

# **Maltese Full-Time, Arable Farmers’ Perceptions on Sustainable Development**

**Jessica Zahra**

A Dissertation presented to the Centre for Environmental  
Education and Research (CEER) in part fulfillment of the  
Requirements for the Degree of Master in Education for  
Sustainable Development



University of Malta



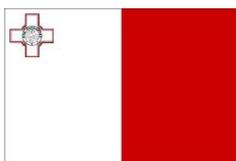
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The research work disclosed in this publication is partially funded by the Endeavour Scholarship Scheme (Malta). Scholarships are part-financed by the European Union - European Social Fund (ESF) - Operational Programme II – Cohesion Policy 2014-2020  
*“Investing in human capital to create more opportunities and promote the well-being of society”.*



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Scholarships are part-financed by the European Union –  
European Social Funds (ESF)  
Co-financing rate: 80% EU Funds;20% National Funds



## **Abstract**

Farming is an integral part of sustainability. The agricultural products farmers grow help to maintain an ever increasing world population. Nonetheless, over the past years, farmers may have adopted some unsustainable practices, which have helped increase their yield and guarantee better income. At what cost has this been done? This thesis presents a local analysis of farming and sustainability in Malta by analysing farmers' knowledge of their agricultural practices through their life experiences. Additionally, it aims to understand farmers' perceptions on sustainable development and to seek the most viable means of moving towards more sustainable agricultural practices. A special emphasis is given to explore the farmers' attitudes in view of sustainable development, whether they are willing to implement sustainable strategies and promote a change in mindsets and current unsustainable practices.

A mixed methods approach was deemed the most viable means of obtaining a clear and thorough picture of the farming situation amongst full-time, arable farmers on the Islands. This involved the use of both questionnaires (n=168) and interviews (n=12) which were conducted to gain as many farmers' opinions and perspectives as possible. The findings of this study revealed that although the majority of farmers already practice some sustainable measures in their farming practices, there is still work to be done. The interviews were able to reveal the reality behind the everyday farming practices in Malta and Gozo, providing farmers with a means of voicing their opinions of current farming issues, such as the use of artificial chemicals and extraction of groundwater.

Through the research findings, a number of recommendations are suggested to aid farming practices become more sustainable. The results from this research will help policy makers in the agricultural sector to seek the best means to collaborate with farmers and to give them the opportunity to voice their opinions and to help in the designing of a training programme for farmers that utilise Education for Sustainable Development principles.

### **Keywords:**

Sustainable agriculture; farming; education for sustainable development; sustainable development; conventional farming in Malta.

To

*my husband Wayne*

*for his unconditional support*

To

*my parents Maria and Gianni,*

*two of the most hard-working farmers*

## **Acknowledgements**

I cannot express enough gratitude towards my supervisor, Dr. Mark Mifsud, without whose guidance I would not have been able to complete this thesis. His support and continuous guidance were of utmost importance.

I would also like to acknowledge all the participants of this thesis, all the full-time farmers who dedicated their personal time to participate in questionnaires and interviews. Without their contribution and input this thesis would not have been possible. I would also like to thank the Endeavour Scholarship Board for funding this course, the National Statistics Office and Jobs Plus who offered the latest available statistical information.

I am also grateful towards my colleagues Jeanelle Galea and Erika Vassallo, along with my friend Neal Sammut, who offered their support to properly word this thesis.

Attending the Masters in Education for Sustainable Development proved to be of great interest and the lecturers helped extend and enhance my knowledge on issues related to sustainable development. I would like to praise all the lecturers at the Centre for Environmental Education and Research, for sharing their expertise in this field.

Being part of this impeccable journey, with all its ups and downs would not have been possible without the support of my family, who were always there to offer their encouragement. I am extremely grateful towards my husband, Wayne Zahra, who has stood by me throughout the past three years of studies, offering his words of encouragement and ultimately believing in me.

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## List of Abbreviations

CAP	Common Agricultural Policy
EE	Environmental Education
ERA	Environment and Resources Authority
ESD	Education for Sustainable Development
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GAP	Global Action Programme
MCCAA	Malta Competition and Consumer Affairs Authority
NAP	National Agricultural Policy
NGO	Non-Governmental Organisation
NSO	National Statistics Office
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Scientific and Cultural Organization
WCED	World Commission on Environment and Development
WSC	Water Services Corporation

1

# Introduction

# **1 Introduction**

Agriculture, as defined by Lehman, Clark & Weise (1993) consists of “activities which foster biological process involving growth and reproduction to provide resources of value. Typically, the resources provided are plants and animals to be used for food and fibre, although agricultural products are used for many other purposes also” (p. 127). Agriculture has been evolving tremendously throughout the years, with notions of sustainable agricultural practices becoming more popularised, where economic viability is being given equal importance to environmental, habitat and resource protection, along with the well-being of farmers and consumers of the produce (Gold, 1999).

Although this primary industry has evolved, it did not do so equally throughout the world. You have extremities in the way agriculture is practised around the world, from the use of hoes and spades in the less developed countries, to advanced machinery, technologies, fertilisers, pesticides and selected varieties of plants and animal breeds, in developed countries (Mazoyer and Roudart, 2006).

Poverty is more often than not associated with undernourishment, mostly living in rural areas, sometimes being producers and sellers of agricultural produce themselves (Mazoyer and Roudart, 2006). So how are they producing food and yet are still undernourished? This is where the struggle for power comes in. With the principles of sustainable development in mind, the global population has been working to

eradicate such injustices and has been struggling to reduce poverty worldwide. Where did the term ‘Sustainable Development’ come from?

## **1.1 Sustainable Development, Education for Sustainable Development and Sustainable Agriculture**

Sustainable development has become even more popularised since the publication of the report “Our Common Future, From One Earth to One World” in 1987, by the United Nations, also known as the Brundtland Report (WCED, 1987). Previous to this report, there were other reports published by the United Nations which gave rise to Sustainable Development and Education for Sustainable Development (ESD). Such reports include The Conference on the Human Environment (UN, 1972), the UNESCO Belgrade Charter (UNESCO, 1975) and the Tbilisi Declaration (UNESCO-UNEP, 1977). All of these proved to be pivotal for the introduction of sustainable concepts, values and attitudes.

Consequently, one cannot not mention the United Nations Conference on Environment & Development (UNCED, 1992), known as Agenda 21. The UN World Summit on Sustainable Development (WSSD), met in Johannesburg a decade later, in 2002. Since then there was the UN Decade of Education for Sustainable Development (2005-2014), and most recently the Sustainable Development Goals (UN, 2016) were set into action as a result of the 2030 Agenda for Sustainable Development (UN, 2015a), a set of seventeen goals targeting various global issues until the year 2030.

Having seen how the concepts of sustainable development and ESD came about, we are now going to delve into one aspect related to this issue; that of sustainable agriculture. The Food and Agriculture Organization of the United Nations (FAO, 2019) provides various notions on sustainable agriculture, such as:

- Sustainable agriculture must nurture healthy ecosystems and support the sustainable management of land, water and natural resources, while ensuring world food security.
- To be sustainable, agriculture must meet the needs of present and future generations for its products and services, while ensuring profitability, environmental health and social and economic equity.
- The global transition to sustainable food and agriculture will require major improvements in the efficiency of resource use, in environmental protection and in systems resilience.
- Sustainable agriculture requires a system of global governance that promotes food security concerns in trade regimes and trade policies, and revisits agricultural policies to promote local and regional agricultural markets.

(FAO, 2019, para.1)

Agricultural sustainability is being given more consideration globally, while facing the consequences of unsustainable farming practices. One of the first people to raise awareness on such unsustainable agricultural practices has been Rachel Carson, by the publication of her book “Silent Spring” back in 1962. She portrayed the effects of the unsustainable use of artificial chemicals, such as pesticides and fertilisers, not only on the environment but also on human beings, focusing especially on the use of DDT as an insecticide. She discussed how the overuse of such a chemical lingers in soils, waters and the whole ecosystems for years and years after being applied, leaving behind a realm of devastation. After Carson’s

publication the public became more conscious of the effects of unsustainable farming practices, paving the way towards today's struggle to promote the adoption of more sustainable farming practices.

Foley (2014) discusses how “our need for food poses one of the biggest dangers to the planet”, contributing towards climate change, imposing pressures on water resource and accelerating the loss of habitats and its biodiversity, all in the name of providing food. But what are the alternatives and what can be done? This is where sustainable farming comes in with regards to reducing agriculture's footprint, and reducing the environmental impacts of conventional methods of farming.

Furthermore, Foley (2014) suggests five steps to help minimise the global impacts of agricultural activities: *Freeze agriculture's footprint* by reducing agriculture's expansion by the clearing of land, mainly for grazing, timber production and palm oil; *Grow more on farms we've got* making efficient use of the land already available rather than expanding over virgin land; *Use resources more efficiently* including, if necessary, the efficient use of artificial chemicals, minimizing its runoff, and ideally incorporating organic farming; *Shift diets*, having only 55% of the crop calories fed to people, while the rest are fed to livestock or turned into biofuels or other products, shifting to less meat-intensive diets; and, finally, *Reduce Waste* having around 25% of the world's food calories and 50% of total food weight wasted before they are even consumed either due to unreliable storage or transportation or due to large plate portions.

Royte (2016) added on how food waste is not only due to inadequate transportation or portion size, but may also be attributed to the fact that a great number of fruits and vegetables will not meet the exact export standards, either to irregular shapes or colour, with 46% of global fruits and vegetables never making it from the farm to the fork, all the while having around 800 million people suffering from hunger.

## **1.2 The current study and personal experiences leading to it**

My interest in this topic had long been lingering. Being a farmer's daughter myself, I grew up helping with farming chores on Saturdays, although at that time, it was no hobby of mine to go to the fields. Growing up in the fields of Mgarr and Burmarrad, I was able to witness agriculture first-hand. Growing in such a community, where the majority of my friends came from farming families themselves, I took it for granted that everyone knows where our food comes from.

Graduating as a Geography teacher, I began teaching in an urban area, where to my amusement some of my students had never touched a patch of soil or knew how strawberries grew. I tried to expose my students through such environments as much as possible through fieldwork. Joining the Master's course in Education for Sustainable Development, helped trigger an interest in sustainable agricultural practices, seeking means of living a more sustainable lifestyle. Supporting local farmers, believing in the importance of reducing the carbon footprint by buying

local produce and most importantly, changing mindsets towards more sustainable practices are at the heart of this research.

The main aim of this study was to find out about the local full-time arable farmers' perceptions on issues pertaining to sustainable agricultural practices. The main research questions being:

- Are farmers aware of the negative impacts of commercial arable farming practices on the environment?
- Through their life experiences and knowledge on the field, what are their views of moving towards more sustainable farming practices?
- Are farmers willing to seek means of improving their practice while tackling daily agricultural issues?

The major findings of this study focus on the current local farming situation, delving in issues and possibilities of targeting more sustainable farming practices, considering the environmental, economic and social aspects of this local primary industry. This study helped bring to light farmers' concerns and daily issues faced in their practice, helping identify their perceptions and attitudes towards sustainable agriculture, helping to find the most viable means of adapting such sustainable strategies.

This thesis comprises of six main chapters, the first being the introduction chapter. This is followed by the second chapter, the literature review which delves into the issues related to agriculture, sustainability and the role of education for sustainable development in view of previous studies and publications. The third chapter deals with the methodology adopted for this study, explaining the mixed method

approach. Following is the data analysis chapter, representing the data results collected from both the quantitative and the qualitative tools used. The fifth chapter, the discussion of findings, links the results obtained through both methods linking them to other studies. The final chapter, the conclusion, portrays the main findings and limitations of this study, giving suggestions for further studies and recommendations.

2

Literature

Review

## **2 Literature Review**

In this chapter, the literature review will be represented, by researching the topic of agriculture and its various contexts relevant to the purpose of this study. “A literature review is based on the assumption that knowledge accumulates, and that people learn from and build on what others have done” (Neuman, 2006, p.111). Building on what is still unknown and filling in the gaps, are the main purposes behind this literature review.

This literature review will start by introducing agriculture and its history, the relation between agriculture and ESD, linked to the seventeen sustainable development goals, followed by the local progress made through the publication of the National Agricultural Policy. Mentioning the local scenario, issues related to local agricultural practices will be discussed, seeking means of improving through alternative, sustainable farming practices. This will be concluded through analysis of similar studies of farmers’ perceptions.

### **2.1 Introduction to Agriculture**

“Everything else can wait, but not agriculture.”

By Jawaharlal Nehru (1947)

Food, a necessity for all mankind, is all derived from agriculture. Whether it is fruits, vegetables, meat or poultry, we cannot survive without this industry. “Agriculture is the most comprehensive word used to denote

the many ways in which crop plants and domestic animals sustain the global population by providing food and other products” (Harris & Fuller, 2014, p. 104). Agriculture may also be defined as the art, science and business of maintaining, cultivating and tilling the soil, growing crops and rearing livestock, preparing food for consumption and its distribution in various markets (National Geographic, 2019).

With an ever-increasing global population, research on how to increase outcrops through the use of advanced technology and machinery have evolved in order to cater for global demands. The growth and improvement in agricultural practices, over the past number of centuries have led to the rise of global civilisations (National Geographic, 2019).

### **2.1.1 The history of Agriculture**

“Agriculture is one of the most ancient forms of art and science that ties human development and well-being to natural resources and ecosystems.”

By Pinter, 2007, p.21.

The history of the human kind is one where they have learned to exploit and modify their surroundings for their own benefit. The first hominids emerged from Africa around four million years ago, where they started to “gather and carry food and process it using simple tools” (Kagan, 2006, p. 16). They evolved as hunters and gatherers, moving from one place to another in search of food to guarantee their survival. At around 10,000 B.C. the domestication of plants, such as wheat, barley, rice, maize and

other cereals, allowed them to start the earliest settlements (Kagan, 2006; Mifsud, 2014).

Kagan (2006) discusses how along with the domestication of plants, there was also the domestication of animals such as dogs, cattle and sheep, providing them with meat, fur, milk, wool and later on helping them with the ploughing of fields. These earliest settlers proved to be more successful than hunters and gatherers. Agriculture provided them with food surpluses, allowing them to specialise in pursuing new tools and technologies. These earliest achievements in agriculture are believed to have taken place in the Middle East. By 5,000 B.C., the practice of agriculture had spread out throughout Europe, Asia and Africa.

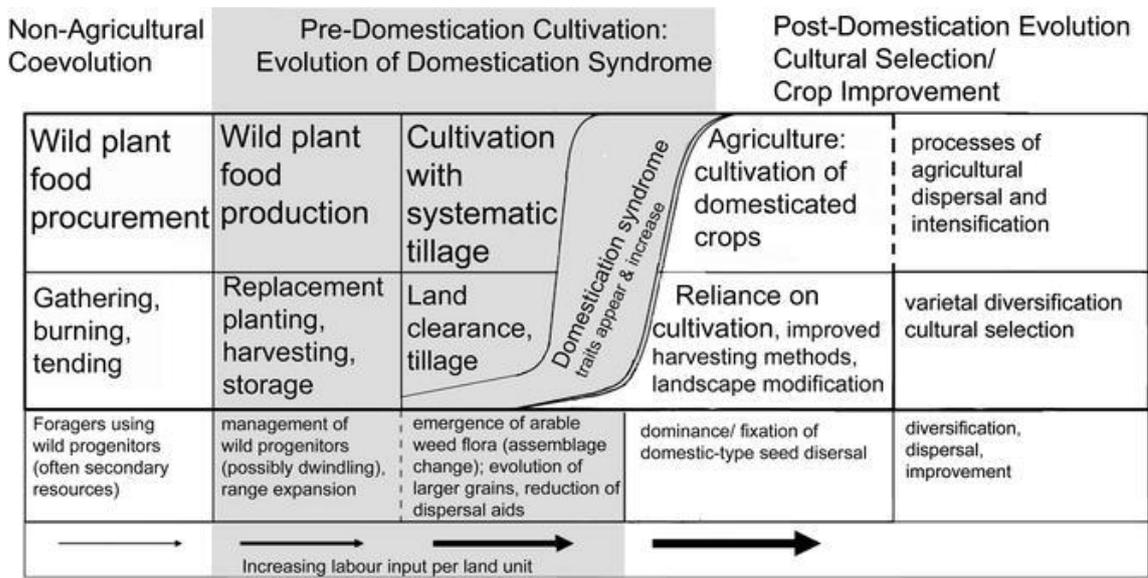


Figure 2.1: An evolutionary model of agriculture. Source: Modified from Harris 1989 and Fuller 2007, in Harris & Fuller, 2014.

Viault (1990) speaks of the agricultural revolution which began in Great Britain in the 18<sup>th</sup> century A.D. and how it paved the way for an ever-evolving industry. Richards (1985) argues that this revolution was sparked by an ever-increasing population, demanding increased food

supplies. Science and technology began to improve agricultural practices, where the outcrops began to increase, along with profits. Improved planting of seeds, awareness on crop rotation, cultivation of turnip to enrich the soil and provide food for animals, etc. all contributed positively to the industry. This gradual improvement in agriculture continued in the following centuries through improved scientific breeding, inventions in farming machinery, introduction of new crops and eventually the introduction of pesticides along with fertilisers.

## **2.2 Sustainable Agriculture**

“Sustainable agriculture is not agriculture without risk, which would be unrealistic to expect. It is agriculture that is able to manage risk and maintain its resilience in the face of change and inevitable surprise” (Pinter, 2007, p.22).

Agriculture has a major role to play in environmental protection, social wellbeing and economic growth. There is a change in the agricultural practices taking place today, in order to minimise the negative effects this primary industry has, especially on the environment (Alonge & Martin, 1995).

The Food and Agricultural Organization (FAO, 2016a) expects that by 2050, 60% more food production is needed to feed, an anticipated 9 billion global population. The increase in global food production is expected to impact on the natural resources, mainly water used for irrigation purposes, the land and its nutrients, such as phosphates (GIZ, 2015 ). The 2030 Agenda (FAO, 2016a), recognizes that agriculture today faces more challenges than ever before, needing to feed more people, with

a lack of water, reduced land productivity and a decreasing agricultural workforce, enforcing the need for global agricultural sustainability.

Scherer, Verburg & Schulp (2018) discuss the role of sustainable intensification and global food security, stating that “Ideally, sustainable intensification implies more production on the same land area while reducing environmental impacts and maintaining ecosystem functioning” (p.43). Farmers need to be open to adopt innovative techniques and technologies in order to cater for more sustainable practices. However, it is not only the job of farmers to guarantee sustainable practices, but consumers also play a crucial role. The following diagram depicts various issues which must be tackled to opt for sustainable agricultural intensification.

