with responses often being more subjective than objective. Clearly this points to the need to put organic farming into the academic curriculum where its value in terms of production, economics and the environment can be studied. Its exclusion from, or

marginalisation within, the curriculum, will not resolve the debate. The study suggests allocating equal attention to organic and conventional farming in the curriculum as a starting point.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In the process of analyzing organic farming training in the UKZN curriculum, the previous chapter presented a number of elements regarding the perception of participants vis-à-vis organic farming, what is offered currently and the key issues or problems faced in the field of organic agriculture. Chapter five will discuss the implication of these elements by linking them with the main research question and sub-objectives (given below), based on the results provided in Chapter Four and supported by the literature review:

- Understand to what extent organic farming is included in the BSc. Agric and B. Agric programme at UKZN and what is offered
- Solicit the perceptions of students and lecturers concerning organic farming training
- Identify the key issues and stumbling blocks for organic farming training

Chapter Five will draw also the main conclusions of the research, based on findings linked to the main research question and sub-objectives. It will show whether or not the objectives of the study were met and make recommendations.

5.2 Discussion of findings

The discussion of findings will cover: organic farming in the UKZN curricula, perception of lecturers and students concerning organic farming training, and key issues and stumbling blocks in organic farming. It will then provide a brief summary of the findings**.**

5.2.1 Organic farming in the UKZN agricultural curricula

The study found that organic farming is included in the B.Sc. Agric and B Agric curricula at UKZN. It is covered in modules offered by five agriculture-related disciplines – AGPS (Agricultural Plant Science), CRMS (Community Resource Managements), SSCI (Sustainable Soil Fertility Management), PPTH (Plant Pathology) and BIOR (Bioresource). However, the extent to which organic farming is covered is very limited.

There are 10 modules that cover organic farming: AGPS 305 (Field Crop Management), AGPS 210 (Sustainable Community Agriculture), AGPS 304 (Greenhouse Management), AGPS 308 (Crop Protection), AGPS 307 (Orchard Management), AGPS 711 (Field Crop Production), CRMS 350 (Food Security), SSCI 770 (Sustainable Soil Fertility Management), PPTH 745 (Field plant pathology) and BIOR 118 (Introduction to the Environment). The content of these modules (as displayed in Table 4.9) was compared to the standards adopted for this study, as set out in 2.6.2.2. The comparison showed that the UKZN curricula fall short of the proposed standard. As shown in Appendix J, the UKZN curricula compare favourably with the standard in the following areas:

The UKZN curricula do cover: Traditional farming, role of soil organic matter in sustainable agriculture, waste disposal, management to sustain productivity, the influence of the environment on growth and development, impact of environmental variables, conservation of biodiversity, tillage and residue management, effects of tillage practice and crop rotation on soil fertility, mulching, ecological interaction, soil fertilization and liming, soils and pollution, concept and role of soil-quality indices, climate change and food security measurement.

The UKZN curricula include some issues in its organic content that are not included in the standard from Graduate Programme in Sustainable Agriculture (2008) and Williams (2008), such as traditional farming, climate change and food security measurement.

A curriculum is expected to cover the following themes: agro-ecosystem analysis, sustainable agriculture tutorial, foundation for sustainable agriculture, integrated crop and livestock production systems, ecologically based pest management strategies, organizational strategies for diversified farming systems, agro-forestry systems and organic agriculture theory practice [Graduate Programme in Sustainable Agriculture (2008) and Williams (2008)]. The content detail is in Appendix J.

As established in Chapter 2, the planet Earth is currently facing environmental problems such as climate change, global warming and disturbance of seasons, all of which can inhibit food production in the coming years if responsible measures are not taken now (Alma & Etheridge, 1993). Organic farming is one possible measure that can be taken. It is

understandable that the approach of organic farming is still new and thus not commonly acknowledged or accepted. More research is needed and its supporters need to weigh in with extensive awareness programmes, so that people can start changing their perceptions of the role organic farming can play for the betterment of the future. In the present study, the majority of respondents suggested more courses to be offered as part of the current curriculum (Table 4.11). While some organic farming courses already exist, or at least organic farming can be found in the programme under a different name (even if to a small extent), incorporating some of the suggested content would be a valuable additional step toward environmental protection taken by UKZN.

5.2.2 Perceptions of lecturers and students concerning organic farming training

Responses from lecturers and students were often very similar. Although there were generally positive responses to the idea of organic farming being included in the UKZN agricultural curricula, the divergence of responses (taking into account the minority of negative responses) provides good insight into the issue. The responses of students and lecturers clearly expose the nature of the debate around organic farming and its inclusion in university curricula. Lecturers and students generally thought that organic farming was a valid area of study, but that it presented some problems. Both understood that, in keeping with the FAO (2008), organic farming aims to produce food, but at the same time maintain an ecological balance of the nature. However, they also understood that, again in keeping with the FAO (2008), there are limits to the ability of organic farming to address the rapidly increasing demands for food, which are driven by population increases.

The arguments and views of students and lecturers were related to specific points, such as environmental protection, as one of the important outcomes of organic farming training. This was rated higher than issues of the economy, food security and markets, indicating that environmental factors are of more concern than any other factor when it comes to organic farming. This is consistent with the view that organic farming has become an important alternative to intensive, conventional farming, with the basic principles of protecting the nature and preventing harmful influences on the environment (Bavec & Bavec, 2007). Organic farming methods are considered as natural, involving environmental protection in the whole process (Boland *et al.,* 1999).

Some students and lecturers suggested seeing other food production methods promoted or emerging, so that, in the variety of alternatives, producers can choose which one would be suitable for them, rather than relying on one method. This is not meant to imply that conventional farming is necessarily bad, but it was to raise the idea of diversifying practices to extend the choices available to producers and consumers. It was also meant to raise the concern over long-term sustainability of food production, which is, of course, directly related to acquiring knowledge on the concepts and practice of sustainable food production (FAO, 2007). Therefore more effort needs to be added to what is currently delivered as knowledge to students, so that sustainability of the whole production system and protection of the future is incorporated.

A further argument from students and lecturers supporting including organic farming in the curricula was related to another aspect of sustainability. Respondents said that in order to protect the future and work efficiently, farmers need to be physically healthy and not exposed to hazardous elements (e.g. chemicals and sprays). Organic farming promotes such health-conscious use of the soil and air (Duram, 2005).

Lecturers added a practical element, noting that current university investors in agricultural programmes are more interested in profit-making than they are in producing quality food through environmentally sustainable means. Put simply, such investors would be unlikely to finance organic farming programmes at the University.

The fact that organic products are in demand by many consumers, was one of the reasons why lecturers perceived organic farming to be important, even though the supply of organic food is limited compared to demand. They understood that supply and demand issues drive organic food prices up (FAO, 2008) and that this, in turn, raises issues of affordability for people with low incomes (Niggli *et al*., 2008). Notwithstanding this limitation, lecturers saw organic farming as a good opportunity for emerging farmers, because they can profit from it and, at the same time, contribute to environmental protection and food security. This makes organic farming a good alternative for land use and labour intensive, taking into account the fact of affordability which can constitute a stumbling bloc.