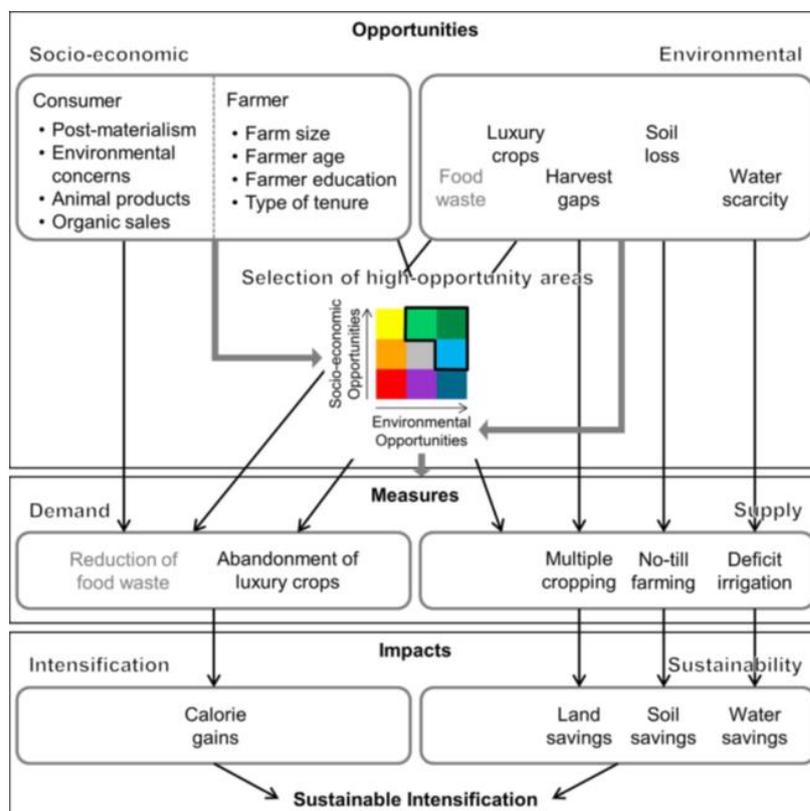


Figure 2.2: Conceptual framework for assessing opportunities for sustainable intensification. Source: Scherer, Verburg & Schulp, 2018.

The more industrialised agriculture has become, the more people have begun to realise “that agriculture does more than simply produce food, animal feed and energy. It also has impacts on the climate, human health, and global ecosystems” (GIZ, 2015, p.5). Agricultural sustainability may offer us a solution as “it can be thought of as an ability to manage risk without compromising human and ecosystem well-being over time” (Pinter, 2007).

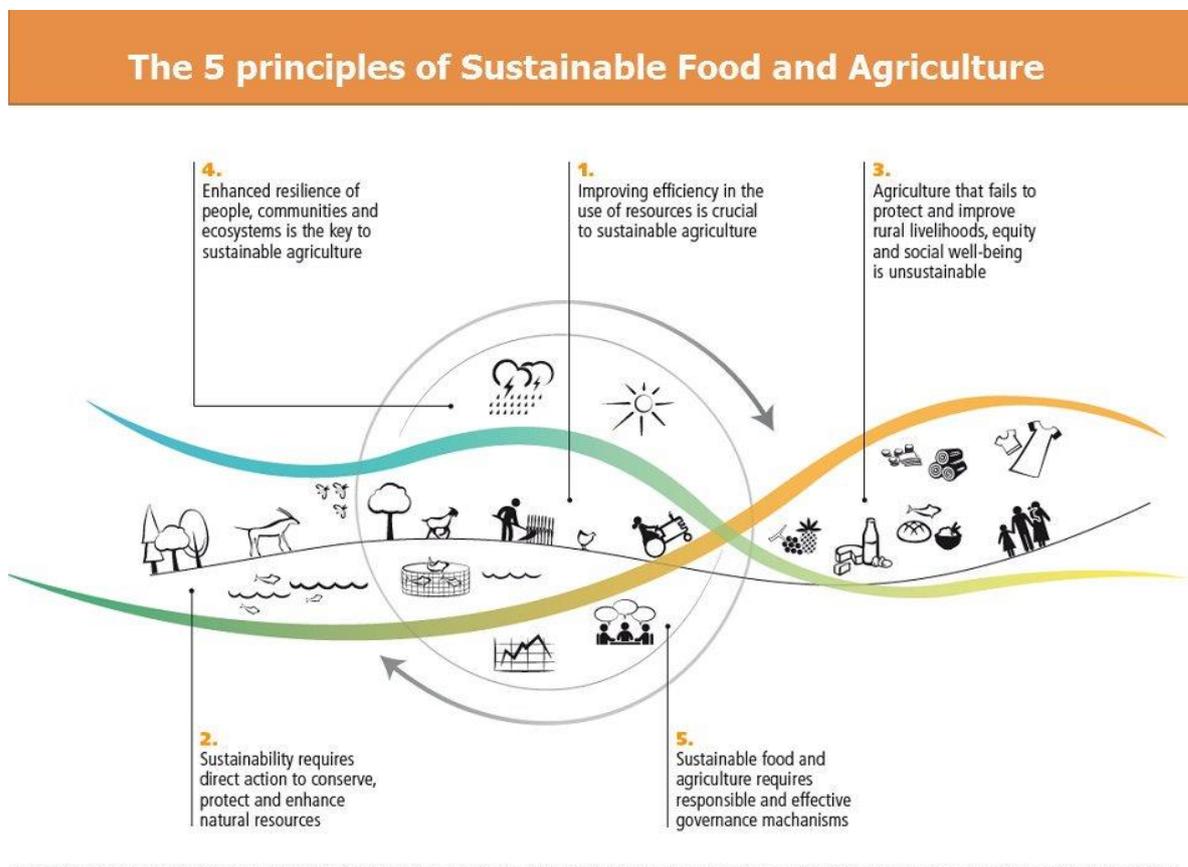


Figure 2.3: The five principles of Sustainable Food and Agriculture. (FAO, 2014).

FAO (2016a, p.11) came up with five key principles for sustainable food and agriculture, outlined in figure 2.3:

1. Improving efficiency in the use of resources
2. Conserving, protecting and enhancing natural ecosystems

3. Protecting and improving rural livelihoods and social well-being
4. Enhancing the resilience of people, communities and ecosystems
5. Promoting good governance of both natural and human systems

GIZ (2015, p.7) defines sustainable agriculture according to the following criteria:

1. Seek means of improving soil productivity by improving agricultural methods and processes.
2. Minimise the use of non-renewable inputs and resort to renewable ones
3. Place attention on the needs of local people
4. Help guarantee that the basic nutritional needs of current and future generations are met
5. Ensure guaranteed long-term employment, having a sense of security when it comes to income and living conditions of those within the agricultural community.
6. Help reduce the susceptibility of the agricultural sector when it comes to weather, price changes, etc.
7. Promote the active involvement of all stakeholders to help reach the best outcomes for all.

Using more sustainable measures of farming, such as organic farming, use of water from sewage treatment plants, natural fertilisers, etc. may be the way forward.

## **2.3 Agriculture and Education for Sustainable Development**

### **2.3.1 The start of Environmental Education (EE) and Education for Sustainable Development (ESD)**

Stapp, et al. (1969), began to raise awareness of environmental problems which societies were starting to face. They proclaimed that citizens need to be knowledgeable about their environment and “aware of how they can help solve these problems, and motivated to work toward effective solutions” (p.33). This new approach was termed ‘environmental education’ by the same authors. The four main objectives of EE, were: to raise understanding and knowledge of environmental problems; to understand the relation between human activities and the environment, to find solutions and bring about a change in attitudes towards more active participation (Stapp, et al., 1969).

The most famous and commonly used phrase for sustainable development is that coined during the World Commission on Environment and Development (WCED, 1987) stating that “Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs” (p.16). In other words, sustainable development implies that all societies need to work hand in hand for the common good, not only of the present generations, but also for future ones.

Prior to the Brundtland report, there were other major declarations which paved the way towards EE and ESD. The Conference on the Human Environment (UN, 1972), through its 26 principles, recognised the importance of the human being's responsibility towards the environment and its resources, paving the way towards environmental protection. Yet it did not abide any participating countries to do so. The UNESCO Belgrade Charter (1975) was the first conference related to environmental education, with the key goal being:

“To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones” (p.3).

Following was the Tbilisi Declaration (UNESCO-UNEP, 1977), which continued on the recommendations of former Charter. As a result of the United Nations Conference on Environment & Development (UNCED, 1992), Agenda 21 came into publication. Chapter 36 is totally dedicated on “Promoting Education, Public Awareness and Training.” This chapter discusses the need of education as a tool to promote sustainable development and to bring about a much needed change consistent with sustainable development (Palmer, 1998).

A decade later, the UN World Summit on Sustainable Development (UN, 2002), met in Johannesburg. The main objectives were to minimise and eradicate poverty as much as possible, promote the change of unsustainable patterns of consumption, protect and manage well the

Earth's natural resources, improve health and sanitation, and most importantly to promote and educate on means of sustainable development.

The latest international development on ESD was the UN Decade of Education for Sustainable Development (2005-2014). Pace (2007) discusses how these were aimed to encourage effort and overcome the problems which had discouraged previous attempts to tackle issues outlined before. UNESCO's Global Action Programme (GAP) on ESD, the follow-up programme to the Decade of ESD (2005-2014), launched in November 2014, seeks to generate and scale-up ESD and to accelerate progress towards sustainable development. The GAP (UNESCO, 2017) aims:

- to contribute substantially to the 2030 agenda through two main objectives: reorienting education and learning so that everyone has the opportunity to acquire knowledge, skills, values and attitudes that empower them to contribute to a sustainable future;
- to strengthen education and learning in all agendas, programmes and activities that promote sustainable development, as a long-term commitment involving as many people as possible (UNESCO, 2017).

The 17 Sustainable Development Goals (UN, 2016) were set into action as a result of the 2030 Agenda for Sustainable Development (UN, 2015a). Although these goals are not legally binding any countries, all countries are expected to take ownership and develop a national framework to achieve them within the next 15 years. These are mainly aimed at

reducing poverty worldwide, ensuring good quality education for all, deterring inequalities and tackling climate change. Caruana and Pace (2018) highlight the fact that the SDGs differ primarily from previously set goals due to the fact that these goals are now applicable to each and every country, aiming to target local issues, ultimately leading to global changes. These rely primarily “on the ability of each country to address its social and environmental challenges” (Caruana & Pace, 2018, p.294).

All of these international declarations and conferences have provided the platform for effective ESD worldwide. The development of EE and ESD locally was surely influenced by these global developments. Achieving sustainability in a small island state like Malta, is surely no easy task, and there is still a lot of work to be done.

### **2.3.2 Education for Sustainable Development and Adult Education**

Environmental adult education seeks to bring changes in people’s attitudes and behaviours. It aims at bringing about a sense of transformation, in the way people act and view the environment around them. To ensure that a strategy is successfully implemented, one must ensure that there is social and political stability, that is all the pillars of sustainable development should be given equal importance (UNESCO, 1997). Adult education plays a crucial role in allowing participants to see the link between the social, political and the environment, exploring each one and seeing the links between them as more of a holistic approach (UNESCO, 1997).

UNISA (2015) discuss Paulo Freire's belief of the ability of adult education to bring about a sense of consciousness and the ability to critically become conscious of one's own situation while being able to act on a social and political level to bring about the necessary changes, overcoming silence. Freire believed that everyone has knowledge to offer and contribute towards learning. Adult education should offer the opportunity for the participants and adult educators to work on the same level, sharing their power, feeling comfortable to share and communicate their ideas effectively. "Through what Freire calls 'a pedagogy of question', adult learners are given an opportunity to reflect more critically upon their experiences and begin to re-shape their ideas, experiences and visions of the world" (Mayo, as cited in Clover, 2002).

After all, as Engel & Engel (2012) discuss, the ultimate agents who ought to bring about change are the members of the community, in this case, a community of farmers who are to adopt new practices and implement other measures to cope with global issues, such as the threats of global warming. Farmers are the key stakeholders whose decisions will directly impact "either the environmental conservation or degradation" thus adequate training on developing and meeting their needs sustainably is essential (Freitas, Matias, Macedo, Freitas, & Venturin, 2015, p. 324).

"The preservation of the environment depends on an ecological awareness, which depends on education," (Gadotti, 2009, p. 108) and through such training courses the participants are encouraged to awaken

their relationship with nature, feeling the need to protect and preserve its resources, becoming conscious of one's own practices (Gadotti, 2009).

Caruana (2015) through his four case studies set in the Mediterranean context, sought to identify the necessary conditions to improve Adult Environmental Education, supporting action towards sustainable development. Adult educators need to produce “local culturally appropriate guidelines for good practice” (p.666) encouraging effective decision-making and problem resolutions. Caruana continues by adding that one of the roles of Environmental Education is to help encourage the shift from the dominant paradigm of thinking to an emerging paradigm where one's behaviour is more in line with his values, encouraging commitment through community solutions, motivating one another. ESD allows for community-dialogues, whereas the emerging paradigms, which are more sustainable, are not only discussed, but also implemented at a community level. When it comes to adult education, “passion and motivation seem to be crucial” (Caruana, 2015, p.671) in encouraging a shift in mind-sets towards more sustainable measures.

### **2.3.3 Agriculture and the 17 Sustainable Development Goals**

Agriculture has a major role to play in all of the seventeen Sustainable Development Goals (SDGs). The SDGs are a continuation of the eight Millennium Development Goals (MDGs) adopted for fifteen years till 2015 (UN, 2015b), interlinking the three main pillars of sustainable development: “economic growth, social inclusion and environmental

protection” (FAO, 2017). These MDGs were replaced by the new seventeen SDGs, which have been in place since 2016 and which will remain in place till the year 2030 in view of the 2030 Agenda for Sustainable Development (FAO, 2017). This Agenda was adopted by all 193 members of the United Nations, including Malta.

The Food and Agriculture Organization of the United Nations (FAO), has the task of targeting sustainable agriculture in view of all the SDGs, focusing on the importance of cooperation and partnerships between the relevant stakeholders across the globe. The main five strategic priorities of the FAO (2016a, p.21) in the 2030 Agenda are:

- To help eliminate hunger, food insecurity and malnutrition
- To make agriculture, forestry and fisheries more productive and sustainable
- To reduce rural poverty
- To enable inclusive and efficient agricultural and food systems
- To increase the resilience of livelihoods to threats and crises

The FAO (2017) states that:

“As the fundamental connection between people and the planet, sustainable food and agriculture are at the heart of the 2030 Agenda. Without proper nourishment, children cannot learn, people cannot lead healthy and productive lives, and societies cannot prosper. Without nurturing our land and adopting climate-resilient agriculture, future generations will struggle to feed a growing population” (p.5).



Figure 2.4: Food and Agriculture's link to the 17 SDGs. Source: FAO, 2016a.

In the following table, the link between agriculture and each of the seventeen different goals will be discussed, all in view of the targets generated by the FAO (2019).

<p><b>Goal 1</b> <b>No Poverty</b></p>	<p>In 2015, at the start of the SDGs there were about 737 million people considered as being financially poor, with three-quarters of them residing in rural areas, practicing agriculture to guarantee their livelihoods. Targeting agriculture, helps create more job opportunities in this sector and helps them lead a more decent life.</p>
<p><b>Goal 2</b> <b>Zero Hunger</b></p>	<p>The issue is not with food production, as there is enough food produced for the global population, yet there are still people who remain undernourished in the developing countries. On the other hand, malnutrition is prevalent in developing and developed countries. With an ever-increasing population, agricultural production will have to increase by at least fifty percent by the year 2050, coinciding with a decrease in land availability, soil and biodiversity degradation and climate change.</p>
<p><b>Goal 3</b> <b>Good Health and Well-Being</b></p>	<p>Agriculture provides the main sources of food and nutrition. A reliable source of nutrition will impact one's education, living and health. FAO considers the health not only of human beings, but also that of animals, plants and the environment.</p>
<p><b>Goal 4</b> <b>Quality Education</b></p>	<p>FAO helps promote an educational system which is feasible to the needs of those living in rural areas. It also promotes the establishment of school gardens and school food programmes.</p>
<p><b>Goal 5</b> <b>Gender Equality</b></p>	<p>Women are an essential sector of the agricultural working force, representing half of the labour force, fulfilling important roles in the agricultural sector. Women in the agricultural sector, especially those living in remote rural areas, may have to face greater challenges. Empowering women means empowering the agricultural sector to achieve food security.</p>
<p><b>Goal 6</b> <b>Clean Water and Sanitation</b></p>	<p>The agricultural sector depends on a reliable supply of water, doing constant research on how to improve production while at the same time minimising the use of water. The production of crops and the rearing of livestock accounts to 70% of water use and up to 95% in several developing countries. FAO works on the promotion of efficient use of water resources which helps increase production while safeguarding water resources, such as adopting clean water technologies.</p>
<p><b>Goal 7</b> <b>Affordable and Clean Energy</b></p>	<p>Agriculture consumes around 30% of the energy resources while emitting 20% of the greenhouse gases. The ideal situation would be one where the agricultural sector depends less on fossil fuels and depends more on renewable sources of energy, also keeping in mind the energy used for transportation of goods.</p>
<p><b>Goal 8</b> <b>Decent Work and Economic Growth</b></p>	<p>Agriculture contributes a great deal in providing employment, especially in developing countries. The food and agricultural industry may help solve the problem of challenges in employment. FAO contributes by supporting the generation of new jobs in rural areas, increasing investment in smallholder producers and improving working conditions.</p>
<p><b>Goal 9</b> <b>Industry, Innovation and Infrastructure</b></p>	<p>The lack of adequate infrastructure and isolation from markets affects the livelihood of small-scale farmers across rural areas. FAO supports improved infrastructure, proper storage and transportation, along with improved means of communication, leading to a decrease in people, especially the younger generations from seeking new lives in urban areas.</p>

<p><b>Goal 10 Reduced Inequalities</b></p>	<p>Achieving the goal of sustainable development, along with reducing global poverty and hunger, comes along with the prospect of leaving no one behind, giving everyone equal opportunities to prosper.</p>
<p><b>Goal 11 Sustainable Cities and Communities</b></p>	<p>It is estimated that by the year 2030, around 60% of the global population will be living in urban areas, increasing the demands on food systems. Expanding urban areas is often at the cost of fertile land, leading to increasing demand for land, water and other natural resources. Addressing urban resilience strategies is the key towards ensuring food security.</p>
<p><b>Goal 12 Responsible Consumption and Production</b></p>	<p>With an increasing global population comes an increase in demand for natural resources such as soil and water. There is an increasing need for more sustainable production of food, along with sustainable consumption to reduce food waste. Currently a third of global food is lost or wasted, while hunger remains a global issue. Sustainable food production not only means less food loss or waste, but also the importance of reducing the negative impacts on the environment, meaning having a lower environmental footprint.</p>
<p><b>Goal 13 Climate Action</b></p>	<p>Agriculture is one of the contributors of greenhouse gases, leading to climate change. Sustainable agricultural practices are a step forward in the right direction. Climate change affects the agricultural industry directly, increasing the risk of droughts, flooding and other severe weather patterns, disrupting food production and increasing its losses. Adapting and mitigating the effects of climate change in one of the key roles of FAO, by helping in designing national action plans to help make farmers more resilient in face of such changes.</p>
<p><b>Goal 14 Life Below Water</b></p>	<p>All the life above water will ultimately affect life below water. Aquaculture may help with feeding and coping with the increasing demand for food supply. All these activities must be sustainable, otherwise overfishing, unsustainable fish-farms, etc. may lead to more pollution. The increase of Carbon Dioxide in the atmosphere is also leading to ocean acidification. Evidence to this is the loss of coral reefs. FAO helps in encouraging good practices through its Blue Growth initiative.</p>
<p><b>Goal 15 Life on Land</b></p>	<p>The increasing demand for food production, brings along an increase in demand for agricultural land, often at the cost of forests, which cover 31% of the world land area. Forests home a great array of biodiversity, providing us with clean air, food, medicine and fuel. Combating deforestation is a means of also combating increasing desertification, soil erosion, land degradation and safeguarding indigenous tribes.</p>
<p><b>Goal 16 Peace, Justice and Strong Institutions</b></p>	<p>Hunger and the fight for natural resources is one of the key contributors to disputes across the globe. Political instability often leads to food shortages, malnutrition and the undermining of livelihoods. Peace brings along food security and the FAO helps by encouraging participatory policy-making, which takes into consideration the needs of the small-scale producers in view of social, political and economic needs.</p>
<p><b>Goal 17 Partnerships for the Goals</b></p>	<p>The link between all the SDGs demands for cooperation between different stakeholders, by sharing their knowledge and good practices to help improve the situation of others and promote sustainable development objectives. The FAO helps in building</p>

	and encouraging partnerships between all food and agricultural stakeholders.
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Table 2.1 Sustainable Agriculture’s link to the 17 SDGs

## 2.4 Agriculture in Malta

Agricultural land in Malta takes up around 110 km<sup>2</sup>, with 9370 total holdings, characterised by small scale holdings (average of 1.2 hectare). It contributes to 1.7% of Malta’s economy and 2.9% of total employment (EU, 2016).