More thought was given to expressing students' perceptions, as students regard themselves as learners seeking to acquire valuable knowledge. A significant number of participants (75%) suggested that equal attention be given to organic and conventional farming at the tertiary

level. Such training will provide graduates with capabilities which allow them to respond to changing paradigms (Madukwe, 2008). Agricultural students are meant to learn every aspect of agriculture and then specialise only after getting a broader picture. A wide spectrum of knowledge is always valuable, as it places a person in a position to be more flexible and to adapt easily to different situations. Dlamini (2003) stressed that education plays a crucial role in the life of a person, in the sense that it equips individuals with important skills to earn their livelihoods and contribute positively to society.

5.2.3 Key issues and stumbling blocks in organic farming

Each group pointed out some particular issues as reasons for the organic farming industry not progressing and being seen as an impossible route to follow. These included the cost involved in production of organic food, poor yields, making organic farming not competitive, lack of interest/awareness, uncertainty for career opportunities, lack of expertise by academics and farmers in the domain, chemical companies driving all the support of investors, and government not supporting organic farming. These views are not majority views and are presented to ensure that all sides of the argument are presented.

Cost of production: The organic producers participating in this study emphasised that the organic industry is expensive to run and maintain. A key cost is labour. The FAO (2008) confirmed that there is a greater labour input per unit of output, which results in higher prices of products on the market. Participants in this study, citing high market prices, warned that consumers are reluctant to purchase items that are expensive, especially if the same items can be found "next door" at a lower price, without considering the quality differences between organic and conventionally produced foods. Greeno (2006) confirms that a negative aspect of organic farming is related to finance, in the sense that customers who are willing to purchase organic products are paying high prices compared to those of the same items produced conventionally. Few people would choose organic quality standards as there is little awareness about the products.

Poor yields and non-competitiveness: Another stumbling block identified was that organic farming is considered as good practice in theory, but in reality the yields are poor, making organic farming non-competitive. Participants suggested that this is the reason why it is difficult for it to be taken as a reliable practice by many. Advocates of organic farming state

that the key factor that makes organic farming important is that it produces high quality food (Bavec & Bavec, 2007) and the whole process improves soil resources by providing quality top-soil for future generations (Duram, 2005). They seem to imply that if this is understood by consumers, organic farming would become competitive, in spite of the low yields.

Lack of awareness and interest: Participants indicated that, because consumers are not aware of the unique benefits of organic products, they are not willing to pay the higher prices. Of course, if people do not know the products and therefore do not buy them, it will be difficult for producers to trade and make a profit. Ironically, this feeds a negative cycle: the lack of perceived profitability discourages those who are in a position to promote organic farming from creating the very awareness that producers require to be profitable. Rettich *et al*. (1996) speculated that it is possible that people in charge of setting educational curricula could be reluctant and disregard the integration of organic courses because of their own perceptions and interests, while the key element of curriculum innovation is the integration of organic farming and conventional farming concepts in the programme. It can be argued, then, that lack of awareness and interest is a priority issue to be addressed in organic farming, as it is holds the key to overcoming the stumbling blocks of high prices, low yields, lack of competitiveness and poor profits driven by poor sales. Although the participants have identified this as an issue of awareness, the present researcher suggests that it is related to good marketing practice, which is a fundamental element of sound farm management.

Uncertainty concerning career opportunities: There are few people involved in organic farming and it is still facing challenges to being considered as a viable practice. Many scientists are not convinced about organic farming, although, as suggested by one of the organic farming participants, it gives everyone the opportunity to farm. This all leads to uncertainty about organic farming as a career option. Participants said that there are currently very few job opportunities created in the organic farming sector; this, too, makes the industry seem like a doubtful option.

Lack of expertise: Participants indicated that other challenges in organic farming are related to scarcity of specialists or lecturers in the discipline. Some academics are not yet fully convinced about its effectiveness. It is also still a new approach under research.

Influence of chemical companies: Chemical companies driving all the support of investors was another challenge pointed at by participants. They have indicated that, currently, many investors are motivated to support businesses that can pay back with good profit. In this regard, organic farming is neglected because is perceived to be unprofitable.

Lack of government support: It was pointed out by participants that another challenge is the lack of government support for organic farming. People can put in effort at the grassroots level, but if the State does not intervene, it would be difficult for organic farming to progress. The involvement of government in organic farming is considered to be a key factor that can convince producers and consumers of the advantages that this alternative agricultural practice can bring.

5.2.4 Summary of discussion of findings

The sub-objectives of the study were met. Courses that cover organic farming have been identified at UKZN, but this coverage was found to be less than the coverage given to conventional agriculture. The perceptions about organic farming training showed that it is important to teach it as an alternative method of producing food, a method that keeps the ecological balance and at the same time provides students with additional knowledge of what agriculture is all about. Participants identified some challenges that hinder organic farming being recognized as a reliable practice. This makes the future of the industry uncertain. Organic farming does, however feature in the UKZN curriculum and there are at least a few organic farmers currently in business. What is needed is support from government and others to promote the awareness of the value of organic farming. This will overcome consumer reluctance, which inhibits the profitability needed to foster organic farming as a viable career choice.

5.3 Conclusions and recommendations

The study shows that organic farming was the former traditional way of producing food. It was replaced by conventional farming due to the increasing demand for food in the world. Because of the high demand for food after widespread starvation during World War II, starvation, this traditional (organic) farming was considered unable to meet the demand of feeding more people. As a result, the extensive use of fertilizers and pesticides commenced. It

was then noticed that, despite the fact that conventional farming produces good yields, it harms the environment. This created a tension between two important aspects of life on earth: ensuring ample food production and preserving the environment for future generations. Producing food at the expense of destroying the environment was not acceptable, but allowing masses to starve, to protect the environment, was also not acceptable. Organic farming was introduced as a way of achieving both objectives. The need to bring back organic farming practices emerged as a means of restoring balance in food production systems.

The following sections will present the conclusions and recommendations related to the UKZN curriculum, perceptions of students and lecturers and stumbling blocks to organic farming training. It will give further insights into the debate over organic farming and will present the weaknesses of the study.

5.3.1 Organic farming in the UKZN curriculum

This section addresses the two sub-objectives and concentrates on what organic farming content is offered in the UKZN curriculum and the extent to which it is found in the two main agricultural qualifications. It was revealed that there was very little organic farming content in the UKZN agricultural undergraduate curricula. This means that anyone studying agriculture at UKZN will not have any appreciable knowledge or skills in organic farming. He or she will therefore be ill-equipped to work in organic farming or to advise farmers in organic farming. He or she will not have the background to engage in organic farming research or to intelligently debate the issue. It perpetuates the lack of expertise in organic farming and this lack was one of the key obstacles uncovered by the study. The lack of expertise could reinforce the current focus on conventional farming in terms of research efforts, practice in the field and funding of programmes.

Students interested in learning about organic farming will not be able to do so. The study suggests, based on the reluctance and ambivalence shown by lectures, that students may be discouraged from studying organic farming.

The obvious recommendation is for the UKZN to give serious consideration to paying greater attention to organic farming in its undergraduate curriculum. This could be achieved in a

number of ways. First, new modules dedicated to organic farming theory and practice could be included as required modules for the B Sc Agric and B Agric. Second, organic farming could be included as parts of existing modules dealing with agricultural production, such as are found in the AGPS and ANSI programmes. Third, an intelligent debate concerning organic farming could be included in either or both of the proposed new modules, or existing ones. Although participatory curriculum development has not been discussed in this study, it is recommended that students be involved in developing the curriculum, as the study has shown that they have some good ideas to share.

5.3.2 Perceptions of students and lecturers

Students showed a reasonable understanding of the key issue concerning organic farming: food production for the masses compared with environmental considerations. Students are not fixed in their views about organic farming and should be prepared to learn more and contribute to finding answers to the question of balance. The debate itself should be a regular part of the UKZN curriculum.

The responses of lecturers showed uncertainty and ambivalence. They were not opposed to organic farming *per se,* or to its inclusion in the curriculum. They were, however, uncertain about its real value and therefore seemed unable to settle on what should be covered, as well as where, when and how organic farming should be treated in the curriculum. It is recommended that research be done to explore the merits and disadvantages of organic farming, including production, economics, marketing, environment and social issues, with a view to eliminating the uncertainty and enabling academics to engage in objective debate concerning the placement of organic farming in the curriculum. It is recommended that this process be started with a well-planned seminar on organic farming, in the context of the debate discussed earlier, and its inclusion in the curriculum.

5.3.3 Key issues and stumbling blocks for organic farming training

The study found that there are many challenges that inhibit the success of organic farming as a viable farming business. These challenges fall broadly into two areas: issues of farm-level economics and management; and sector-level position of organic farming in South African agriculture.

In terms of cost of production, it is recommended that the UKZN commission research in this area. The research could look for ways to improve on production costs by examining production technologies, post-harvest technologies and issues of input supply and markets. This would not only help solve the problems faced by the farmers, but would contribute to the development of the organic farming curriculum in the UKZN agricultural programmes.

Regarding the sector-level positioning of organic farming, the study revealed a thread of commonality among the issues of uncertainty of careers in organic farming, a lack of expertise in organic farming, the influence of chemical companies and limited support from government. The common thread is lack of awareness. It is recommended that organic farmers, processors and retailers form a partnership with government, to study a range of issues related to organic farming, including its role in food security and nutritional health and support to organic farming entrepreneurs as a part of economic planning. Given the known value of organic farming and its products, awareness programmes could be developed and implemented at schools and in clinics – particularly clinics dealing with nutrition in children.

5.3.4 Further insights into the debate over organic farming

The study reaffirms the traditional concept of sustainable development; that is it a function of the relationship and tension between economic, social and environmental factors. It suggests that all the stakeholders are part of the struggle to find the 'right', or at least a workable way. Although one can separate these three elements, as will be done in the paragraphs that follow, these elements often overlap. The study suggested that the person holding the environmental aspect of the debate is also connected to the other elements.

On the economic side, the study found that a primary motivation in the debate concerns making money. The organic farming business needs to make profit. The chemical companies are also motivated by profit. Research options appear to follow the money. Even students are influenced by economics, both in terms of funds to study and in terms of perceived future employment opportunities. The study indicates that the current tendency is to pursue conventional agriculture, because it is seen to be more economically attractive.

People practising organic farming are not motivated purely by the environmental aspects of organic farming. They are also motivated by making money. This is affected by consumers who are making purchasing choices based on economic factors, i.e. prices.

The primary social concern in the debate concerns meeting the food requirements for an ever-increasing population. As stated earlier, organic farming is generally not seen as being capable of achieving this. This social factor tends to support conventional agriculture for food production.

In terms of the continuing debate over the place of organic farming in agriculture and in higher education curricula, a fourth factor emerges: someone taking the lead. In some discussions of sustainable development this is referred to as governance (Kemp & Parto, 2005).

The study suggests that no-one is taking the lead in the debate. The organic farmers appear to be waiting for the State. Academics appear to be waiting to be shown the value of organic farming; if industry takes it up and provides funding, the curriculum may follow. Finally, the lack of leadership in the debate is evidenced by the lack of dialogue between UKZN and the other stakeholders who are engaged in organic production.

While it has been recommended that UKZN initiate discussions concerning organic farming, it is also recommended that the current organic farmers (other stakeholders in this study) initiate such interactions. They stand to gain the most from a genuine debate which addresses the social, economic and environmental factors influencing the organic farming industry and how it is treated in curricula.

5.3.5. Further research

This study looked at organic farming from a curricular perspective in the context of agricultural production. Studying the role and placement of organic farming in educational curricula would benefit from a study of consumer behaviour in purchasing organic products; the economic viability of organic farming; and the role of organic farming in mass-production of food.

5.4. Weaknesses in the study

Although time and finances limited the scope of the field work, the study could have benefitted from the inclusion of additional academic disciplines such as environmental science, bio-engineering and those involved in conventional farming: farmers and agro-industry (e.g. chemical companies).

The analysis of the data showed that some of the questions used in the questionnaires did not allow deeper probing of the perceptions of respondents. This would not have changed the overall outcome of the study, but would have enriched its depth and level of insight. By design, the study did not investigate research topics at Masters and PhD levels. This could have revealed additional information valuable for the study.