The latest official statistics collected with regards to the farming population was through the Census of Agriculture and was last carried out in 2010 (NSO, 2012), while a Farm Structure Survey was conducted by the NSO in 2013, having a total of 1372 full-time farmers, including both arable and pastoral farmers. This study will focus on arable farmers, totalling 725 according to NSO statistics collected in 2013. For the purpose of the study, JobsPlus (2018) provided the current data for the number of registered full-time mixed crop growers, amounting to 162 farmers and a total of 136 farmers, including both field and animals. This amounts to an overall total of 298 farmers.

The two main farming practices carried out on local land are dry (arable) farming, relying on rain water only, in Maltese known as *bagħli* and irrigated farming, either in open fields or greenhouses, in Maltese known as *saqwi*. Most of the local farmers practice mixed farming, meaning they do not specialise in one specific cash crop, but grow a variety of seasonal crops (NAP, 2018a).

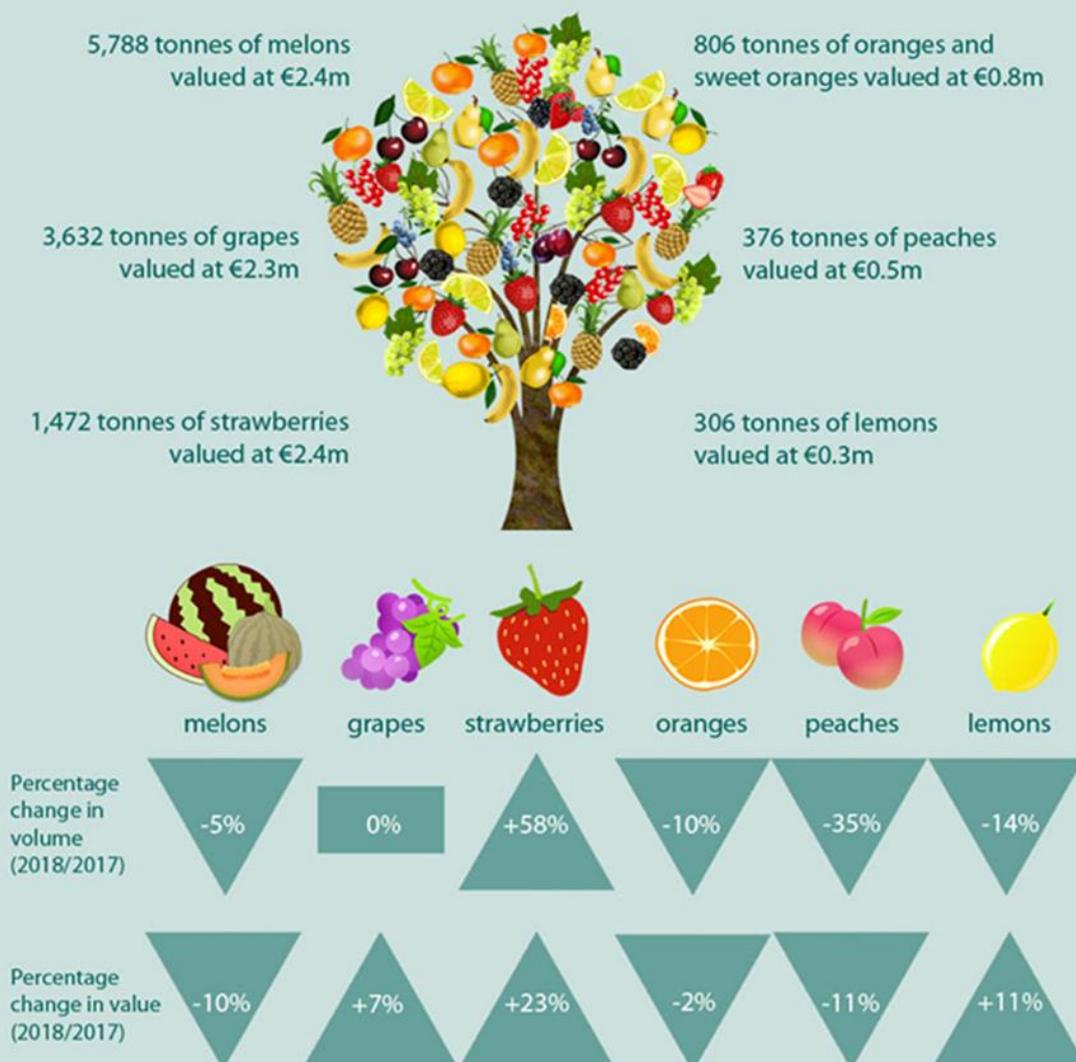
# WORLD FOOD DAY 2019

Healthy diets for a #ZeroHunger world

Fruit produced locally in 2018...

Total fruit (in tonnes) amounted to: 13,057, down by 1% when compared to 2017. These were valued at €10m, up by 3%.

The top six fruit (in volume terms) produced were:



Source: Agriculture Statistics, NSO



Figure 2.5: Locally produced fruits in 2018. Source: NSO, 2019

# WORLD FOOD DAY 2019

Healthy diets for a #ZeroHunger world

Vegetables produced locally in 2018...

Total vegetables (in tonnes) amounted to: 58,178, down by 7% when compared to 2017. These were valued at €30m, down by 13%.

Top six vegetables (in volume terms) produced were:

11,189 tonnes of tomatoes  
valued at €3.4m

4,628 tonnes of cauliflowers  
valued at €2.4m

9,356 tonnes of potatoes  
valued at €4.6m

3,578 tonnes of cabbages  
valued at €1.8m



8,688 tonnes of onions  
valued at €4.2m

2,891 tonnes of lettuce  
valued at €1.3m



Tomatoes



Potatoes



Onions



Cauliflowers



Cabbages



Lettuce

Percentage  
change in  
volume  
(2018/2017)



Percentage  
change in value  
(2018/2017)



Source: Agriculture Statistics, NSO



Figure 2.6 Locally produced vegetables in 2018. Source: NSO, 2019

Maltese farmers have to face a variety of constraints some of which were outlined in the National Agricultural Policy (NAP) paper (2018a, p.24):

- Scarcity of land related to the small size of the islands and dense population.
- Lack of natural resources, in particular, water scarcity.
- Urbanisation, land use pressures and opportunity cost of land.
- Dependence on imported fodder and other inputs that are costly in view of a limited bargaining power.
- Fragmentation of human and physical resources.
- Individualism and general inability to exploit economies of scale.

Malta's membership within the EU has guaranteed farmers subsidies and aid, but has also introduced new regulations. The Common Agricultural Policy (CAP) aims to increase agricultural productivity, self-sufficiency, maintaining farming jobs by guaranteeing improved income for farmers. It also aims to stabilise markets and guarantee stable and reasonable consumer food prices (Waugh, 2002). The Maltese government has also negotiated a Special Market Policy Programme, aiming to transform this small-scale industry into a self-sustainable one, rehabilitating, encouraging and reviving this traditional activity (Ministry for Rural affairs and the Environment, n.d.).

Before Malta's entry into the EU, Maltese farmers had trade policies which protected their local produce, as imported produce had levies, so to a certain level their production was safeguarded. Once Malta joined the EU, the levies on importation from EU countries were removed, in

view of the CAP, and this may have resulted in increased competition and irregular income. This led to existing farmers to either seek other employment or to invest in modernising their trade through EU funding, leading to an increase in quantity of produce rather than quality. With an ageing farming population, attracting younger farmers is essential (NAP, 2018a).

Sustainable farming practices are also being encouraged, through the 'Greening' rules, based on 3 environmentally friendly practices: "crop diversification, maintaining permanent grassland and conserving 5% of areas of ecological interest" (EU, 2016, p.2). Most Maltese farmers will be exempted from such requirements because of the small-scale farms.

Maltese farmers have benefitted a lot from CAP, in fact, Malta has the highest average Direct Payment per hectare. The aims directed to Malta by CAP focused on restoring, preserving and enhancing the ecosystems on the Islands; increasing the efficiency while still combatting climate change, specifically by shifting to renewable energy and efficient irrigation; and finally improving the competitiveness of this sector (EU, 2016, p.2-3). Training and surveys are held with farmers by the Ministry to improve farming production and to move towards more sustainable practices and environmental protection.

### **2.4.1 Agricultural Policy**

In 2018, the Parliamentary Secretary for Agriculture, Fisheries and Animal Rights launched a public consultation, to help in the first ever structuring of the National Agricultural Policy (NAP, 2018b) for the Maltese Islands, for the period 2018-2028. The consultation paper discusses the need of re-shaping the local agricultural sector in face of Malta's accession in the European Union (EU), aiming that in the coming ten year period, this sector will steer towards more sustainable practices in view of the Common Agricultural Policy (CAP) and other such EU regulations (2018b).

The aim of this policy is to involve all the relevant stakeholders within the agricultural realm. This Policy places emphasis on (NAP, 2018a, p.7):

- Increasing the competitiveness of active farmers and livestock breeders by focusing on quality and embracing diversification;
- Facilitating the entry of young farmers by creating a cost-effective agri-business sector;
- Fostering sustainability of farming activities by adapting to the local geo-climatic conditions;
- Ensuring that farmland is managed by genuine farmers for agricultural purposes and related activities.

This Agricultural Policy focuses on six main strategic policy objectives. These policy objectives target all the current local issues which were recognised to be of importance by the respective stakeholders which were consulted.

Food presentation, labelling & traceability	Consolidation of land holdings	Sustaining water & key resources	Competitiveness & diversification	Adaptation to & mitigation of geo-climatic conditions	Research & development
Pitkali Markets	Agricultural leases	Water supply	Demographics	Seasonal changes	Higher educational institutions
Farmers Markets	Farmer benchmarking	Rainwater harvesting	Farming skills	Severe weather conditions	Research & innovation
Viticulture	Agricultural Land Scheme	Groundwater abstraction	Capital investment	Adaptation & mitigation measures	Idea incubators & product development
Tomatoes for processing	Land degradation	New water	Profitability	Renewable energy	Smart agriculture & IT development
Potatoes	Fodder crop production	Nitrates	Working conditions	Carbon sinks	Internationalisation
Olive oil production	Farms on government land	Intensive farming	Planning permits	Risk insurance	Extension services
Fertilisers & pesticides	Livestock breeder benchmarking	Soil conservation	Cooperation		
Dairy	Fodder crop demand	Ecosystem services	Production targets		
Beef			Niche markets		
Swine			Tourism		
Broilers			Organic farming		
Egg production			Access to finance		
Sheep & goats					
Rabbits					
Honey production					
Key marketing perspectives					

Figure 2.7: Strategy policy objectives and pertinent policy issues addressed in the Agricultural Policy for the Maltese Islands Source: NAP, 2018b.

The operational objectives are divided under four main categories; economic objectives, social regeneration, resources and governance.

### 2.4.1.1 Economic Objectives

The eight economic objectives are aimed to reinforce the economic performance within the agribusiness sector through empowering farmers and encouraging “innovation, farmer clustering, training, niche markets’ penetration, automation, IT development, local gastronomy, local premium products and possibilities of diversification” (NAP, 2018b, p.9).

Ref.	Objective title
E1	Develop and/or adopt (a) new practices, (b) business processes and (c) smart technologies to address current and upcoming challenges faced by the agricultural sector with special focus on competitiveness, increasing average age of farmers and climate change.
E2	Promote and support a migration, especially by young farmers, towards the cultivation and supply of high quality and value added market-oriented products to increase farm-based earnings.
E3	Promote and support innovation to assist the sector to migrate towards a more circular approach by transforming wastes into resources.
E4	Assist and incentivize farmer cooperation and clustering to improve economies of scale in the collective acquisition and provision of goods and services as well as other key issues.
E5	Diversify the agricultural product through a holistic rationalization of field crops, both traditional and underutilized, horticultural, floricultural and herbal crops, bee keeping and other activities to optimize the resource use including land and soil. This will complement a move towards premium product agriculture, secure further the local food supply, enhance earnings and employment opportunities and increase agricultural exports.
E6	Incentivize the transition of Maltese farmers from their dependence on quantitative production to reap the economic value of the rural environment generated from rural tourism, the associated complementary employment and diversified income opportunities.
E7	Redirect further efforts towards the development and promotion of enhanced harvesting, processing and storage methods to reduce product losses, to increase product value added and to identify new export markets.
E8	Facilitate the capacity of agricultural stakeholders to exploit international markets

Figure 2.8: List of Economic operational objectives. Source: NAP, 2018b.

### 2.4.1.2 Social Regeneration Objectives

The six social regeneration objectives are aimed towards all farmers and livestock breeders, helping to give more incentives to new entrants of this sector, guaranteeing its survival in the long-run. These objectives target “career development, development of pertinent curricula, skills development, bridging of farmer-customer relationship, farmer networking, further emphasis on the promotion of agricultural products and placement of focus on health and nutrition” (NAP, 2018b, p.10).

Ref.	Objective title
S1	Introduce customer relationship management frameworks to better understand consumer demands for agricultural products, their quality, origin and other differentiating features.
S2	Mainstream social and cultural activities to raise awareness on the local product offered, its nutritional benefits and the opportunities emanating from the sector.
S3	Invest in flexible career pathways and educational services for current and prospective rural entrepreneurs to offer an array of essential information, exchange of ideas, networking and training opportunities for product upgrading and diversification.
S4	Develop curricula that combine agricultural science with business development to enhance the capacity of future agricultural operators.
S5	Early stage exposure to agricultural issues and practices.
S6	Safeguard the Maltese agricultural heritage by fostering and disseminating traditional rural skills, knowledge and technology that prevail in the farming of small parcels, the maintenance of intricate landscapes and the production of those unique products that preserve typically Maltese flavours.

Figure 2.9: List of Economic operational objectives Source: NAP, 2018b.

### 2.4.1.3 Resources Objectives

The ten resources objectives target the shortage of natural resources available in Malta, mainly the resource of water as well as the resource of fertile soils across the Islands. Since both of these resources are very much limited across the Maltese Islands, it is imperative that such an agricultural policy ensures to safeguard them and seeks means to create new resources. These objectives target “the sustainability of resources such as water, soil, renewable energy sources, farmland, rural environment, indigenous species and local breeds.” (NAP, 2018b, p.12).

Ref.	Objective title
R1	Increase capacity to implement effective actions that promote sustainable agricultural products and services with added value throughout the value chain whilst maximising the value of natural resources.
R2	Enhance the resilience of the agricultural sector by increasing its adaptive capacity and identifying appropriate measures to reduce Greenhouse Gas emissions.
R3	Enhance the utilisation of land and farm resources by applying sustainable cultivation practices.
R4	Valorise farmland for its agricultural value and non arable land for its ecological, scenic and eco-touristic potential.
R5	Encourage measures for farmers to reduce their dependence on groundwater.
R6	Assist farmers in the integrated management of water resources through financial and knowledge based instruments.
R7	Facilitate sustainable agricultural production through environmentally sound agricultural practices including integrated pest management and plant nutrition.
R8	Develop a soil action plan in relation to agricultural use.
R9	Investigate and disseminate information related to soil improvement methods through sustainable soil tilling practices, agro ecosystem services, smart irrigation and climate smart farming.
R10	Secure the legacy of indigenous plant species to preserve them for research and propagation purposes including on a commercial scale so as to conserve them as a genetic insurance in the face of environmental and climate risks as well as for food security in line with access and benefit sharing legislation.

Figure 2.10: List of Resources objectives Source: NAP, 2018b.

#### 2.4.1.4 Governance Objectives

The eleven governance objectives seek to improve the value of local food production, targeting food security, culinary traditions, land ownership, conservation of the local habitat and environment, Maltese landscape, eco and rural tourism, amongst others. The objectives are multi-faceted, including the involvement of various stakeholders, targeting a variety of issues, all in view of the Common Agricultural Policy (CAP) which helps in financing the agricultural sector across the EU member states. (NAP, 2018b, p.13).

Ref.	Objective title
G1	Encourage the setting up of stakeholder networks.
G2	Provide the necessary capacity to develop a Management Information System to cover the agricultural sector.
G3	Consolidated information on the land tenure of farm holdings.
G4	Create and manage a structured framework that addresses issues of farmland tenure and consolidation with due regard to state aid implications.
G5	Facilitation of the process to utilise accredited laboratories for various requirements.
G6	Optimize the agricultural water mix.
G7	Develop farmer and livestock benchmarking systems.
G8	Establish the financing of the various initiatives included in the agricultural policy.
G9	Maintaining coherence and consistency between different policies that are intended to positively impact on the agricultural sector.
G10	Ensuring effective communication.
G11	External evaluation.