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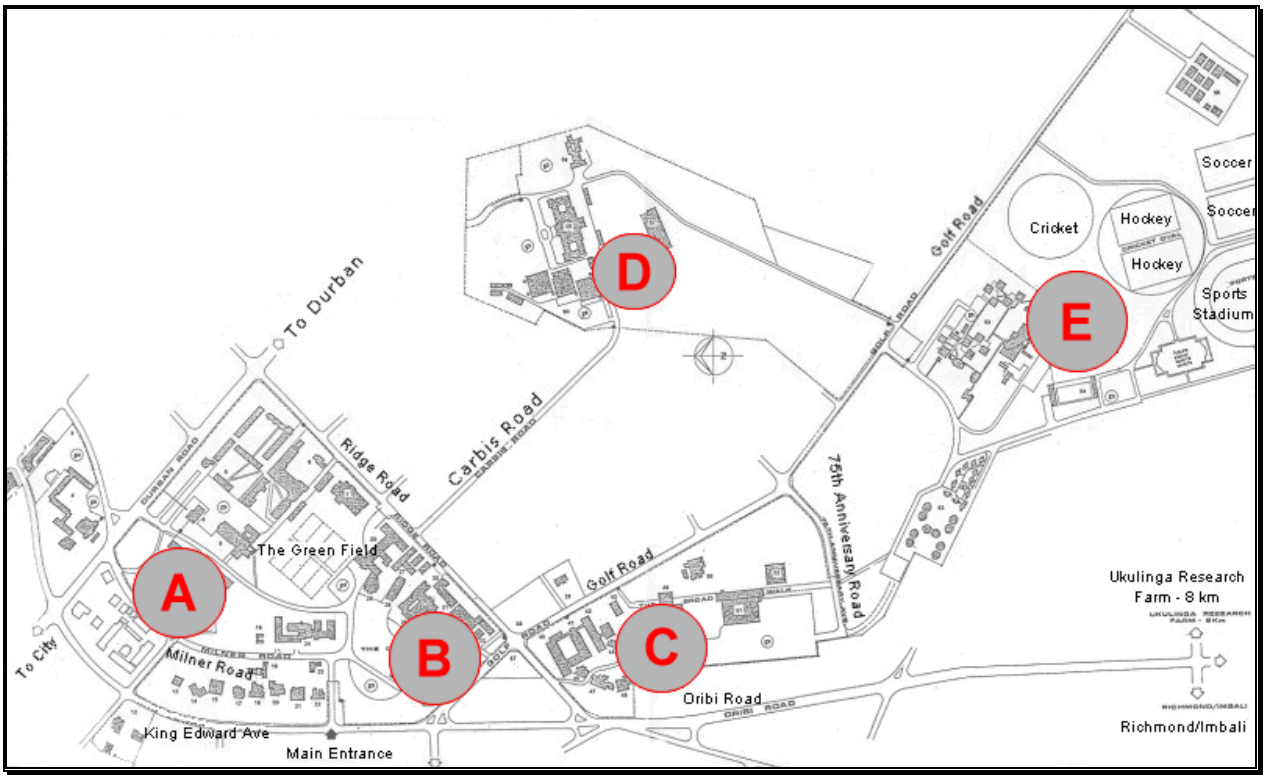
APPENDICES

Appendix A: Map of University of KwaZulu-Natal / Pietermaritzburg



Appendix B:

2009 Contract & Permanent Academic Staff /Faculty of Science & Agriculture/ Pietermaritzburg Campus

School	Pietermaritzburg Campus (Staff)	
ADMIN OFFICE:FACULTY(S&A)	1	
AGRI SCIENCES & AGRIBUSINESS	40	*
BIOCHEM,GENETICS & MICROBIOL	14	
BIOLOGICAL & CONSERVATION SCI	19	*
CHEMISTRY	11	
COMPUTER SCIENCE	5	
ENVIRONMENTAL SCIENCES	15	*
MATHEMATICAL SCIENCES	9	
PHYSICS	6	
STATISTICS & ACTUARIAL SCIENCE	4	
Grand Total	124	

Note:

1. The data above excludes temporary staff.
2. Considered in the study (*)

Source: UKZN Management Information

Appendix C:

Questionnaire for Stakeholders in Business
University of KwaZulu-Natal

Pietermaritzburg

This questionnaire will be answered by a sample of business practitioners to collect information about organic farming. To facilitate meaningful and free responses, the questionnaire is done on an anonymous basis, ensuring that your identity will not be known by any one. Your full participation will be appreciated.

1. Are you interested in buying and selling organic products? Yes ☐o ☐Yes

Please give the reason…...…….

……

……

……..

2. Do you think it is important for students to learn more about organic farming?

Yes ☐ No ☐ if Yes

Please give the reason…...…….

……

……

……

3. Can you suggest any contents (section, material) that would be valuable for organic farming training?

……

……

……

4. Should we be worried about environmental problems now?

Yes ☐ No ☐ if yes

Please give the reason…...…….

……

……

……

5. What do you think we should do to avoid these problems or challenges?

……

……

……

6. What kind of challenges are you facing in dealing with organic products?

……

……

……

7. Who are the stakeholders in this domain? What do they say about organic products?

……

……

……

8. How do you share information with others? What challenges are you facing in this process?

……

……

……

Any other comment

……

……

……

Thank you very much for your contribution in this research. If necessary you can send further information to johnsanzipol@yahoo.com

Appendix D: Question guide to other stakeholders

1. What are the key issues and stumbling blocks in dealing with organic farming
2. Who else are you working with in this field?
3. To what extent stakeholders in organic farming are involved in the programme?
4. What are the problems / issues faced by your colleagues (stakeholders) in this field?
5. What do you think should be offered under organic farming programme at University?
6. How can organic farming be part of the curriculum at secondary, high and tertiary level?

Appendix E:

Questionnaire for Postgraduate students of
University of KwaZulu-Natal

Pietermaritzburg

This questionnaire will be answered by a sample of students to collect information about organic farming training in the curriculum of UKZN. To facilitate meaningful and free responses, the questionnaire is done on an anonymous basis. Your full participation will be appreciated.

Please tick [√] *the provided relevant boxes and fill the dotted lines where necessary*.

SECTION A: DEMOGRAPHIC

Gender: Female ☐ Male ☐

Current qualification at University of KwaZulu-Natal……

Which School/Programme……

Level: Honours ☐ Postgrad. ☐ Maters ☐ PhD ☐

Number of years at University of KwaZulu - Natal: ……

Where did you do your undergraduate studies?

At University of KwaZulu-Natal ☐

- Other University ☐ Specify Name & Place: ……..
- Local language……..Country ……...

Which of the following describes best the place where you grew up?

- urban area [ ]
- rural area [ ]
- semi urban area [ ]
- semi rural area [ ]

Future career after studies…….

SECTION B: Qualitative

1. It is important to teach organic farming at tertiary level
    a) Strongly agree [ ]
    b) Moderately agree [ ]
    c) Slightly agree [ ]
    d) Not sure [ ]
    e) Slightly disagree [ ]
    f) Moderately disagree [ ]
    g) Strongly disagree [ ]

Please give the reason ……

...……

……

2. In agricultural education, equal attention should be allocated to both organic methods and conventional methods
    h) Strongly agree [ ]
    i) Moderately agree [ ]
    j) Slightly agree [ ]
    k) Not sure [ ]
    l) Slightly disagree [ ]
    m) Moderately disagree [ ]

n) Strongly disagree [ ]

Please give the reason ……..

……..

……..