Figure 2.11: List of Governance objectives Source: NAP, 2018b.

## **2.4.2 Education for Sustainable Development in the National Agricultural Policy**

“Changing the nature of development involves changing people who can change development.”

(Gadotti, 2009)

As discussed in the National Agricultural Policy (NAP) for the Maltese Islands (2018a), the agricultural sector does not only provide us with a local primary economic activity, but it helps in other social aspects. An agricultural lifestyle has its own set of skills and knowledge which are passed on from one generation to another such as rural skills which can come about with years of practice. “Such skills can be improved through education, research and capacity building, the farming lifestyle does not permit much free time in order for the farmers or livestock breeder to engage in formal education” (p. 35).

The NAP (2018a) continues by acknowledging the importance of education and research within the agricultural community in order to assist in entrepreneurship and innovative methods within the agricultural community which seeks to improve profitability and increase sustainable practices within Malta’s small farm settings. Certification of such educational courses is beneficial in order to accredit the farmer’s participation. The policy states that:

“The wide range of benefits that the national economy obtains from agricultural activity needs to be better recognised and appreciated. These benefits go far beyond food production, and this goal can only be achieved through adequate investment in educational resources, in up skilling and increasing the expert pool, as well as in the

various research and development themes that are being identified within this policy document” (p.104).

### 2.4.3 Ground Water usage in Malta

As discussed in the National Agricultural Policy (2018a) the agricultural sector is very much dependent upon two main natural resources, that is soil and water. When it comes to water, the main source of freshwater available for farmers to irrigate their fields comes from the naturally stored water in the aquifers. Water naturally seeps down through the porous limestone rocks which form the Maltese islands, and is either stored on top of Blue Clay which is an impermeable layer, forming what is called the perched aquifer; or is stored in rock at sea level in the Lower Coralline Limestone, forming what is known as the mean sea level aquifer (Azzopardi, 2002).

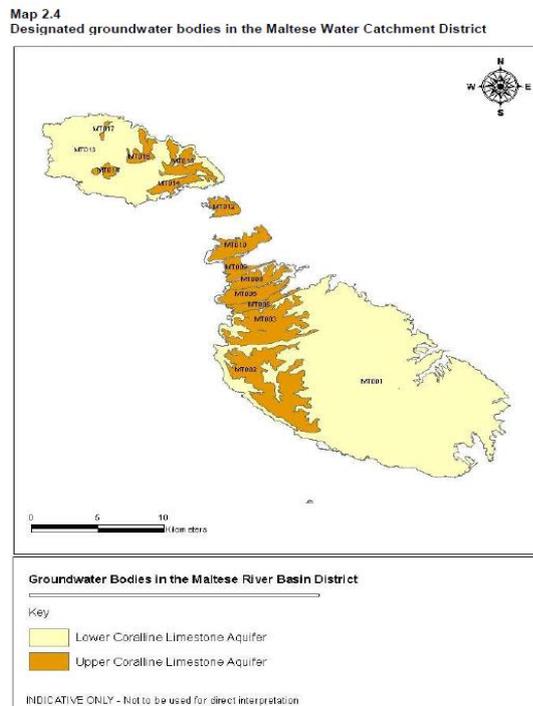
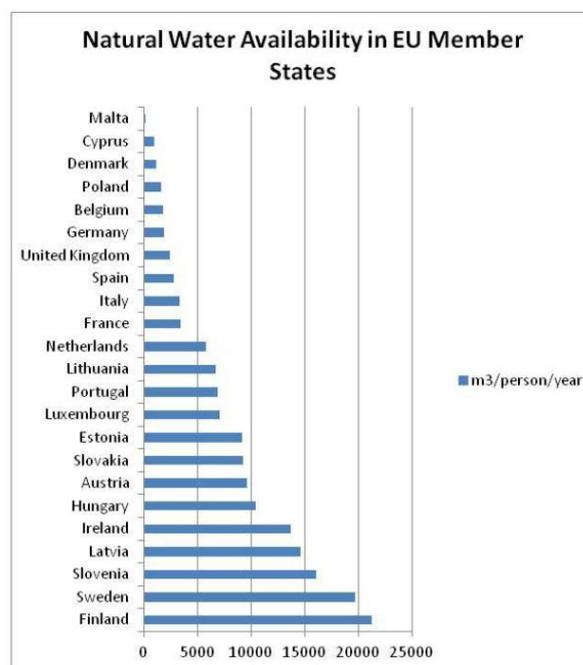


Figure 2.12: Groundwater bodies in the Maltese Islands. Source: Water Catchment Management Plan, ERA, 2011.

The extraction of groundwater in the Maltese Islands does not only come about from the agricultural sector. With an increasing population on such a small archipelago, the pressure on groundwater resource is ever increasing. Malta has the highest rate of population density within the EU, accompanied by a shortage of natural water resources, Malta has the lowest freshwater availability per capita within the EU Water Catchment Management Plan (WCMP) (ERA, n.d.).



Figures 2.13: Freshwater availability within the EU member states. Source: WCMP, ERA, n.d.

Ground water abstraction does not only occur for the purpose of agricultural practices, but also for domestic use, usage within the commercial sector, including various industries, commercial purposes and tourism, along with other sectors (ERA, n.d.).

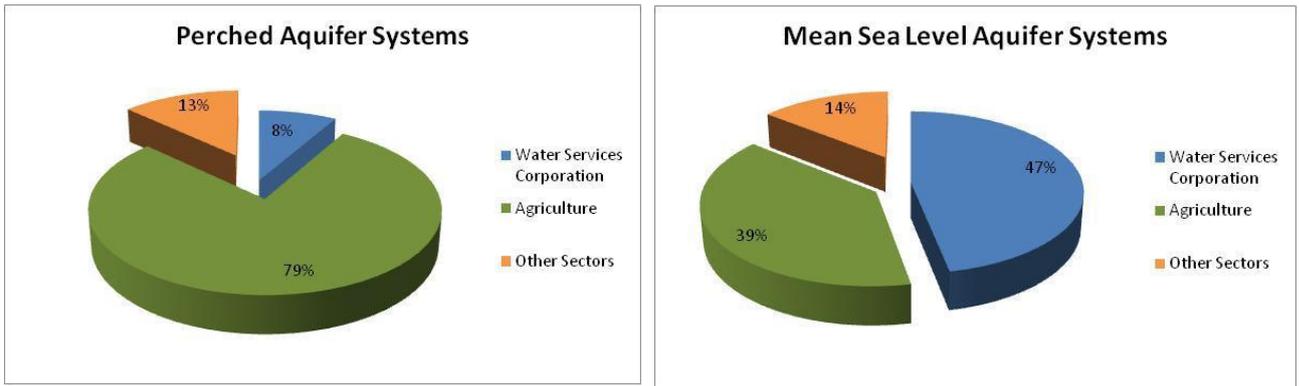


Figure 2.14: Abstraction from the perched aquifer systems and the mean sea level aquifer systems. Source: ERA, n.d.

The graphs above show the abstraction of groundwater resources within the Maltese Islands. As evident in the graph, the perched aquifer which is predominantly found in the Northern areas of Malta, is mostly used for agricultural purposes, while the mean sea level aquifer is mostly used by the water services corporation for domestic distribution, although agriculture still plays a major role in using water from this aquifer (ERA, n.d.).

The location of natural water resources, such as rivers, springs and groundwater, has always had a crucial role in agricultural practices. Agriculture depends a lot on water, and climate is a major factor affecting the type of agriculture produced in a particular country or area, especially the average temperature and rainfall in the area (Waugh, 2002). Crops and animals are all very much dependent on a steady supply of water (Bowen & Pallister, 2002). Foley (2014) discusses how agriculture is one of the thirstiest users of water supply globally, and is a polluter of water as well. For example, the production of tomatoes, which is popular in

Malta, is highly dependent on irrigation water, and it is estimated that on average, more than thirteen gallons of water are used per tomato (Folger, 2014). One must keep in mind that in Malta, water is a very scarce resource, and the only natural water available is groundwater. One measure which farmers have adopted is the shift from surface irrigation to drip irrigation, which reduces the amount of water lost through evaporation and regulates water supply (Ward, 2014).

The increased amount of irrigation has also led to water salinization. It is estimated that between September 2009 and August 2010, a total amount of 28.2 million cubic metres of water were used locally for irrigation (NSO, 2012). This amount increases during dry spells and decreases according to annual rainfall. The drier it is, the more ground water is extracted. When water is extracted from the mean sea level aquifer, especially during summer, decreasing amounts of fresh water means that the water pumped up will be more saline, such as is the case in Wied il-Pwales and l-Armier (Mifsud, 2014).

#### **2.4.4 Nitrates Policy**

High nitrate levels in the water table may also be a result of agricultural practices. “If too much nitrogenous fertiliser or animal waste (manure) is added to the soil, some remains unabsorbed by the plants and may be leached to contaminate underground water supplies and rivers” (Waugh, 2002, p.494).

This is a huge problem in Malta, and membership within the EU has guaranteed constant monitoring of nitrate levels. The EU Nitrates

Directive set the accepted nitrate level to be that of 50mg of nitrates per litre (EU, 2010). Local water readings in 2011, resulted in a staggering 11 out of 15 groundwater bodies having nitrates which exceeded the EU limit, especially in the perched aquifer.

The highest concentration of nitrates in the perched aquifer was at Żebbuġ, (213.5mg/l) while at the coastal groundwater level, the highest was at Pwales (488mg/l). These readings were taken in 2011 (MEPA, 2012, p.32).

<b>Groundwater Body</b>	<b>Mean Nitrate Content (2009-2014) mg/l</b>
Malta Mean Sea Level	66.9
Rabat Dingli Perched	193.3
Mgarr-Wardija Perched	117.6
Pwales Coastal	407.6
Mizieb Mean Sea Level	43.3
Mellieha Perched	167.5
Mellieha Coastal	33.3
Marfa Coastal	217.4
Comino Mean Sea Level	15.8
Gozo Mean Sea Level	48.0
Ghajnsielem Perched	119.0
Nadur Perched	79.7
Xaghra Perched	237.5
Zebbug Perched	215.9
Victoria-Kercem Perched	226.7

Figure 2.15: Mean Nitrate contents in groundwater for the years 2009-2014.

Source NAP, 2018a.

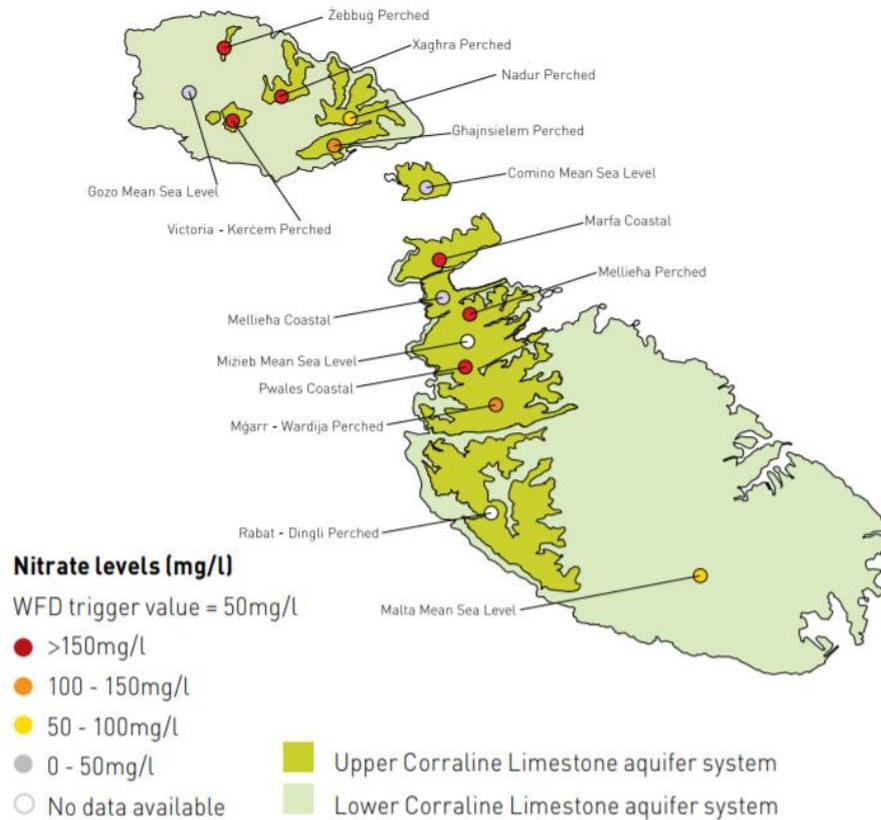


Figure 2.16: Map showing the nitrate levels across Malta and Gozo as at 2011. Source: MRA in MEPA, 2012, p.32.

Intensive animal husbandry has demanded better management of animal manure, which when left exposed to rain, will ultimately lead to nitrates leaching in the water table. Pig manure is more of a treat as it is made of more liquid than the manure from poultry (Rainelli, 1989).

Locally, the government is taking measures such as enforcing the prohibition of applying manure in the rainy season (15<sup>th</sup> October till 15<sup>th</sup> March), the storage of manure in leak-proof storage areas on farms and limiting the amounts of fertilisers used per field (Nitrates Action Programme, 2011).

### **2.4.5 New Water**

Recently, the Water Services Corporation (WSC) in Malta has been producing what is known as “New Water”, which is a product of treated sewage water and is also second class water, which can be used for crop irrigation. It has the potential to cater for 35% of the total demand within the agricultural sector. Currently there are three water polishing plants located at Ras il-Ħobż in Għajnsielem, Gozo, another at Taċ-Ċumnija in Mellieħa, and at Ta’ Barkat in Xgħajra. The overall aim is to replace the extraction of groundwater by this New Water. Currently, new water is mainly available for farmers in the Northern part of Malta, mainly in Mellieħa, Mgarr and in the limits of Manikata, along with some areas in Gozo. WSC are aiming that they will have around 125 water dispensers in the North of Malta, around 200 dispensers in the South of Malta and another 45 dispensers in Gozo (WSC, n.d.).

In order for this project to increase its efficiency, farmers would still need to practice water-conservation measures, such as drip irrigation, timing their irrigation hours, etc. Such measures are being promoted through the “*L-Ilma: Ibda Minnek*” campaign. Access needs to improve across most agricultural areas around Malta and Gozo, as areas such as St. Paul’s Bay and the limits of Rabat, Siggiewi and Żebbuġ, have no distribution points available close by.

Similar to the case of Malta, in the dry areas of a number of countries in North Africa, there is a scarcity of fresh water resources. In this case, urban wastewater is being re-used for irrigation processes, by treating

such wastewater to make it viable for its use in the agricultural sector. One of the projects supported by the FAO (2017) was targeted at “Using non-conventional waters to sustain livelihoods” in Algeria, Egypt, Morocco and Tunisia (p.26).

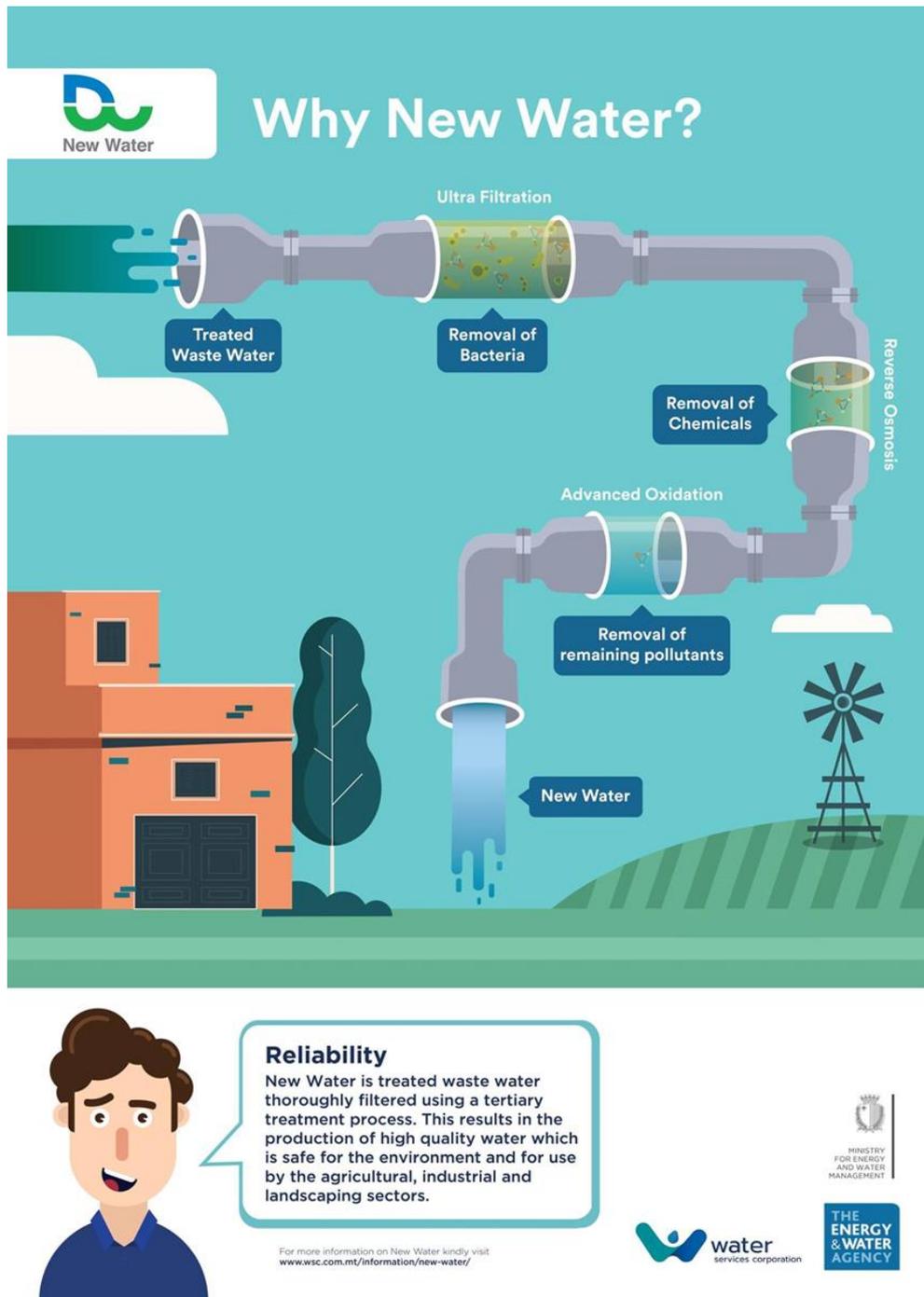


Figure 2.17: New Water explained. Source: WSC (n.d.)

## **2.4.6 Use of Insecticides, Herbicides and Fungicides**

The greater the demand for food, the greater the demand for improved outcrops. In order to minimise the loss of crops to pests, the farming industry has developed pesticides, which leaves an impact not only on the targeted pests, but also on other flora and fauna. To enhance the yield, fertilisers are being used, as they help prompt the system, resulting in an increase in production. Ultimately, these induced chemicals will end up being consumed by humans if not all the necessary precautions are taken by the producers.

Uri (1999) expressed concern “over acute and chronic poisonings by pesticides, detection of pesticide and fertiliser residues in food and water, or in the environments far from where they are applied” (p.7). The use of fertilisers also prompts algal blooms in water courses and rivers, which deprives other organisms from oxygen (Foley, 2014; Kolbert, 2011).

The problem with local farmers is that even if one farmer regulates the amount of pesticides and fertilisers used, these may travel by wind or water runoff from other nearby fields, which are usually only divided by rubble walls.

The most viable solution is to educate farmers on the harmful impacts such excessive use of pesticides and fertilisers have on their fields and crops, their consumers and the local ecosystem in general. Other natural alternative methods used by our ancestors must be encouraged, such as the use of *Posidonia* to prolong the life of potatoes without the use of

pesticides once it is extracted from the field and the shift towards organic farming.

Recently on a National level, there has been the publication of “Malta’s National Action Plan for the Sustainable Use of Pesticides: 2019-2023” by the Malta Competition and Consumer Affairs Authority (MCCAA). This Action Plan for the Sustainable Use of Pesticides has six main are objectives:

- Training, Information and Awareness-raising
- Controls on Pesticide Application Equipment
- Controls on Handling, Storage and Disposal of Plant Protection Products
- Controls on the use of Plant Protection Products in Specified Areas
- Integrated Pest Management and alternative low pesticide input pest management strategies
- Risk Indicators and Data Gathering

Such an Action Plan is the second of its kind in Malta, providing a guideline on the use of such chemicals within the agricultural scenario, targeting the sustainable use of pesticides. Training, provision of information and raising awareness within the community of pesticide users, distributors and the general public are all targeted.

## **2.5 Alternative Farming Practices in Malta**

### **2.5.1 HydroPonics and Aquaponics**

Hydroponics is generally referred to as the science of growing crops in water nutrient based solutions, not using soil on ground. It is estimated that this method yields around fifty times more crops, such as lettuce, per acre rather than planting in one acre of soil (National Geographic, 2019). Locally, we have no data available on the registered hydroponic farmers, but the idea of growing crops in water is becoming more popular.

The plants are usually suspended in a water solution, having controlled levels of nutrients circulating around their roots, making it easier for such nutrients to be absorbed by the plants. It is easier to control fungal and microbial infections when using hydroponics rather than planting directly in soil. It is a common misconception to think that for hydroponics more water is needed. However, this is not the case, as the water is circulated back and reused within this system, whereas in traditional agriculture where plants are watered in a soil base, water seeps downwards through the soil. (NAP, 2018a; Somerville, Cohen, Pantanella, Stankus & Lovatelli, 2014).

Somerville et al. (2014) discuss how hydroponics is a soil less system, where other substrata may be used to hold the moisture and providing nutrient solutions to the plants' roots. Hydroponics may not even use any substrata but rather have bare roots in an aqueous system. These authors add on by stating:

“Beyond its significantly higher yields compared with traditional agriculture, soil-less agriculture is also important because of its higher water- and fertiliser-use efficiency, which makes hydroponics the most suitable farming technique in arid regions or wherever nutrient dispersal is an issue for both environmental and economic reasons.” (Somerville et al., 2014, p.2).

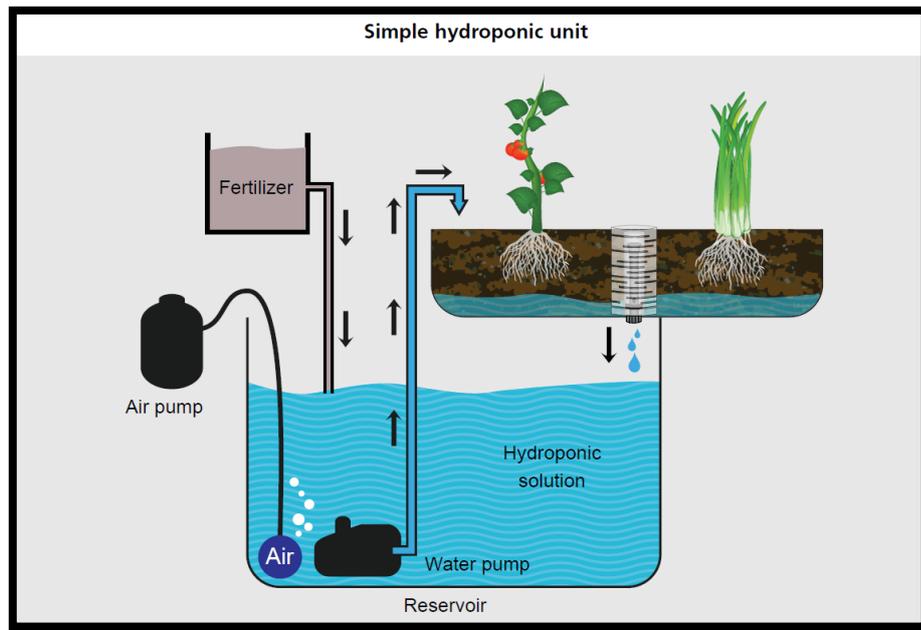


Figure 2.18: Depiction of a simple hydroponic unit. Source: Somerville et al., 2014.

The same authors discuss another similar method of producing crops, through the use of aquaponics. It is a mixture of both aquaculture and hydroponics. The water is recycled, giving nutrients to both plants and fish. Filters are used to remove any solid fish waste, nitrates and other nutrients are taken up by the plants, naturally purifying the water for the fish to grow in.

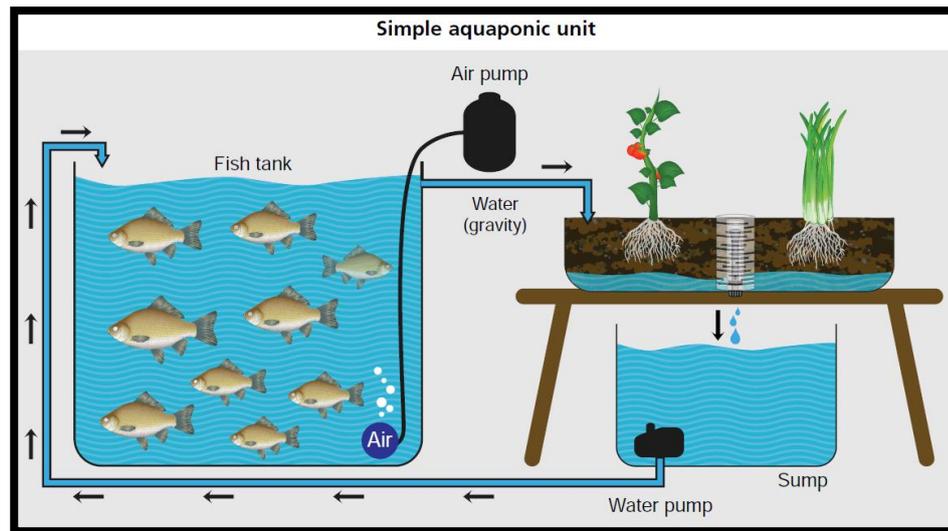


Figure 2.19: Depiction of a simple aquaponic unit. Source: Somerville et al., 2014.

Taking into consideration that Malta has a semi-arid climate and our water resources are very limited, such methods of producing food, may be more viable than the traditional methods of producing our crops in soil. As the years pass by, arable land in Malta is becoming less and less common, thus hydroponics and aquaponics may be the most viable means of sustainably producing food with limited natural resources, such as land and water. On the hindsight, the capital needed to transition from traditional agriculture to incorporate such modern technologies may hinder or deter some farmers.

## 2.5.2 Permaculture

Permaculture is designed on sustainable production of food which imitates the natural diversity and resilience found in a natural ecosystem, without having any interference from human inputs or artificial chemicals. It mimics all the natural patterns and relationships

which take place within an ecosystem in its natural state, having its own natural cycles (Brain & Thomas, 2013).

In the following design (figure 2.20), Holmgren (2013) illustrates the seven domains which incorporate all the features to target a sustainable future, not only a sustainable farming future. It envisions the principles and ethics behind the concept of permaculture, the concept of working for a sustainable generation, not only at a personal level, but also at a local and global level. He states that:

“In this more limited but important sense, permaculture is not the landscape, or even the skills of gardening, sustainable farming, energy efficient building or eco-village development as such, but it can be used to design, establish, manage and improve these and all other efforts made by individuals, households and communities towards a sustainable future.” (p.3)

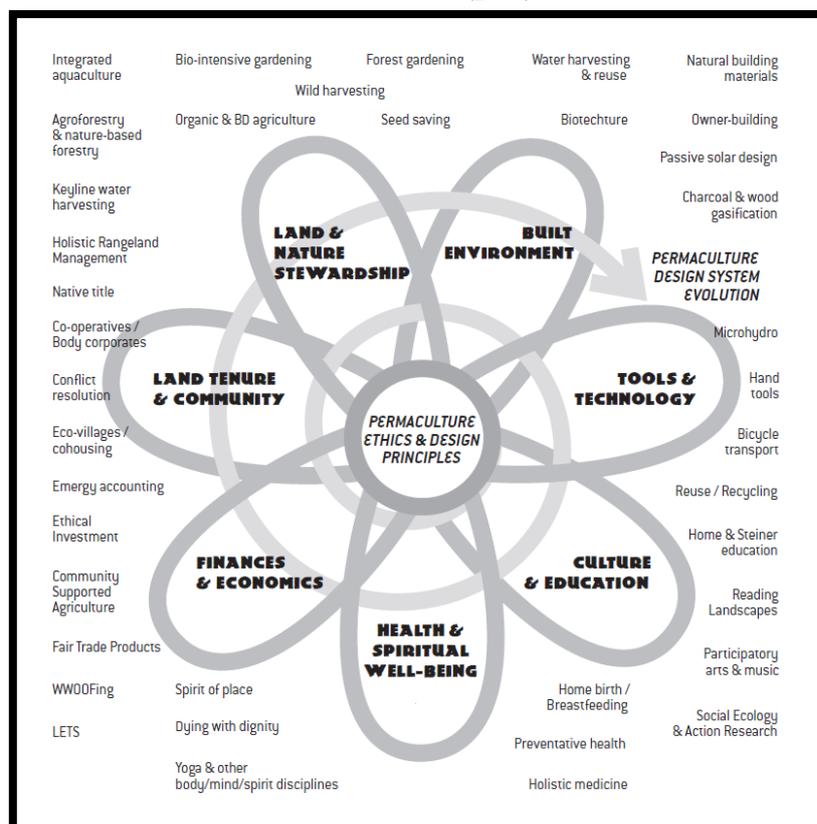


Figure 2.20: The Permaculture flower. Source: Holmgren, 2013.

Holmgren (2013) sets a total of twelve principles to incorporate the whole idea of permaculture:

- Principle 1: Observe and Interact
- Principle 2: Catch and Store Energy
- Principle 3: Obtain a yield
- Principle 4: Apply self-regulation and accept feedback
- Principle 5: Use and value renewable sources and services
- Principle 6: Produce no waste
- Principle 7: Design from patterns to details
- Principle 8: Integrate rather than segregate
- Principle 9: Use small and slow solutions
- Principle 10: Use and value diversity
- Principle 11: Use edges and value the marginal
- Principle 12: Creatively use and respond to change

On a national level, permaculture is becoming even more popular, envisioning a more sustainable farming future on the islands. The “Perma Culture Research Foundation Malta” has its own farm based on permaculture principles. This is called the Baħrija Oasis and has been under the care of Peppi Gauci since 2003. The foundation also offers an array of courses to the general public, advertising the concepts behind permaculture and a sustainable lifestyle. Permaculture Malta (2016) discusses how within the Baħrija Oasis one could find an integrated aquaponics system, an apiary to help in pollination, cultivation of micro-greens and a pesticide-free cultivation garden. The infrastructure is also an innovative one, having a bush kitchen in the setting of a treehouse, geodesic domes and composting toilets.

At the Fawwara research centre (limits of Siggiewi), under the care of the Centre for Environmental Education and Research (CEER), University of Malta, the centre designed a permaculture project within their fields. The aim of this project is to explore the means of sustainably growing crops, taking into consideration the sustainable principles behind permaculture and protecting the natural resource of soil to ensure fertility and protecting the natural ecosystem. Another permaculture project taking place in Malta is at Dar Frate Jacoba where the principles of permaculture are also applied in their fields. Allowing nature to be itself, balancing itself, while also sustaining an array of crops.

Recent, local studies, such as the one conducted by Vella (2010) found out that the concept of permaculture is not well known with farmers. There is a need of better dissemination of such practices. Vella (2010) found out that some of the farmers were reluctant to take such measures because of economic feasibility, while others were interested in getting to know more about this practice.

ESD plays a crucial role in promoting such sustainable farming practices, not only amongst farmers, but also in schools to encourage the younger generations to actively participate in food production, appreciating and getting to know about the whole process of cultivating crops.

### **2.5.3 Organic Farming**

Leifeld (2012) defines organic farming as:

“a set of management practices aimed at environmentally friendly production by avoiding the use of synthetic fertilisers and pesticides and by strong resilience on closed

on-farm nutrient cycling, including biological nitrogen fixation and crop rotations, to support soil fertility by enhancing soil organic matter content” (p.121).

According to the European Union (2007) Council Regulation No.834/2007 on organic production and labelling of organic products, organic farming must be based on a farm management system that produces food, combining sustainable environmental practices, which safeguard biodiversity and preserve the natural resources while guaranteeing the welfare of animals by using only natural substances and processes. Thus, while providing for the market’s demand for organic food, it is also guaranteeing sustainable means of practice, safeguarding the environment as well as animals. Genetically Modified Organisms (GMOs) should be at the lowest possible, or none at all, and preference should be given to renewable sources of energy. Food waste, and other organic waste, should be returned back to the land, guaranteeing an efficient nutrient cycle.

The NAP (2018a) mentions a total of 14 registered organic farmers in Malta, with a total of 21 hectares of converted land, having the lowest level of organic farmers within the EU. The Agriculture Directorate, when contacted through email, stated that the conversion period for crops (vegetables) grassland and forage for feed, there should be at least a two year period before sowing any product. For fruit and other perennial crops, including vines, there should be a period of conversion of three years before harvesting of organic crop. Malta has not set any distances.

However, producers are obliged to take all the necessary precautions and preventive measures to ensure that the regulations are adhered to depending on the topology and location.

The Local Subsidiary Legislation 427.93 (2018) for Organic Production and Labelling of Organic Products Regulations, allows the competent authorities to take samples of organic produce to guarantee that it conforms to the standards, issue certifications and labels. The certificates issued are valid for a period of three years.

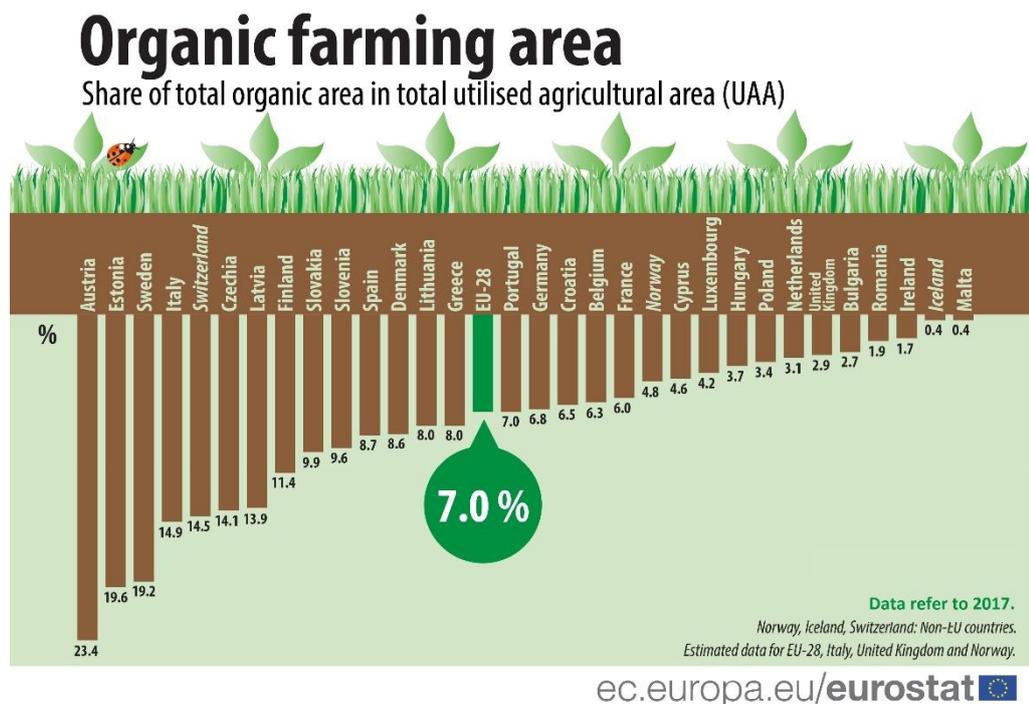


Figure 2.21: Organic Farming area. Source: Eurostat, 2019.

As is evident in figure 2.21, Malta has one of the lowest organic farming areas from amongst the EU states. The NAP (2018a) debated how the issue of having small land parcels and fragmented fields across the Islands, may hinder farmers from converting to organic farming because of contamination from nearby fields. The use of rubble walls, the planting

of hedges and natural buffers, such as trees, all may be of an asset to lower the level of contamination from nearby fields.

The Malta Organic Agriculture Movement (MOAM), a member of the International Federation of Organic Agriculture Movements (IFOAM), was set up in 1999 and has the goal of encouraging organic initiatives within the national level. Sharing of organic practices helps the Maltese agriculture to prosper in a sustainable manner, incorporating ideas and good organic practices. “Education, training and instructing remain the main pillar of MOAM's mission to reach out for more active organic producers and various ages of the local population are being targeted” (MOAM, 2018).

ESD plays a crucial role in promoting such sustainable farming practices, not only amongst farmers, but also in schools to encourage the younger generations to actively participate in food production while appreciating and getting to know about the whole process of cultivating crops through sustainable means.

## **2.6 Some Pros and Cons related to Agricultural activities**

### **2.6.1 Landscape alteration**

What would happen to the Maltese landscape if agricultural activities had to keep on diminishing? Would urbanization take over such landscapes?