3. Have you ever had a course related to organic farming or sustainable agriculture?

Yes ☐ No ☐ If Yes

Module Name		Module Code	
Core Y / N	In what Qualification/Major	Elective Y / N	In what Qualification/Major
Which University		Which country	

Include organic farming in content Y / N	If yes, brief explanation of organic content:

If yes, Organic Farming Learning outcomes
1
2
3
4

4. What modules in the agricultural syllabi do you think cover organic farming?

Module Name		Module Code	
	Brief explanation of organic content:		

5. What would you like to see covered in organic farming training?

……

……

……

6. To what extent do you think organic farming features in the current UKZN agricultural curriculum?

a) Features to a small extent [ ]
b) Features to a very large extent [ ]
c) Features to a large extent [ ]
d) Features to a moderate extent [ ]
e) Not at all [ ]
f) Not sure [ ]

7. How important is it that organic farming feature in the agricultural curriculum at UKZN?

o) Strongly important [ ]
p) Moderately important [ ]
q) Slightly important [ ]
r) Not important at all [ ]
s) Not sure [ ]

Please give reason for your choice

……

……

……

8. If it is important at all can you suggest any contents (section, material) that would be valuable for organic farming training?

at what level?		What should be covered (content)
Year 2		
Taught		
Research		

Year 3		
Taught		
Research		
Year 4/honours		
Taught		
Research		
Masters		
Taught		
Research		
PhD		
Taught		
Research		

9. If important at all, what do you see as the stumbling blocks; why does it not feature more prominently?

……

……

……

……

……

……

……

……

10. Please tick [√] how can you score the importance / significance of organic farming to the:

VI=Very Important; **I**= Important; **LI**= Less Important; **NS**=Not Sure

	VI	I	LI	NS	Reason
Environment					
Economy					
Food security					
Market					

Thanks for your time!

Appendix F: Handbook calculations / Faculty of Science and Agriculture (UKZN, 2009)

BSc AGRIC PLANT SCIENCES												
CROP SCIENCE STREAM												
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	
BIOL101	16	12.5%	AGEC210	16	11.8%	AGPS301	16	12.5%	AGPS701	8	6.7%	
CHEM110	16	12.5%	BMET210	16	11.8%	AGPS303	8	6.3%	AGPS711	8	6.7%	
MATH133	16	12.5%	GENE210	16	11.8%	AGPS305	16	12.5%	AGPS713	16	13.3%	
PHYS131	16	12.5%	SSCI212	8	5.9%	AGPS307	16	12.5%	ELECTIVES	16	13.3%	
BIOL102	16	12.5%	AMET210/ BIOL204	16	11.8%	AGPS304	8	6.3%	AGPS710	16	13.3%	
BIOR118	8	6.3%	AGPS200	16	11.8%	AGPS306	16	12.5%	AGPS712	16	13.3%	
BIOR130	8	6.3%	AGPS220	8	5.9%	AGPS308	16	12.5%	AGPS791	8	6.7%	
CHEM120	16	12.5%	BIOC212	16	11.8%	AGSP320	16	12.5%	AGPS790	32	26.7%	
MATH143	8	6.3%	BMET222	16	11.8%	SSCI320	16	12.5%				
PHYS133	8	6.3%	MICR212	8	5.9%			0.0%				
TOTAL CR	128			136			128			120		512
ORGANIC/YEAR	8	6.3%		0	0		56	43.8%		8	6.7%	72
ORGAN/DEGREE		1.6%			0			10.9%			1.6%	14.1%

BSc AGRIC PLANT SCIENCES													
HORTICULTURE STREAM													
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIOL101	16	12.5%	AGEC210	16	11.8%	AGPS301	16	12.5%	AGPS701	8	6.7%		
CHEM110	16	12.5%	BMET210	16	11.8%	AGPS303	8	6.3%	AGPS724	8	6.7%		
MATH133	16	12.5%	GENE210	16	11.8%	AGPS305	16	12.5%	ELECTIVES	64			
PHYS131	16	12.5%	SSCI212	8	5.9%	AGPS307	16	12.5%					
BIOL102	16	12.5%	AMET210/BIOL204	16	11.8%	AGPS304	8	6.3%					
BIOR118	8	6.3%	AGPS200	16	11.8%	AGPS306	16	12.5%	AGPS790	32			
BIOR130	8	6.3%	AGPS220	8	5.9%	AGPS308	16	12.5%	AGPS791	8	6.7%		
CHEM120	16	12.5%	BIOC212	16	11.8%	AGSP320	16	12.5%					
MATH143	8	6.3%	BMET222	16	11.8%	SSCI320	16	12.5%					
PHYS133	8	6.3%	MICR212	8	5.9%								
TOTAL CR	128			136			128			120		512	
ORGANIC/YEAR	8	6.3%		0	0		56	43.8%		0	0.0%		64
ORGAN/DEGREE		1.6%			0			10.9%			0.0%	12.5%	

PLANT BREEDING STREAM													
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIOL101	16	12.5%	AGEC210	16	11.8%	AGPS301	16	12.5%	AGPS701	8	6.7%		
CHEM110	16	12.5%	BMET210	16	11.8%	AGPS303	8	6.3%	AGPS711	8	6.7%		
MATH133	16	12.5%	GENE210	16	11.8%	AGPS305	16	12.5%	GENE732	8	6.7%		
PHYS131	16	12.5%	SSCI212	8	5.9%	AGPS307	16	12.5%	ELECTIVES	16	13.3%		
BIOL102	16	12.5%	AMET210/ BIOL204	16	11.8%	AGPS304	8	6.3%	BMET710	8	6.7%		
BIOR118	8	6.3%	AGPS200	16	11.8%	AGPS306	16	12.5%	AGPS721	8	6.7%		
BIOR130	8	6.3%	AGPS220	8	5.9%	AGPS308	16	12.5%	AGPS730	16	13.3%		
CHEM120	16	12.5%	BIOC212	16	11.8%	AGSP320/ SSCI320	16	12.5%	AGPS790	32	26.7%		
MATH143	8	6.3%	BMET222	16	11.8%	GENE310	16	12.5%	PPTH330	16	13.3%		
PHYS133	8	6.3%	MICR212	8	5.9%								
TOTAL CR	128			136			128			120		512	
ORGANIC /YEAR	8	6.3%		0	0		56	43.8%		8	6.7%		72
ORGANIC/DEGREE		1.6%			0			10.94%			1.6%	14.1%	

ANIMAL AND POULTRY STREAM													
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIOL101	16	12.5%	AGEC210	16	12.5%	ANSI332	16	12.5%	ANSI703	16	12.5%		
CHEM110	16	12.5%	BIOC201	16	12.5%	ANSI344	16	12.5%	ANSI741	16	12.5%		
MATH133	16	12.5%	GENE210	16	12.5%	ANSI305	8	6.3%	ANSI742	16	12.5%		
PHYS131	16	12.5%	MPHY200	16	12.5%	ANSI362	16	12.5%	GENE350	16	12.5%		
BIOL102	16	12.5%	ANSI201	16	12.5%	ANSI370	16	12.5%	ANSI790	32	25.0%		
BIOR118	8	6.3%	ANSI202	16	12.5%	BMET222	16	12.5%	ANSI324	8	6.3%		
BIOR130	8	6.3%	ANSI204	8	6.3%	BMET210	16	12.5%	ANSI702	8	6.3%		
CHEM120	16	12.5%	ANSI205	8	6.3%	ELECTIVES	16	12.5%	ANSI704	16	12.5%		
MATH143	8	6.3%	BIOC212	16	12.5%	ELECTIVE	8	6.3%					
PHYS133	8	6.3%											
TOTAL CR	128			128			128			128		512	
ORGANIC /YEAR	8	6.3%		0	0		0	0		0	0		8
ORGANIC/DEGREE		1.6%			0			0			0	1.6%	

GRASSLAND SCIENCE													
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIOL101	16	12.5%	BIOL204	16	12.5%	ANSI344	16	12.5%	BIOL701	16	12.5%		
CHEM110	16	12.5%	BIOL223	16	12.5%	BIOL303	16	12.5%	BIOL722	16	12.5%		
MATH133	16	12.5%	SSCI217	16	12.5%	BIOL321	16	12.5%	AGPS710	16	12.5%		
BIOL108	8	6.3%	BIOL203	16	12.5%	BIOL323	16	12.5%	BIOL723	16	12.5%		
BIOL102	16	12.5%	BIOL211	16	12.5%	BIOL312	16	12.5%	BIOL790	48	37.5%		
BIOR118	8	6.3%	SSCI230	16	12.5%	BIOL390	16	12.5%	ELECTIVES	16	12.5%		
BIOR130	8	6.3%	BMET210	16	12.5%	ENVS211	16	12.5%					
ELECTIVES	16	12.5%	BMET222	16	12.5%	ELECTIVES	16	12.5%					
ELECTIVES	24	18.8%											
TOTAL CR	128			128			128			128		512	
ORGANIC /YEAR	8	6.3%		0	0		0	0		0	0		8
ORGANIC/DEGREE		1.6%			0			0			0	1.6%	

PLANT PATHOLOGY													
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIOL101	16	12.5%	AMET210	16	12.5%	MICR316	8	6.3%	PPTH730	16	12.5%		
CHEM110	16	12.5%	BMET210	16	12.5%	PPTH330	16	12.5%	PPTH723	16	12.5%		
MATH133	16	12.5%	GENE210	16	12.5%	AGPS301 /305/307	16	12.5%**	PPTH745	16	12.5%		
PHYS131	16	12.5%	SSCI217	16	12.5%	BIOL321	16	12.5%	PPTH785	8	6.3%		
BIMI120	16	12.5%	AGPS200	16	12.5%	AGPS308	16	12.5%	PPTH713	16	12.5%		
BIOR118	8	6.3%	MICR220	8	6.3%	PPTH310	8	6.3%	PPTH750	48	37.5%		
BIOR130	8	6.3%	PPTH214	16	12.5%	AGPS304/ 306	16	12.5%	ELECTIVES	8	6.3%		
CHEM120	16	12.5%	ELECTIVES	24	18.8%	ELECTIVES	32	25.0%					
ELECTIVES	16	12.5%											
TOTAL CR	128			128			128			128		512	
ORGANIC /YEAR	8	6.3%		0	0		48	37.5%		16	12.5%		72
ORGANIC/DEGREE		1.6%			0			9.4%			3.1%	14.1%	

** If only students will pick either AGPS305 or AGPS307, otherwise the organic part will be 0

SOIL SCIENCE													
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIO101	16	12.5%	AMET210	16	12.5%	AGPS301	16	12.5%	SSCI710	8	6.3%		
CHEM110	16	12.5%	BMET210	16	12.5%	SSCI351	8	6.3%	SSCI760	8	6.3%		
MATH133	16	12.5%	SSCI217	16	12.5%	SSCI320	16	12.5%	SSCI770	8	6.3%		
PHYS131	16	12.5%	AGPS200	16	12.5%	SSCI352	8	6.3%	SSCI780	8	6.3%		
BIOR118	8	6.3%	SSCI230	16	12.5%	SSCI372	8	6.3%	SSCI792	16	12.5%		
BIOR130	8	6.3%	ELECTIVES	48	37.5%	ELECTIVES	32	25.0%	ELECTIVES	16	12.5%		
EART122	8	6.3%				ELECTIVES	32	25.0%	ELECTIVES	16	12.5%		
MATH143	8	6.3%				SSCI371	8	6.3%	SSCI793	48	37.5%		
ELECTIVE	8	6.3%											
CHEM120	16	12.5%											
PHYS133	8	6.3%											
TOTAL CR	128			128			128			128		512	
ORGANIC /YEAR	8	6.3%		0	0		0	0		8	6.3%		16
ORGANIC/DEGREE		1.6%			0			0			1.6%	3.1%	

B. AGRICULTURE										
MODULE	CREDITS	%	MODULE	CREDITS	%	MODULE	CREDITS	%		
BIOL101	16	12.5%	AGPS210	8	6.3%	RRMG312	16	12.5%		
GEO110	16	12.5%	RRMG212	16	12.5%	RRMG370	16	12.5%		
RRMG111	16	12.5%	AGEC210/AGEC220/ AMET210/BIOL223/ BMET210/SSCI217/E LECTIVE	40	31.3%	AGPS301/AGPS303/ AGPS305/AGPS307/ ELECTIVE	32	25.0%**		
CHEM110/ECON101/M ATH133	16	12.5%	AGPS200	16	12.5%	RRMG350	32	25.0%		
RRMG112	16	12.5%	RRMG222	16	12.5%	AGPS304/AGPS308/ ANSI305/ANSI362/F DSC350/FDSC360/D RAM311/SSCI320/E LECTIVE	32	25.0%***		
BIOL102/BIOL108/BIO R118/BIOR130/EART1 22/ECON102/MATH14 3/STAT101/ELECTIVE	48	37.5%*	AGEC240/AGEC270/ AGEN225/AGPS220/ ANSI201/ANSI202/E NVIS211/ ELECTIVE	32	25.0%					
TOTAL CR	128			128			128		384	
ORGANIC /YEAR	8	6.3%*		8	6.3%		64	50.0%**/***		80
ORGANIC/DEGREE		1.6%			1.6%			16.7%	19.8%	

* If only students will pick the module (BIOR118) among other choices, otherwise the organic part will be 0

** If only students will pick either AGPS305 or AGPS307 otherwise the organic part will be 0

***If only students will pick AGPS304, AGPS308 and FDSC350 among other choices, otherwise 0

HONOURS DEGREE										
BSc Honours										
ANIMAL & POULTRY				CROP SCIENCE				HORTICULTURAL SCIENCE		
MODULE	CREDITS	%		MODULE	CREDITS	%		MODULE	CREDITS	%
ANSI704	16	12.5%		AGPS701	8	6.3%		AGPS701	8	6.3%
ANSI730	16	12.5%		AGPS710	16	12.5%		AGPS724	8	6.3%
ANSI741	16	12.5%		AGPS711	8	6.3%		AGPS790	32	25.0%
ANSI742	16	12.5%		AGPS712	16	12.5%		AGPS791	8	6.3%
ANSI790	32	25.0%		AGPS713	16	12.5%		AGPS712/ 720/721/ 723/725/ 726/727/ 728 (ELECTIVES)	72	56.3%
ANSI702/ ANSI703/ ANSI770/ ELECTIVE	32	25.0%		AGPS790	32	25.0%				
				AGPS791	8	6.3%				
				ELECTIVES	24	18.8%				
TOTAL CR	128				128				128	
ORGANIC /YEAR	0	0			8	6.3%			0	0
ORGANIC/DEGREE		0				6.3%				0