“Apart from the agronomic perspective, the farming community is directly involved in the maintenance of the rural landscape and its development. Throughout history, agricultural activities have shaped the Maltese landscapes

in rural areas and the upkeep of the countryside reflects the intensity of the farming activities and the reliance of the population on farmland.” (NAP, 2018a, p.93)

Does agricultural activity necessarily result in a benefit to the landscape? McKnight & Hess (2008) correctly state that “one of mankind’s most successful skills is the elimination of other living organisms” (p.343). The landscape is usually altered by removing native plants and animals, making way for modified landscapes which are thought to be more important, such as fields for agricultural purposes. Of all the ice-free land on our planet, 38.6% is being used by agriculture, either as pastureland or cropland (Foley, 2014). The increase in intensive, commercial farming has led to an increase in pressure on land. For example, locally, the use of greenhouses for industrial farming, alters the landscape and may be a visual eyesore on an otherwise natural landscape. These greenhouses provide a means of growing non-seasonal plants, such as tomatoes in winter (Kolbert, 2011).

The modification of the habitat is also an area in which mankind specialises in. Soil is altered through farming, grazing and ploughing; Water is contaminated by the use of pesticides and fertilisers; all of these have an impact on the native ecosystem (McKnight & Hess, 2008).

Harris and Fuller (2014) debate how the cultivation of products in soil, may and will eventually lead to its manipulation and the surrounding environment. Maintaining the nutrients in the soil is of utmost importance to guarantee sustainability and the soils’ viability in the long

run. This is usually done by adding manure, fertilisers and through the use of crop-rotation, farmers make sure to use nitrogen-fixing species, such as legumes. They also offer the possibility of leaving the fields fallow for a period of time, but in the local scenario, this may not be as viable because of the limited size of agricultural land in the Maltese Islands.

Till farming may intensify soil erosion, especially during the arid season in Malta and the prevalence of wind on the Islands. The use of heavy machinery may ultimately increase the rate of soil erosion due to ploughing (Uri, 1999). An improvement in farming methods will result in less soil degradation. Crop rotation, contour ploughing and terracing of fields, all aid in decreasing soil erosion (Waugh, 2002). Farmers are also responsible of taking care of rubble walls, which not only serve as divisionary walls, but also drastically reduce soil erosion and harbour their own ecosystem within.

A local study conducted by Vella (2015) sought to investigate Gozitan farmers' perceptions on sustainable means of reducing soil erosion. The results concluded that farmers believe that soil erosion can be of a threat and most are willing to adopt sustainable measures to reduce the amount of soil lost from their fields, mainly through terracing of fields and minimum tillage.

### **2.6.2 Agriculture, Climate Change and Deforestation**

Foley (2014) states that:

“agriculture is among the greatest contributors to global warming, emitting more greenhouse gases than all our cars,

trucks, trains and air-planes combined- largely from methane released by cattle and rice farms, nitrous oxide from fertilised fields, and carbon dioxide from the cutting of rain forests to grow crops or raise livestock” (p.35).

Farmers have to be aware of the consequences of climate change and the impact countries like Malta are likely to endure, finding the best possible mitigation strategies (Galdies, Said, Camilleri & Caruana, 2016). It is expected that southern Europe, is likely to become “warmer and drier, and suffer more heatwaves, droughts and shortages of irrigation water” (Park, 2001, p. 266).

The rise in demand for meat has triggered an increase in animal husbandry. This increase in the rearing of farm animals, has also led to an increase in the amount of methane being produced, specifically by cattle. Beef production produces the most greenhouse gas emissions, in fact 40% of these greenhouse gases produced are methane “burped by cattle from their specialised stomachs”, and the number increases with grass-fed cattle (Kunzig, 2014).

The cutting down of trees has also been a result of an increase in agricultural activities, and non-sustainable agricultural practices have led to even more deforestation. For example, in West Africa, agricultural expansion is responsible for high rates of deforestation, while in Central America, deforestation for cattle ranching is a common practice (McKnight & Hess, 2008). This has led to extensive loss of biodiversity worldwide. Native people cleared small areas of land by slash-and-burn methods, but intensive agricultural practices clear much larger areas and

when all the nutrients are depleted from the soil and the land is abandoned, the seeds are too far away for the original forest species to replenish (Strahler & Strahler, 2005). Deforestation also “contributes to accelerated soil erosion, drought, flooding, water quality degradation, declining agricultural productivity, and greater poverty for rural inhabitants” (McKnight & Hess, 2008, p.344). Deforestation ultimately increases global warming, as “forests act as carbon sinks, absorbing CO<sub>2</sub> from the atmosphere and storing carbon in their biomass and soils” (FAO, 2016b, p.10).

## **2.7 Relevant Studies on farmers’ perceptions**

A quantitative, descriptive survey study was conducted with a sample of 150 farmers in the USA, to determine the farmers’ perceptions on issues related to sustainable agricultural practices. Alonge and Martin (1995) conclude that most of the farmers viewed sustainable agricultural practices under a positive realm when it came to their profitability and compatibility, but still expressed their concerns about some practices. The findings of such studies suggest that it is of utmost importance to take into consideration the farmers’ perceptions of such sustainable practices in order to motivate them to start, or continue practicing them.

A similar study, “Farmers’ perception of sustainable agriculture and its determinants: a case study in Kahramanmaras province of Turkey”, conducted by Tathdil, Boz and Tatlidil (2008), focused on collecting quantitative data from 208 farmers to determine how such perceptions are influenced by the socio-economic characteristics of the farmers. The

results showed that the higher the farmers' socio-economic status in view of their contact to extension services, level of education, land ownership, access to information, etc., the higher their perception on sustainable agricultural practices.

Another study conducted in Iran, focused on the perceptions of potato farmers' on sustainable agriculture. Bagheri (2010) found out that farmers displayed a favourable attitude when it came to sustainable strategies such as resource conservations, the negative effects of the use of chemicals and the invasion of pests due to successive cultivation. The study was conducted through a descriptive survey design with a total of 140 farmers, using SPSS to analyse the data collected through a Likert scale.

A study conducted with small-scale farmers in Indiana, USA, was conducted through in-depth qualitative investigation, using semi-structured interviews with 15 key informants and 33 farmers. Grover and Gruver (2017) found out that the difficulties of small-scale farmers were overall similar to those of other conventional farmers, but they felt that they were not being offered the same training opportunities which they felt favoured more the conventional farmers. They also felt the need for more promotion of local food production and consumption of local produce, feeling that it is difficult to compare mass production of conventional farmers with larger farms. This may be similar to the case of local farmers competing with imported produce from larger-scale foreign farms. One of the suggestions offered by Grover & Gruver (2017)

is that “instead of trying to change the attitudes themselves solely through education, this research suggests attempts be made to modify these thresholds so that existent attitudes are allowed to move in the way that befits them” (p.521). This is a great suggestion so that farmers won’t be discouraged to take on and adopt more sustainable means of practices.

ESD plays a crucial role, in view of the findings of these studies. In order to have the farmers onboard, one must convince them that sustainable farming practices are really beneficial and useful. Bringing about change in the farming industry may not be an easy task, especially with the older generation of farmers, but through proper engagement of ESD principles, this can be reached.

Locally there have been studies of farmers’ perceptions on various related issues. Cauchi (2015) analysed the Northern Malta farmers’ attitudes and perceptions with regards to the use of treated sewage effluent for irrigation purposes. Through the use of interviews, she found out that some farmers are willing to give it a try, others are not so keen, fearing it will result in degradation of the quality of their produce. The potential use of ‘New Water’ will aid in diminishing the demand of groundwater extraction for irrigation purposes. A similar study, conducted with Gozitan farmers by Grech (2016), also found out that over three-thirds of the hundred interviewed farmers, were willing to make use of the water, provided and that it would cost them less than the abstraction of groundwater.

Another study conducted by Cortis (2016), investigated the farmers' perceptions on pesticides in the North of Malta. Through the use of semi-structured interviews and field visits, the study showed that most farmers regard pesticides as being an essential tool against pest damages on their crops, but still keep in mind the hazards associated with their use. Then again, farmers were not keen on investing on crop protection management servicing systems.

In the study being conducted for this thesis, such perceptions will be tackled. The following table represents a brief list of the methods used in the studies mentioned above.

<b>Title of Study</b>	<b>Date</b>	<b>Method used</b>
Assessment of the adoption of sustainable agriculture practices: Implications for agricultural education.	1995	Quantitative Study
Farmers' perception of sustainable agriculture and its determinants: a case study in Kahramanmaras province of Turkey.	2008	Quantitative Study
Potato farmers' perceptions of sustainable agriculture: the case of Ardabil province of Iran.	2010	Quantitative Study
<i>The Use of Treated Sewage Effluent for the Irrigation of Agriculture: An analysis about the attitudes and perceptions, of potential users of Taċ-ċumnija wastewater treatment plant.</i>	2015	Qualitative Study
<i>Assessing Gozitan Farmers' Perceptions of Using Treated Sewage Effluent for Irrigation.</i>	2016	Qualitative Study
<i>Pesticide Use: Perceptions of Farmers in Northern Malta.</i>	2016	Qualitative Study
'Slow to change': Farmers' perceptions of place-based barriers to sustainable agriculture.	2017	Qualitative Study

Table 2.2: Local and foreign studies on farmers' perceptions.

## 2.8 Conclusion

We have taken various precautions to guarantee the survival of our food supplies, such as the Svalbard Global Seed Vault, in Norway where different seeds from around the globe are stored to avoid future mass extinction (Siebert, 2011). Awareness on how to avoid food waste is vital.

Buying local, leaves less carbon footprint, reduces the amount of produce lost during shipping and storage, as well as guarantees a better future for our local farmers. Shifting from imported produce to local produce will also aid the economy, ensuring fresh produce and supporting local producers. Wasting less water-intensive foods, such as meat, will also help our local economy and the environment (Royte, 2016).

Education for sustainable development may also lead to bringing about change in local farming, resorting to more efficient practices and measures. Training local farmers and understanding their needs, also guarantees more cooperation, guaranteeing a way forward, for the benefit of society, economy and the environment.

The main findings of the literature review were:

- Agriculture has progressed tremendously throughout the years, not always through the most sustainable means;
- Agriculture has a major role to play in environmental protection through the use of more sustainable means of practice;
- Sustainable agriculture can contribute towards the implementation of the 17 SDGs at a local and global level;
- Sustainable agriculture is about the efficient use of resources, conservation and protection of these natural resources, improving

social-wellbeing and resilience measures through effective use of improved mechanisms;

- Local improvements have been made, moving towards more sustainable means of practice and the publication of the National Agricultural Policy;
- Adult education, through ESD, plays a crucial role in helping change the mindsets of farmers, moving from a dominant paradigm to a more sustainable emerging paradigm;
- Alternative farming practices, such as organic farming, permaculture and aquaculture need to be further promoted through ESD;
- Farmers' perceptions, beliefs, attitudes and values need to be studied and taken into perspective when implementing new strategies, to ensure that farmers are onboard.

Through such findings, this study aims to gather farmers' views and perceptions on sustainable development in order to gain a clearer picture of the farming situation in Malta. In the following chapter, the researcher will outline the main methods of data collection used. A mixed methods approach was deemed to be most suitable to gain a clearer and wider perspective of farmers' views, perceptions and opinions on sustainable development.

3

# Methodology

## **3 Methodology**

In this chapter, the research strategy and methods which were employed to conduct this study will be outlined. The philosophy behind this research and the methodology employed to gather all the relevant data will be delved upon. This is done in light of various studies depicting the strengths and weaknesses of the selected tools.

### **3.1 Aims of the Study**

The research aims for this study are:

- to gather farmers' knowledge of their agricultural practices through their life experiences, those which were used in the past, and those used nowadays.
- view farmers' perceptions on sustainable development and seek the most viable means of moving towards more sustainable agricultural practices.
- seek to explore the farmers' attitudes in view of sustainable development, and whether they are willing to implement sustainable strategies.

### **3.2 The choice for research**

Creswell (2015) discusses what research is, stating that ultimately, research is a means of tackling certain issues and problems within the area of study. Research gives the opportunity to see what is already being

done and move on to what needs to be done. As researchers doing research in a particular field of study, we need to address the gap, by delving in literature, finding the best possible methodology to address that gap.

The gap in knowledge, which this research project aims to fill, is the lack of data on the views of full-time arable farmers on sustainable development. This research aims to gather as many farmers' perceptions and attitudes towards a sustainable farming future, and most importantly, to give a voice to the few remaining full-time conventional, arable farmers on the Maltese Islands.

### **3.3 Research Philosophy**

Creswell and Clark (2011) claim that all research has its own philosophical perspectives and foundations. These will ultimately lead to the choice of the process to conduct this research. One of the frameworks discussed in Creswell (2015) is termed as the “philosophical perspective” (p.8), which states that the researchers have their own “general beliefs and assumptions about the research” (p.8) and have their own understanding of the world around them. Ultimately, this will lead to decisions on what information needs to be collected to be able to answer the research question.

All researchers, need to acknowledge and know both their values and beliefs, which will ultimately mould the outline of their own research. However, the collection of data will finally lead to a certain element of bias

into the research. Being aware of this and staying conscious about this element of bias is of utmost importance as to guarantee a better interpretation and discussion of the results (Creswell, 2015).

Creswell and Clark (2011) discuss how research is often characterised by four basic worldviews:

- Postpositivist (often linked with quantitative research)
- Constructivist (often linked with qualitative research)
- Participatory (often linked with qualitative approaches but is attributed to politics concerns)
- Pragmatism (often linked with mixed methods research).

These worldviews often vary from one another in the ways they perceive the nature of reality itself (ontology), the way knowledge is gained through what we know (epistemology) and the research tools chosen to conduct the research itself (methodology) (Creswell and Clark, 2011, p.41).

The same authors, continue by discussing that in mixed methods research, the ontological perspective, that is the nature of reality itself, is often viewed as both singular as well as multiple, as it is based on two different research methods. Pragmatism is often perceived as the ‘most suitable’ worldview for those researchers who chose to conduct mixed methods research, however, other worldviews may be suited.

Pragmatic Worldview				
Ontology (What is the nature of the reality?)	Epistemology (What is the relationship between the researcher and that being researched?)	Axiology (What is the role of values?)	Methodology (What is the process of research?)	Rhetoric (What is the language of research?)
Singular and multiple realities (e.g., researchers test hypothesis and provide multiple perspectives)	Practicality (e.g., researchers collect data by “what works” to address research question)	Multiple stances (e.g., researchers include both biased and unbiased perspectives)	Combining (e.g., researchers collect both quantitative and qualitative data and mix them)	Formal or informal (e.g., researchers may employ both formal and informal styles of writing)

Figure 3.1: Pragmatic Worldview. Source: Creswell & Clark, 2011. P. 42.

Researchers need to acknowledge the philosophical worldview they bring to a project, identify the components of their worldview, and relate them to the specific elements of their mixed methods study.

In this research project, both a fixed and an emergent mixed methods design were combined, as the use of both quantitative and qualitative research methods was predetermined before the research and data collection was initiated, however, the qualitative data was finalised according to the interpretation of the results in the initial phase (Creswell & Clark, 2011).

### **3.4 Research methodology**

It is often the case in human sciences, that the research questions which are sought to be answered, are more or less multifaceted (Tashakkori & Teddlie, 2010). The phenomena being put under investigation, are connected and intertwined in a way where if either quantitative or

qualitative methods used on their own would not be able to reveal the true scenario behind the results.

Tashakkori & Teddlie (2010) state that “researchers immersed in a topic area are typically not only interested in what has happened (causal effects) but also in how or why it has happened (causal mechanisms)” (p.274). That is where mixed methods research comes into the picture. The more varied the tools used are, the richer the picture. Mengshoel (2012), complements them by stating the “the findings of mixed methods research are believed to be more comprehensive and valid than the findings of quantitative and qualitative studies conducted separately” (p.373). Whitehead and Schneider (2013) continue by discussing how in a mixed methods approach, the research tools should “complement each other and so are viewed as equally valuable in constructing research projects” (p. 265), where one tool helps inform the other tool offering the possibility of a more comprehensive research.

The strategy to be employed to reach the aims of this research, is through the application of both quantitative and qualitative research methods, therefore, a mixed methods approach. Mixed methods research is very often represented as the third research paradigm, whereas both quantitative and qualitative research methods are sought off as being both useful, and may eliminate the limitations of a single method research (Johnson & Onwuegbuzie, 2004).

Creswell (2015) offers a thorough explanation of what a mixed methods approach truly represents:

“An approach to research in the social, behavioural, and health sciences in which the investigator gathers both quantitative (closed-ended) and qualitative (open-ended) data, integrates the two, and then draws interpretations based on the combined strengths of both sets of data to understand research problems” (p.2).

Mixed methods offer the researchers the best means of answering their research questions, taking on both a positivist and an interpretative approach to the research. Mixed methods research, is defined “as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concept or language into a single study” (Johnson & Onwuegbuzie, 2004, p. 17)

Rauscher & Greenfield (2009) discuss how mixed methodology also helps “to cross-validate results and offset the limitations of using only one methodological approach” (p.92). Both quantitative and qualitative research methods have their own benefits and limitations. The same authors continue by debating how quantitative data is beneficial at examining relationships between different variables and coming out with predictions, but at the same time, it is not as accurate at describing the context and what led for these relationships between the different variables to occur. That is where qualitative data comes in. The aim of qualitative data is not to generalise, but rather to refine findings and go in further depth. It allows the researcher to dig into both the social and economic aspects, which are often not evident in quantitative research methods (Rauscher & Greenfield, 2009).

Using either quantitative or qualitative research on their own, was deemed as insufficient to get a clearer depiction of the farming situation in Malta. As Creswell (2015) suggests, “Quantitative research does not adequately investigate personal stories and meanings or deeply probe the perspectives of the individuals. Qualitative research does not enable us to generalise from a small group of people to a large population” (p.15).

Mixed methods research is ideal “when researchers have a specific issue or problem that is best understood through both explanation and exploration” (Rauscher & Greenfield, 2009, p.93). In their book, Creswell and Clark (2011) thoroughly highlight a set of characteristics which best portray mixed methods research. If this research method is chosen, the researcher is expected to collect both quantitative and qualitative data which are each meticulously analysed in respect to the research question. The researcher should then combine these two forms of data in a way which best suits the objectives of the research, or prioritises one form of data over the other, yet still collecting both (p.5).

Mixed methods research does not come short of its own limitations. This type of research is usually more complex than single methods research as it is usually more time-consuming since it is generally resource-intensive (Whitehead & Schneider, 2013). The researcher has to have a good know-how of both research fields, qualitative and quantitative, as well as knowing how to combine them together for better results (Rauscher & Greenfield, 2009; Creswell & Clark, 2011; Whitehead & Schneider, 2013).

### **Quantitative Research**

**Strengths:** Helps in generalizing data. Data collection may be relatively quick when using certain survey tools. Provides precise, quantitative, numerical data. Useful for sampling large numbers of people.