HONOURS DEGREE						
BSc Honours						
PLANT PATHOLOGY				SOIL SCIENCE		
MODULE	CREDITS	%		MODULE	CREDITS	%
PPTH730	16	11.1%		SSCI710	8	6.3%
PPTH745	16	11.1%		SSCI760	8	6.3%
PPTH750	48	33.3%		SSCI770	8	6.3%
PPTH785	8	5.6%		SSCI780	8	6.3%
PPTH713/ 723(ELECTIVES)	56	38.9%		SSCI792	16	12.5%
				SSCI793	48	37.5%
				SSCI794	16	12.5%
				ELECTIVE	16	12.5%
TOTAL CR	144				128	
ORGANIC /YEAR	16	11.1%			8	6.3%
ORGANIC/DEGREE		11.1%				6.3%

B. Agric Honours		
MODULE	CREDITS	%
RRMG700	16	12.5%
RRMG710	32	25.0%
RRMG711	16	12.5%
RRMG712	16	12.5%
RRMG730	48	37.5%
TOTAL CR	128	
ORGANIC /YEAR	0	0
ORGANIC/DEGREE		0

POSTGRADUATE DIPLOMA										
COMMUNITY NUTRITION				RURAL RESOURCE MANAGEMENT				FOOD SECURITY		
MODULE	CREDITS	%		MODULE	CREDITS	%		MODULE	CREDITS	%
NUTR711	48	31.6%		GEOG726	16	12.5%		FDSC700	16	12.5%
NUTR730	8	5.3%		GEOG733	16	12.5%		FDSC760	8	6.3%
NUTR741	32	21.1%		GEOG735	16	12.5%		FDSC701/711	40	31.3%
PODS701	32	21.1%		RRMG700	16	12.5%		FDSC715	8	6.3%
CRMS710/ CRMS715/ FDSC700/ FDSC720/ FDSC730/ NUTR720	32	21.1%		RRMG710	32	25.0%		PODS601	32	25.0%
				RRMG712	16	12.5%		RRMG712	16	12.5%
				ELECTIVE	16	12.5%		FDSC720/730/755	8	6.3%
TOTAL CR	152				128				128	
ORGANIC /YEAR	0	0			0	0			0	0
ORGANIC/DEGREE		0				0				0

MASTERS DEGREE IN AGRICULTURE							
FOOD SECURITY				MASTER DEGREE IN ENVIRONMENT AND DEVELOPMENT			
MODULE	CREDITS	%		ENVIRONMENTAL MANAGEMENT			
FDSC800	16	12.5%		MODULE	CREDITS	%	
FDSC811	64	50.0%		EDEL802	16	12.5%	
FDSC840	16	12.5%		EDEL805	16	12.5%	
FDSC860/870/880	32	25.0%		EDEL851	16	12.5%	
				EDEL860	16	12.5%	
				EDEL890	64	50.0%	
TOTAL CR	128			TOTAL CR	128		
ORGANIC /YEAR	0	0		ORGANIC /YEAR	0	0	
ORGANIC/DEGREE		0		ORGANIC/DEGREE		0	
EXTENSION AND RURAL RESOURCE MANAGEMENT				MASTER DEGREE OF SCIENCE IN AGRICULTURE			
Research				Research			

Appendix G:

Questionnaire for lecturers of
University of KwaZulu-Natal

Pietermaritzburg

This questionnaire will be answered by a sample of lecturers to collect information about organic farming training in the curriculum of UKZN. To facilitate meaningful and free responses, the questionnaire is done on an anonymous basis. Your full participation will be appreciated.

1. Module taught by lecturer:

Module Name			Module code	
Is it a Core module? Y/N	In what Qualification/Major	Is it an Elective Y/N	In what Qualification/Major	
Does it include organic farming in content Y / N	If yes, brief explanation of organic content:			

If yes, Organic Farming Learning outcomes	Assessment
1	
2	
3	
4	
5	
6	
7	
8	

2. What modules in the agricultural syllabi (that you do not teach) do you think covers organic farming?

Module Name		Module Code	
Brief explanation of organic content:			

3. To what extent do you think organic farming features in the current UKZN agricultural curriculum?

g) Features to a small extent [ ]
h) Features to a very large extent [ ]
i) Features to a large extent [ ]
j) Features to a moderate extent [ ]
k) Not at all [ ]

4. How important is it that organic farming features in the agricultural curriculum at UKZN?

t) Strongly important [ ]
u) Moderately important [ ]
v) Slightly important [ ]
w) Not important at all [ ]
x) Not sure [ ]

Please give reason for your choice

……
……
……

5. If it is important at all

At what level?		What should be covered	What learning outcomes
Year 2			
Taught			
Research			
Year 3			
Taught			
Research			
Year 4/honours			
Taught			
Research			
Masters			
Taught			
Research			
PhD			
Taught			
Research			

6. If important at all, what do you see as the stumbling blocks; why does it not feature more prominently?

……

……

……

……

7. Please tick [√] how can you score the importance / significance of organic farming to the:

VI=Very Important; **I**= Important; **LI**= Less Important; **NS**=Not Sure

	VI	I	LI	NS	Reason
Environment					
Economy					
Food security					
Market					

Any other comment …….....

.....

.....

……..

Thanks for your time!

Appendix H: Data for figures

Data for figure 4.1

Description	Number of participants	Percentage (%)
Postgraduate students	52	65%
Lecturers	20	25%
Other stakeholders	8	10%
Total	80	100%

Data for figure 4.2

Levels	Percent (%)
Postgraduate Diploma	6%
Honours	25%
Masters	34%
PhD	33%
Post doctorate	2%
Total	100%

Data for figure 4.3 (Presence of organic farming in the curriculum / from students)

Description	Percentage (%)
Not at all	4%
Not sure	38%
Small extent	39%
Moderate extent	13%
Large extent	6%
Very extent	0%
Total	100%

Data for figure 4.4 (Presence of organic farming in the curriculum / from Lecturers)

Description	Percentage (%)
Not at all	5%
Not sure	30%
Small extent	45%
Moderate extent	20%
Large extent	0%
Very extent	0%
Total	100%

Data for figure 4.6 (Students who have/ have not received organic courses previously)

Description	Percentage (%)
Students who have received organic courses previously	42%
Students who have not received organic courses previously	58%
Total	100%

Data for figure 4.7 (Responses to the statement that in agricultural education, equal attention should be allocated in the curriculum to both organic and conventional methods)

Description	Percentage (%)	Description	Percentage (%)
Strongly agree	23	Agree	82%
Moderately agree	18		
Slightly agree	2		
Not sure	3	Not sure	6%
Slightly disagree	2	Disagree	12%
Moderately disagree	0		
Strongly disagree	4		
	52		100%

Data for figure 4.8 (Responses of lecturers about the importance of organic farming in the curriculum at UKZN)

Description	Percentage (%)
Strongly important	20%
Moderately important	45%
Slightly important	10%
Not important	10%
Not sure	15%
Total	100%

Data for figure 4.5

Stream / Programme	%Organic content
B. Agriculture	5.5%
BSc. Agric. Hon. Plant Pathology	4%
Plant Pathology	3.5%
Crop Science	3.2%
Plant Breeding	3.2%
Horticulture	2.9%
BSc. Agric. Hon. Soil Science	1.8%
BSc. Agric. Hon. Crop Science	1.3%
Soil Science	0.8%
Animal and Poultry	0.4%
Grassland Science	0.4%
Post Dip. Community Nutrition	0%
Post Dip. Rural Resource Management	0%
Post Dip. Food Security	0%
BSc. Agric. Hon. Horticulture	0%
BSc. Agric. Hon. Animal and Poultry	0%
B. Agric. Hon. Agriculture	0%
Masters Environmental Management	0%
Masters Food Security	0%
Masters Science in Agriculture	0%
Masters Rural Resource Management	0%

Appendix I: Verification of organic content in modules

Module	Total Credit	General Content from handbook (UKZN, 2009)	Rate of organic content	Organic Credit	Percentage (%) of organic farming
AGPS210	8	Principles of agroecology, **traditional farming, organic farming**	2/3	5.33	67%
AGPS304	8	**The influence of environment on growth and development**, green house structure and covering materials, artificial lighting and daylength control, climate control, irrigation and growing systems, with special emphasis on hydroponic production	1/6	1.33	17%
AGPS305	16	**Soil fertilization and liming, tillage and residue management, mulching**, crop improvement techniques, weed and pest control, ley-cropping, forage preservation and grain storage	3/7	6.86	43%
AGPS307	16	Climate and climate modification, modification of the plant environment, **managing orchard soil and orchard floor**, plant factors in the orchard, plant manipulation, crop protection, harvesting and postharvest handling	1/7	2.29	14%
AGPS308	16	Principles of integrated pest control, **ecological interaction**, management and use of threshold level of pests, disease and weeds; pesticide formulation; sprayer calibration and nozzle function. Safe handling and storage of pesticides.	1/7	2.29	14%
BIOR 118	8	Atmosphere: composition, radiative	6/23	2.09	26%

		processes, greenhouse effect, ozone controversy, **climate change**, El Nino, acid rain pollution. Global dimming. Hydrosphere: oceans and currents, hydrologic cycle. Lithosphere: earth structure, plate tectonics, earthquakes, volcanism. Pedosphere: **soils and pollution, waste disposal, soil erosion, organic and mineral matter**. Biosphere: structure and function of ecosystems, energy flows, food chains, succession, **conservation of biodiversity**.			
CRMS350 (FDSC350)	8	Conceptual framework for food security. Food security (access, availability, vulnerability). **Food security measurement.** Policy context. Policy making. Food security policy, programme, project and intervention options.	1/10	0.80	10%
AGPS711	8	A study of the management and production of selected field crops drawn from sugar, cereal, oil and protein, and fibre crops; **impact of environmental variables**, particularly stress on crop production, **management to sustain productivity**; harvesting, grading and storage of crop products.	1/5	1.60	20%
PPTH745	16	Weekly visits to farms, nurseries and other sites of plant pathological interest, where applied disease diagnosis and **control measures** are developed	1/3	5.33	33%
SSCI770	8	Nature and management of acid soils,	3/11	2.18	27%

		chemistry of soil Al, speciation of Al in soil solution, Al toxicity in plants, limes as an ameliorant; P/lime interactions. Nature of subsoil acidity, role of gypsum. **Role of soil organic matter in sustainable agriculture, effects of tillage practice and crop rotations on soil fertility. Concept and role of soil quality indices**			
Total	112	-----		30.10	26.88%

Key: abc: Sections related to organic farming as compared with the standard [GPSA (2008) and Williams (2008)]

Suggested courses in GPSA (2008) and Williams (2008)	
• Agro ecosystem analysis • Sustainable agriculture tutorial • Foundation for sustainable agriculture • Integrated crop and livestock production systems • Ecologically based pest management strategies • Organizational strategies for diversified farming systems • Agro forestry systems and organic agriculture theory practice	• Introduction to sustainable agriculture • Cultural perspectives on sustainability • Plant production • Apprenticeship in sustainable agriculture • Integration of sustainable agriculture principles • Research in sustainable agriculture • Experiential education

Appendix J: UKZN organic content and GPSA/Williams standard

UKZN Organic farming content		Organic farming standard GPSA/Williams (2008)	
Module Name	Organic content	Module Name	Organic content
Sustainable Community Agriculture	Traditional farming, organic farming	Organic Agriculture: Theory and Practice.	Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socioeconomic processes and policies in organic agriculture from researcher and producer perspectives
Greenhouse Management	The influence of environment on growth and development	Foundations of Sustainable Agriculture.	Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging systems of agriculture in terms of core concepts of sustainability and their theoretical contexts
Field Crop Management	Soil fertilization and liming, tillage and residue management, mulching	Integrated Crop and Livestock Production Systems	Managing productivity and minimizing ecological impacts of agricultural systems by understanding nutrient cycles, crop residue and manure management, grazing systems, and multispecies interactions. Consideration of crop and livestock production within landscapes and watersheds
Orchard management	managing orchard soil and orchard floor	Agroforestry Systems	Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for

			agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry
Crop protection	Ecological interaction		
Introduction to the environment	Climate change, soils and pollution, waste disposal, soil erosion, organic and mineral matter	Agro ecosystem analysis	Experiential, interdisciplinary examination of Midwestern agricultural/ food systems, emphasizing field visits, with some classroom activities. Focus on understanding multiple elements, perspectives (agronomic, economic, ecologic, social, etc), and scales of operation
Food Security	Food security measurement		
Field Crop Production	Impact of environmental variables	Organizational Strategies for Diversified Farming Systems	Exploration and evaluation of the organization and operation of complex, diversified farming systems using tools and perspectives drawn primarily from ecology, agronomy, and sociology
Field plant pathology	control measures		
Sustainable Soil Fertility Management	Role of soil organic matter in sustainable agriculture, effects of tillage practice and crop rotations on soil fertility. Concept and role of soil quality indices	Ecologically Based Pest Management Strategies	Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes
		Sustainable Agriculture Colloquium	Guest speakers and discussion of key issues in the field
		Special Topics	For students wishing to investigate a specific topic or problem in sustainable agriculture.
		• Introduction to sustainable agriculture • Cultural perspectives on sustainability • Plant production • Apprenticeship in sustainable	

		agriculture • Integration of sustainable agriculture principles • Research in sustainable agriculture • Experiential education	

Appendix K: Return rate of questionnaires

	Students	**Lecturers**	**Stakeholders**
Total Questionnaires out	75	30	8
Total questionnaires returned	52	20	8
With interview/Face to face	0	20	8
Without interview	52	0	0