**Weaknesses:** The researcher may miss out on phenomena occurring because of the focus on theory. Knowledge produced may be too abstract.

### **Qualitative Research**

**Strengths:** Useful for studying a limited number of cases in depth. Provides individual case information. Provides understanding and description of people's personal experiences of phenomena. Helps describe, in rich, detail phenomena. Qualitative researchers are responsive to changes that occur during the conduct of the study.

**Weaknesses:** Knowledge produced may not generalise to other people or settings. Takes more time to collect and analyse. Results are more easily biased by researcher's personal bias.

### **Mixed Research**

**Strengths:** Words and narrative can be used to add meaning to numbers. Numbers can be used to add precision to words and narrative. Uses the strengths of both quantitative and qualitative research. Can answer a broader and more complete range of research questions. Increases the generalizability of results.

**Weaknesses:** Researcher has to learn about multiple methods and approaches and understand how to mix them properly. More time consuming. Can be difficult for a single researcher to carry out.

Figure 3.2: Strengths and Weaknesses of different research methods. Source: Johnson and Onwuegbuzie, 2004. P. 19-21

## **3.4.1 Triangulation**

There are various benefits when one does not separate the qualitative and quantitative realm, but rather encompass their nature and different methods together. When one uses methodological triangulation, there is a higher possibility of reducing errors in the research and aid in an enhanced interpretation of results (Whitehead & Schneider, 2013; Mengshoel, 2012).

Methodological triangulation or pluralism means that when a single research study is being carried out, more than one research approach, paradigm or method are used, aiming for a better explanation of findings and answering different research questions using the most appropriate means (Whitehead & Schneider, 2013). “Where two or more methods are used in this way, to try to verify the validity of the information being collected, the process is referred to as triangulation” (Blaxter, Hughes & Tight, 2001, p.84).

Doyle, Brady & Byrne (2016) outline the rationales for using mixed methods research. Triangulation is one main feature of mixed methods research. Triangulation within this type of methodological approach allows for both the quantitative and the qualitative fields to complement each other and corroborate these approaches to reach a better outcome.

### **3.5 Methods employed**

Neuman (2006) compares quantitative and qualitative data methods by explaining the deductive and inductive approach to research. Quantitative researchers often take on a deductive approach to research, beginning with a concept and seeking means of creating empirical measures to capture these concepts in a numerical form. On the other hand, qualitative researchers seek alternative means of portraying concepts other than using numbers, taking on a more of an inductive approach, by seeking to create new concepts as part of measuring and collecting data.

### **3.5.1 Quantitative approach**

Research based on quantitative methods are often based on a “positivist approach”. The quantitative research areas often “uses a language of variables and relationships among variables” (Neuman, 2006, p. 160). Quantitative research generates numeric data, which may aid in studying cause and effect, and is often of a deductive nature as it is tests a theory (Ary, Jacobs, Razavieh & Sorensen, 2006).

When collecting quantitative data, numbers are used so that the data can be in a format which is readable, and such data can be transferred into a program (Neuman, 2006), such as the SPSS.

One of the arguments against quantitative data which Creswell & Clark (2011) discuss, is that it lacks in understanding the contexts or settings in which the data has been collected from, as the voices of the participants are not directly portrayed, contrary to qualitative data collection.

### **3.5.2 Qualitative Approach**

The aim of qualitative research is to collect data which is as detailed as possible (Lichtman, 2006), having the opportunity to discuss matters with the farmers, seek their knowledge and perceptions on the issue at hand. Qualitative research “aims to achieve depth rather than breadth” (Blaxter et al., 2001, p. 64). This may be considered as a critical element of qualitative research as it “involves looking deeply at a few things rather than looking at the surface of many things” (Lichtman, 2006, p. 13).

Ary et al. (2006) discuss how qualitative researchers seek to make sense of reality and the uniqueness of each individual, how they think and how they feel in face of particular issues. It is also important to seek understanding through an insider's perspective, an "emic" perspective. The same authors continue by stating that human behaviour is affected by the context in which it is taking place, thus cannot simply be put into numbers, and what is most important "in social disciplines is understanding and portraying the meaning that is constructed by the participants involved in particular social settings or events" (p.449).

When doing qualitative research, the researcher must be aware of the risk of bias, being aware that his/her interpretation of things is influenced by their own view of the topic, thus having an influence on the interpretation of the results (Lichtman, 2006). Interpretive studies is the bases of this part of the research inquiry. "They provide rich descriptive accounts targeted to understanding a phenomenon, a process, or a particular point of view from the perspective of those involved" (Ary et al., 2006, p.463). Qualitative data, on the other hand lacks generalisation, because it is not its aim to collect data from a large number of participants, focusing on quality rather than quantity (Creswell & Clark, 2011).

### **3.5.3 This Study**

The study addresses the situation of full-time arable farmers in Malta and their perceptions on sustainable farming practices on the islands. The research tools were used sequentially (Onwuegbuzie & Collins,

2007), starting by the quantitative method, followed by the qualitative method, as the questionnaires brought forward the best open-ended questions to be asked during the interviews with the chosen farmers. This helped in adding more insights and aid understanding which might have been lost if only a single mode of research had been used (Johnson & Onwuegbuzie, 2004; Blaxter et al., 2001).

An explanatory sequential mixed methods design was used, and involved collecting quantitative data first and then explaining the quantitative results with in-depth qualitative data. The timing used in this research project is known as “Sequential timing” as it was conducted in two distinct phases; first the quantitative phase in which questionnaires were distributed with the farmers, followed by the qualitative phase in which interviews were conducted (Creswell & Clark, 2011).

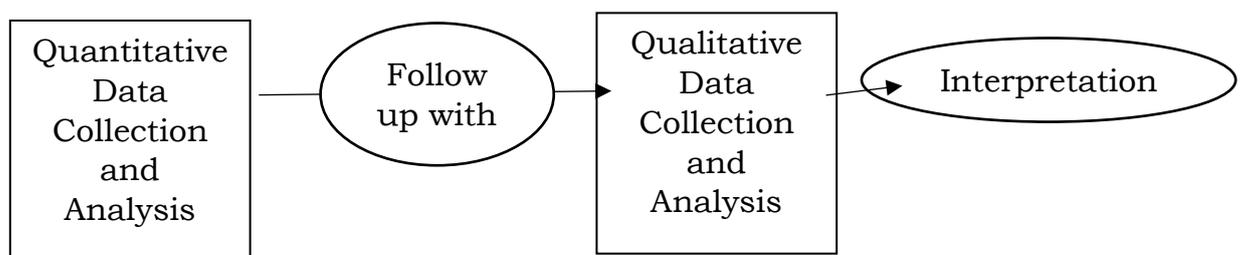


Figure 3.3: The explanatory sequential design. Source: Creswell & Clark, 2011, p.69

Doyle et al. (2016), back up Creswell & Clark (2011) by explaining that choosing the ‘explanatory sequential design’ as a means of conducting mixed methods research shows a rather upfront means of conducting research, especially when the researcher collects data on their own.

Additionally, Doyle et al. (2016) state that this type of research requires a longer time frame to complete.

In the first, quantitative phase of the study, questionnaire data was collected from approximately 168 full-time arable farmers at various locations around Malta and Gozo to assess the farming situation in Malta and their perceptions on various current farming issues. The second, qualitative phase was conducted as a follow up to the quantitative results to help explain these quantitative results. In this exploratory follow-up, the tentative plan was to explore the issues and perceptions of sustainable farming in Malta in depth and come up with solutions to tackle farming issues. The interviews were carried out with 10 full-time arable farmers around Malta and Gozo. In order to include 2 views of organic farmers, 2 interviews were conducted. The reasons behind this sample size will be discussed in a separate section in the following paragraphs.

This research is being carried out on the bases of cross-sectional research, as both the quantitative and qualitative methods will be conducted at only one point in time, leading to the disadvantage of not being able to monitor any changes in behaviour or attitude over a longer period of time (Neuman, 2006). This is being done because of the constraints of the time-frame for completing this particular research, but it would be of great interest if similar studies are carried out to monitor any changes in behaviour.

## **3.6 Research tools**

Quantitative research was carried out, through the use of questionnaires, which was followed by qualitative research through the use of interviews. Priority and focus was given to the qualitative part of the data. A mixed methods approach was chosen in order to gather a more overall picture of the situation of full-time farmers in Malta through the quantitative data collection, and to give a voice to the farmers and be able to discuss with them their perceptions on sustainable farming and their views on the future of farming in Malta, through the qualitative part.

### **3.6.1 Survey questionnaire**

A quantitative part was added to the research, in order to aid in its generalisation and provide a better general picture (Blaxter et al., 2001). Non-experimental survey research (descriptive research) was used. "Surveys permit the researcher to summarize the characteristics of different groups or to measure their attitudes and opinions towards some issue" (Ary et al., 2006, p.31).

Implementation of the questionnaires with the relevant sample size, was conducted by carrying it out face-to-face or on the internet through the use of an online survey system. Blaxter et al. (2001) discuss how face-to-face questionnaires tend to have a higher response rate, but it is rather time consuming, while on the other hand, using the internet, a higher number of farmers can be questioned in a relative short time.

The same authors continue by stating how questionnaires “are designed to collect mainly discrete items of information, either numbers or words which can be coded and represented as numbers” (p.215).

Most of the questions set in the questionnaire were based on a Likert Scale (Refer to Appendix B for questionnaires). This type of scale system is commonly used in surveys, usually used “to discover strength of feeling or attitude towards a given statement or a series of statement” (Bell, 2005, p.142), in this case measuring the farmer’s attitudes and behaviours. In this survey the researcher used 5 categories in the Likert scale: Strongly agree, Agree, Neutral, Disagree, Strongly disagree. Reference can be made to the questionnaire attached in the Appendix.

### **3.6.2 Interviews**

The method deemed to be the most adapt to gather qualitative data from the farming sample, was through individual interviews. Interviews allow the data collected to reflect the participants’ opinions, beliefs and feelings better (Ary et al., 2006). Neuman (2006) defines interviews as “a short-term, secondary social interaction between two strangers with the explicit purpose of one person’s obtaining specific information from the other” (p.305). Cohen, Manion, & Morrison (2007) agree with Neuman (2006), discussing how the aim of an interview is not only about collecting data, but it is embedded into the subject one is discussing.

Semi-structured interviews minimise deviations by asking open-ended questions, but yet allow for follow-up questions and probing questions to clarify answers and go further in depth (Newby, 2014). The type of

interview carried out is a semi-structured interview, with a prepared set of questions, while at the same time using a probing technique to elicit as much information and detail as possible (Refer to Appendix D for interview questions). Interviewer bias must be kept in mind and no personal opinions are to be given during interviews, although one must use probing techniques to encourage an ongoing conversation and keep on point (Neuman, 2006).

The disadvantage of using interviews is that it provides the researcher with a large volume of in-depth data in a relative short period of time. It is time-consuming to analyse and classify the data collected through interviews (Ary et al., 2006). There is also the risk of the interviewees not willing to provide certain information, or rather providing false information (Ary et al., 2006).

Cohen et al. (2007) discuss how voice recording the interview allows the researcher to retain eye-contact with the interviewee, although short note taking is also recommended. All of the interviews conducted with farmers were audio-recorded, with their consent, and this allowed for better communication and the farmers feeling more at ease, as it was more conversational.

### **3.7 Sample Size**

A sample is defined as “a portion of a population” (Ary et al., 2006, p.167), in this case a sample of full-time farmers. Since the sample represents only a small group of the population, it is very important that the sample

is representative of all the various characteristics of that population (Ary et al., 2006). A sample survey was conducted as a specific portion of the population investigated, at a single point in time, resulting in what is called cross-sectional surveys (Ary et al., 2006).

Non-probability sampling was chosen, as the participants were not chosen randomly but according to locality, age, etc. resulting in purposive sampling (Ary et al., 2006). Newby (2014) argues that when compared to probability sampling, this type of sample is often regarded as less demanding due to the fact that there is no probability link between the sample chosen and the population. Cohen et. al (2007) also point to the fact that when choosing non-probability sampling, the researcher must keep in mind that “it does not represent the wider population; it simply represents itself” (p.130).

Purposive sampling gives the opportunity for the researcher to select the sample which is the most representative, having the characteristics pursued and selecting cases which are most informative (Cohen et al., 2007; Neuman, 2006). This type of sampling technique is ideal when the researcher wants to “select members of a difficult-to-reach, specialized population” (Neuman, 2006, p.222), in this case full-time arable farmers. Considering that this ‘representative’ sample may not remain so ‘representative’ on the long-term, thus caution to avoid misleading results must be taken (Ary et al., 2006).

“Sampling decisions typically are more complicated in mixed methods research because sampling schemes must be designed for both the

qualitative and quantitative research components of these studies” (Onwuegbuzie & Collins, 2007, p. 281).

Since quantitative research methods were used, a sample was chosen. When choosing a sample, the researcher aims at a “representative sample, or a small collection of units from a much larger collection or population, such that the researcher can study the smaller group and produce accurate generalisations about the larger group” (Neuman, 2006, p.219).

The focus was only on arable full-time farmers. It was decided not to include part-time farmers as even if one has a field for recreational purposes he/she may register as a part-timer.

According to the National Statistics Office (NSO), from the data collected during a Farm Structure Survey carried out in 2013, the number of full-timers working on agricultural holdings that have only arable land (no rearing of animals) amounted to 725. Since this data was collected in 2013 there have been no other current publications by the NSO. Therefore, in order to obtain a more accurate number, JobsPlus data was consulted in June 2018. Occupation codes 611400 and 613001 were chosen that is, mixed crop grower and farmer (field and animals). These two categories were chosen as they are the two groups which contain the numbers of full-time arable farmers focused on in this research. All the codes used are the same codes used in the International Standard Classification of Occupations (ISCO-08) as published by the International Labour Office (2012).

<b>ISCO-08 CODE</b>	<b>OCCUPATION TITLE</b>
611400	Mixed Crop Grower
612100	Farmer, Livestock and Dairy Producer
612200	Poultry Producer
612300	Apiarists and Sericulturists ( <i>Tannaħal</i> )
612900	Animal Producers not elsewhere classified
613001	Farmer (field and animals)
631000	Subsistence Crop Farmer
632000	Subsistence Crop Farmer
633000	Subsistence Mixed Crop and Livestock Farmer

Table 3.1: Codes used by JobsPlus (2018).

### **Code 611400 as stated in ISCO-08**

“Mixed crop growers plan, organize and perform farming operations to grow and harvest specific combinations of field crops, field vegetables, tree and shrub crops, and garden, horticultural and nursery products, for sale or delivery to wholesale buyers, marketing organizations or at markets” (p.264).

### **Code 613000 as stated in ISCO-08**

“Mixed crop and animal producers plan, organize and perform farming operations to grow and harvest field, tree and various other crops, as well as to breed, raise and tend animals and to produce a variety of animal husbandry products, for sale or delivery to wholesale buyers, marketing organizations or at markets” (p.268).

OCCUPATION CODE	OCCUPATION DESCRIPTION	FULL TIME
611400	MIXED CROP GROWER	162
613001	FARMER (FIELD AND ANIMALS)	136
<b>Grand Total</b>		<b>298</b>

FULL TIME				
OCCUPATION CODE	OCCUPATION DESCRIPTION	FEMALE	MALE	TOTAL
611400	MIXED CROP GROWER	16	146	162
613001	FARMER (FIELD AND ANIMALS)	36	100	136
<b>Grand Total</b>		<b>52</b>	<b>246</b>	<b>298</b>

Data as at end June 2018 – JobsPlus

OCCUPATION CODE	OCCUPATION DESCRIPTION	REGION OF EMPLOYER	FULL TIME
611400	MIXED CROP GROWER	GOZO AND COMINO	23
		NORTHERN DISTRICT	48
		NORTHERN HARBOUR DISTRICT	23
		SOUTH EASTERN DISTRICT	15
		SOUTHERN HARBOUR DISTRICT	8
		WESTERN DISTRICT	45
<b>Group Total</b>			<b>162</b>
613001	FARMER (FIELD AND ANIMALS)	GOZO AND COMINO	27
		NORTHERN DISTRICT	50
		NORTHERN HARBOUR DISTRICT	16
		SOUTH EASTERN DISTRICT	7
		SOUTHERN HARBOUR DISTRICT	8
		WESTERN DISTRICT	28
<b>Group Total</b>			<b>136</b>
<b>Grand Total</b>			<b>298</b>

Data as at end June 2018 – JobsPlus

So, the total of these two categories are 162 and 136, totalling 298 full-time farmers. Choosing a confidence interval (margin of error) of 5% and a confidence level of 95%, the sample needed totalled to 168 full-time farmers. As for the interviews, a selection of 10 farmers from across Malta

and Gozo were chosen, adding another 2 interviews with full-time certified organic farmers.

Since farmers may be hard to reach, snowball sampling techniques were also used. Farmers who participated in the survey, encouraged other farmers to participate or referred the researcher to other farmers who may have been interested in participating. This technique was effective at breaking the ice, encouraging them to participate and answer the questions truthfully.

In the survey carried out, most of the questions asked were close ended questions, based on a Likert scale answer. These close ended questions were chosen so that the questionnaire would be easier to answer and takes the least possible time to answer, keeping in mind the cohort this questionnaire was addressed to. These close-ended questions are more likely to encourage the respondents to answer truthfully on sensitive issues (Neuman, 2006). At the end of the survey the respondents were still given the opportunity to transcribe their opinions on certain issues.

Most of the questionnaires were conducted face-to-face with the farmers. This encouraged a higher response rate as the purpose of the study was clarified and all the questions were explained if any of the respondents needed clarifications. The disadvantage of conducting the surveys face-to-face is that it is very time consuming. Using the snow-ball effect, some of the farmers also offered to give out some questionnaires to other farmers. The information letter was handed in with each of these questionnaires, and the participants were asked to keep this information

in case they needed to contact the researcher later on during the study (Refer to Appendix A for information letter).

A total of 64 surveys were administered online by using an online survey system. The link to this questionnaire was shared on online farming platforms and groups, asking for permission of the administrators of such groups to share such content on their pages. The advantage of collecting some of the surveys online is that it is cost effective and less time consuming than conducting it face-to-face. The IP address for these online questionnaires was not collected to guarantee anonymity of all the participants. The information letter and contact information was also provided for the participants who chose to answer the survey online in case any clarifications were needed.

The interviews were all carried out face-to-face with the participants, at a time and place which was of convenience for them. Most of the interviews were conducted late in the evening, mostly after 6 pm, as most of the farmers would have finished their working day. All the participants were asked to read and sign a consent form. The aim of conducting interviews with full-time farmers was to seek their truthful opinion on specific issues which are related to farming. During the interview, farmers expressed their opinion and worldview on current issues related to the sustainable development of the agricultural industry on the Maltese Islands.

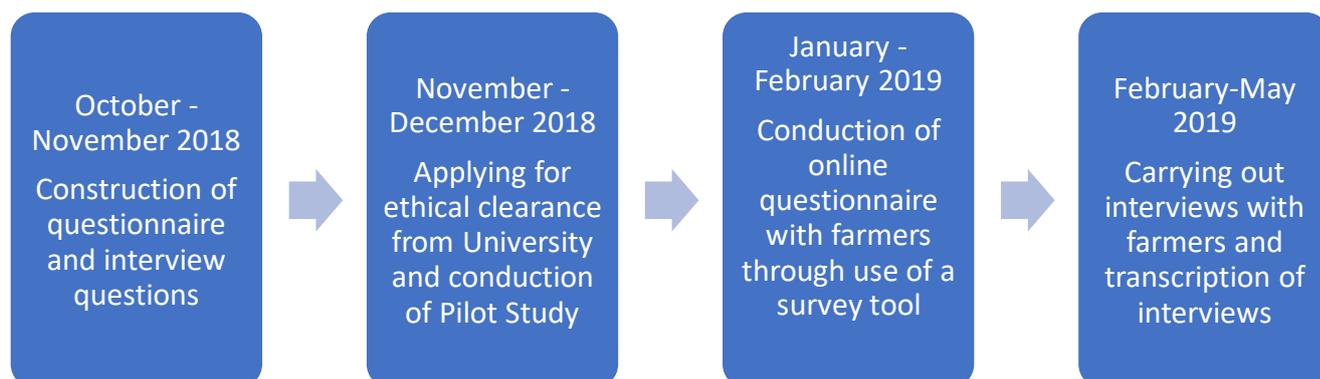
All the interviews, with the consent of the respondents, were audio-recorded and all was transcribed later. The time spent answering

questions and discussing issues ranged from twenty minutes to an hour and forty-five minutes. The interviews proved to be of high interest and very fruitful as all farmers showed great knowledge in their area of specialisation. The following table represents all the information for the different interviews. Some of the locations have not been provided as to safeguard the identity of the farmers.

<b>Interview</b>	<b>Date</b>	<b>Location</b>	<b>Interview time</b>
Farmer 1	28-01-2019	Mġarr	18:22
Farmer 2	05-02-2019	Rabat	56:44
Farmer 3	19-02-2019	Mġarr	1:21:25
Farmer 4	22-02-2019	Żebbiegħ	1:40:29
Farmer 5	01-03-2019	Rabat	50:08
Farmer 6	08-03-2019	Mġarr	43:54
Farmer 7	10-03-2019	Organic	13:29
Farmer 8	15-03-2019	Organic	28:56
Farmer 9	30-03-2019	Kerċem, Gozo	30:46
Farmer 10	30-03-2019	Kerċem, Gozo	38:51
Farmer 11	31-03-2019	Gozo	47:31
Farmer 12	06-04-2019	Hydroponics	16:00

Table 3.2: List of interviewed farmers.

The following timeline, represents the process and timeframe used to conduct and collect all the relevant data needed for this research.



### **3.8 Ethical Issues**

As Neuman (2006) states “the ethical issues are the concerns, dilemmas, and conflicts that arise over the proper way to conduct research. Ethics define what is or is not legitimate to do, or what “moral” research procedure involve” (p.129). For ethical correction, the research must be able to find a balance between pursuing the knowledge and finding answers to the research questions, but at the same time keeping in mind the rights of the participants, in particular guaranteeing anonymity (Bell, 2005; Neuman, 2006).

All participants in this research participated on a voluntary bases and were not pressured to participate. Informed consent was sought (Refer to Appendix C for consent form) as they were provided with the conditions under which the study is being carried out (Gay, Mills & Airasia, 2009). All participants who agreed to be interviewed were given the opportunity to terminate their involvement in the study at any point during the research, without facing any consequences. Privacy was safeguarded by not asking any personal information or any data which could lead to identification of the participants, thus also guaranteeing anonymity and confidentiality by not naming the participants in any way.

### **3.9 Pilot Study**

After designing the interview and the methodology is approved, it is very important to carry out a pilot study. This will be an eye-opener on

questions which may not have the correct wording, may be misunderstood, etc. This allows for further refinement of the questions and allows the researcher to deal with any unanticipated problems which may arise during data collection (Ary et al., 2006; Neuman, 2006).

The pilot questionnaire was conducted with 10% of the population, that is 17 questionnaires in total. These questionnaires were conducted face-to-face as to make sure that the questions are properly worded and understood. In fact, some changes were made to the questionnaire to make it more user friendly and ensure better results.

### **3.10 Validity, Reliability and Generalizability**

“Perfect reliability and validity are virtually impossible to achieve. Rather, they are ideals researchers strive for” (Neuman, 2006, p.188).

Reliability indicates that the study is consistent, and the results do not vary (Neuman, 2006.) For a study to be reliable, it must produce similar results if it is carried out by another researcher, if the same research conditions are provided (Bell, 2005). In this study, it was made a point by the researcher that all interviews were carried out under the same conditions, where farmers felt most at ease, at a time and day which was feasible for them. With regards to questionnaires, those which were administered face-to-face, were completed under similar conditions and took between 5 to 10 minutes to complete. These were often read to the respondents in order to ease the process.

Validity, on the other hand, suggests truthfulness. “It refers to how well an idea “fits” with actual reality.” (Neuman, p.188). Validity is also the level to which the data accurately gauges what is being measured (Gay et al., 2009). Validity is also based on authenticity, ultimately leading to the question: “Would I feel sufficiently secure about these findings to construct social policy or legislation based on them?” (Lincoln, Lynham & Guba, 2011, p.121). In other words, validity is the extent to which the research project truly measures what it is supposed to measure, how credible the research is (Bell, 2005). In this study, using triangulation of methods, using both surveys and interviews, helped “produce a more accurate, comprehensive and objective representation of the object of study” (Silverman, 2014, p.91).

Generalisability is often linked to the field of quantitative data rather than qualitative data, as the latter it is often not the goal to generalise (Ary, et al., 2010). Generalisability may be viewed as the extent to which the theory generated during the research, may be useful in understanding comparable situations within the specific group used during the research (Cohen et al., 2007). As for this study, being a cross-sectional research which was carried out at one-point in time, may cause limitations with regards to generalisability. Most of the questionnaires were directly administered face-to-face with the farmers which resulted in a higher response rate.

## **3.11 Data Analysis**

### **3.11.1 Analysis of Quantitative Data**

The quantitative data collected from questionnaires will be statistically analysed. Gay et al. (2009) state that “Statistics is simply a set of procedures for describing, synthesizing, analysing, and interpreting quantitative data” (p. 303). The same authors describe how the first step is to convert the quantitative data collected into numerical form, that is the process of scoring quantitative data, followed by tabulating the data, that is entering the data into a spreadsheet, finally followed by analysing the data itself. The data from the questionnaire, was numerically coded and inputted into SPSS which led to an analysis of the results.

The Likert-scale was used in the questionnaire, resulting in ranking of answers. Additionally, the Kruskal-Wallis test was used to be able to evaluate the statistical significance when comparing groups, such as the influence of age group when answering another question (Ary, et al. 2010). This test, allows the researcher to “test the difference in ranks of three or more independent groups”, allowing both nominal and ordinal data to be compared (Gay, et al. 2009, p.353). The Chi-square tests was also used to be able to observe the frequencies of results and its statistical significance between different variables (Ary, et al., 2010).

### **3.11.2 Analysis of Qualitative Data**

When it comes to analysing the qualitative data collected, in this case interviews, Gay, et al. (2009) discuss how first, one must start by identifying themes, such as common themes and issues which repeat themselves. This is usually known as coding which allows the clustering of ideas helping the researcher in drawing up conclusions and understanding the meaning behind 'clusters' (Bell, 2005). Using coding, the researcher helps detect frequencies and patterns occurring in the transcriptions of the interview data (Cohen et al., 2007).

Merriam (2009) discusses how qualitative data analysis aims at making sense of all the data, leading to the researchers interpreting and making meaning of what the people have said while being interviewed. The same author provides a step-by-step process of analysing qualitative research:

1. **Category construction:** The researcher jots down notes on the transcript itself, adding comments and bits which are of interest in view of the research aims, usually known as open coding.
2. **Sorting Categories and Data:** At this stage there should be a link between the codes used in different transcript analysis, adding on relevant subcategories or renaming the previously used categories to group all the different themes, usually known as axial coding.
3. **Naming the Categories:** At this point naming the categories should reflect what has been analysed in the data, exhausting all the relevant data presented in the transcripts, usually known as

selective coding. Finalisation of the themes and sub-themes is reached.

Using these steps, a detailed analysis of the transcripts was carried out manually, using colour coding for all the different themes, adding on side-notes and reflections throughout the transcript.

### **3.12 Conclusion**

In this chapter, the research methods chosen were outlined under the realm of a mixed-methods approach. Conducting both quantitative and qualitative data helped in a deeper analysis of the study, targeting all the different aims. The following chapter will now delve into the analysis of both the survey data and interview data, respectively.

4

# Data Analysis

## **4 Data Analysis**

The following chapter represents the results collected through both quantitative and qualitative research methods. The quantitative data was obtained through the use of questionnaires, while the qualitative data was gathered through face-to-face interviews.

### **4.1 Quantitative Data Analysis**

In the first section, the analysis of the data collected from the questionnaire will be analysed. Since the data collected was found to be non parametric after a test of normality, the Kruskal-Wallis test was used to compare different variables.

A total of 168 questionnaires were collected, both from an online survey system, using surveymonkey, and face-to-face. However, most were conducted face-to-face with the farmers or distributed to other farmers by the farmers themselves, using the snowball effect.

The first section of the questionnaire included questions about the demographics of the farmers participating.

## 4.1.1 Demographics of the sample

### 4.1.1.1 Gender

Gender		Frequency	Percent
Valid	Female	20	11.9
	Male	148	88.1
	Total	168	100.0

Table 4.1 Respondents by gender



Figure 4.1 Percentage of respondents by Gender

Results show that the majority of farmers were male, with a total of 148 (88.1%). On the contrary, only 20 females participated in this survey (11.9%). In fact, Jobsplus data (June, 2018) indicates that the number of female mixed crop growers and female farmers having both crops and animals totals to 52 farmers contrary to 246 male farmers. The sample is therefore representative of the whole population.

#### 4.1.1.2 Age Group

Age Group		Frequency	Percent
Valid	18-23	5	3.0
	24-29	6	3.6
	30-35	16	9.5
	36-41	23	13.7
	42-47	20	11.9
	48-53	23	13.7
	54-59	35	20.8
	60-65	23	13.7
	65+	17	10.1
	Total	168	100.0

Table 4.2 Respondents by age group

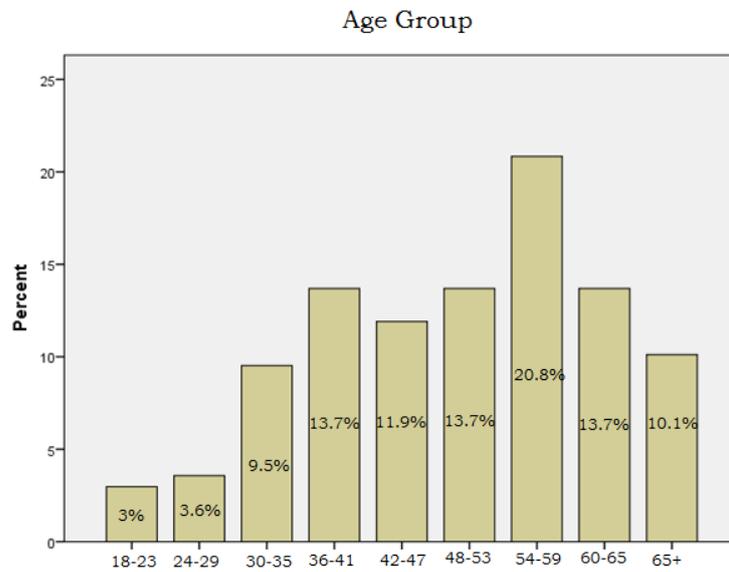


Figure 4.2 Percentage of respondents by age group

From the statistics collected, it is evident that the number of young farmers is decreasing, which will most likely result in a decreasing farming population in the future. The youngest age group totalled to just 3%, while the second youngest age group totalled to 3.6%. The majority of farmers who participated were aged between 54 and 59 (20.8%). There were three age groups who had the same amount of participants 36-41, 48-53 and 60-65, each totalling to 13.7%.

#### 4.1.1.3 Level of Education

Level of education		Frequency	Percent
Valid	Primary	25	14.9
	Secondary	115	68.5
	Tertiary	25	14.9
	Total	165	98.2
Missing	System	3	1.8
Total		168	100.0

Table 4.3 Respondents by level of education

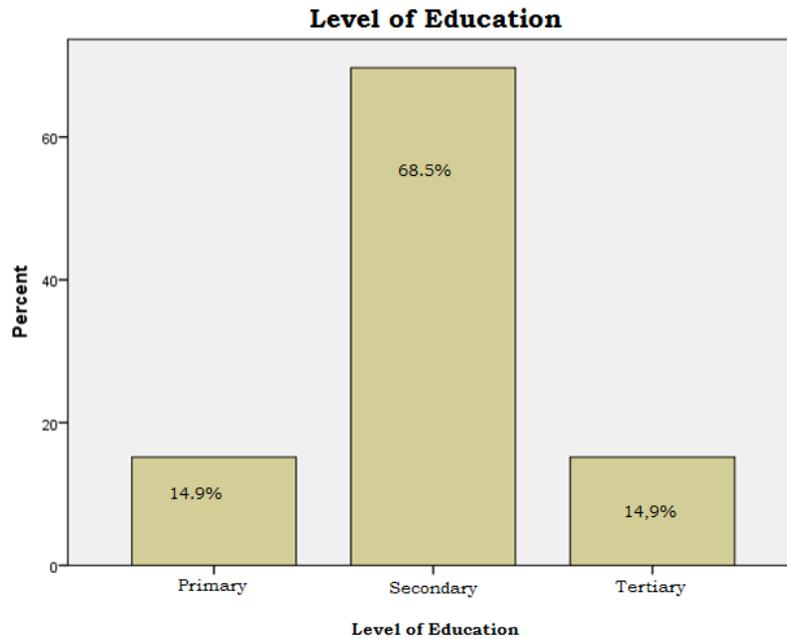


Figure 4.3: Percentage of participants by age group

The great majority of farmers had Secondary level of education (68.5%). On the other hand, both Primary and Tertiary levels of education amounted to the same amount of farmers (14.9%). Three of the participants chose not to answer this question (1.8%). The number of participants completing only the Primary level of education is quite similar to the number of elderly farmers, keeping in mind that education in their time was only obligatory till Primary.

The following map represents the regions identified by the National Statistics Office (NSO) as at 2017. These same regions were used for the purpose of this study. These same districts are the same statistical districts used by JobsPlus, whose data has been used throughout this study.



Figure 4.4: Map of Malta showing regions

**Southern Harbour** Cospicua; Fgura; Floriana; Hal Luqa; Haż-Żabbar; Kalkara; Marsa; Paola; Santa Luċija; Senglea; Hal Tarxien; Valletta; Vittoriosa; Xgħajra.

**Northern Harbour** Birkirkara; Gżira; Hal Qormi; Hamrun; Msida; Pembroke; San Ġwann; Santa Venera; St Julian's; Swieqi; Ta' Xbiex; Tal-Pieta; Tas-Sliema.

**South Eastern** Birżebbuġa; Gudja; Hal Ghaxaq; Hal Kirkop; Hal Safi; Marsaskala; Marsaxlokk; Mqabba; Qrendi; Żejtun; Żurrieq.

**Western** Had-Dingli; Hal Balzan; Hal Lija; H'Attard; Haż-Żebbuġ; Iklin; Mdina; Mtarfa; Rabat; Siġġiewi.

**Northern** Hal Għargħur; Mellicha; Mgarr; Mosta; Naxxar; St Paul's Bay.

**Gozo and Comino** Fontana; Ghajnsielem; Għarb; Għasri; Munxar; Nadur; Qala; San Lawrenz; Ta' Kerċem; Ta' Sannat; Victoria; Xgħra; Xewkija; Żebbuġ

#### 4.1.1.4 Regions where the farmers live

Region		Frequency	Percent
Valid	Northern	82	48.8
	Western	48	28.6
	N. Harbour	7	4.2
	S. Harbour	7	4.2
	South Eastern	9	5.4
	Gozo	15	8.9
	Total	168	100.0

Table 4.4: Respondents by region where they live

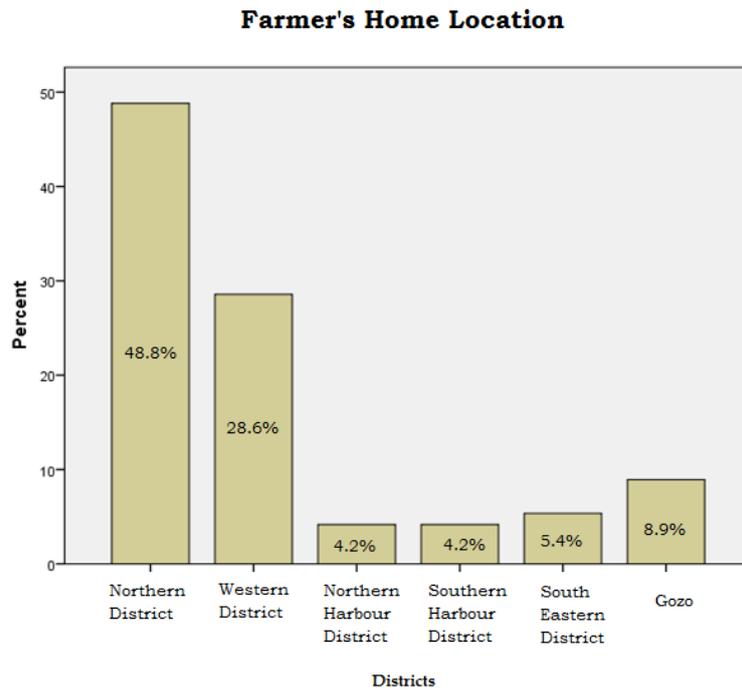


Figure 4.5: Percentage of respondents by region where they live

Results indicate that the majority of participating farmers live in the Northern District (48.8%) and the Western District (28.6%). Due to data protection, Jobsplus could not provide personal data on farmers, so the only data available is from the NSO (2016) was complimentary to the results obtained in this research which shows that the majority of the farmers dwelled in the Northern district (total of 239 farmers) and the Western district (total of 180 farmers), followed by Gozo (total of 75 farmers).

#### 4.1.1.5 Regions where farmers have their fields

Regions of fields		Frequency	Percent
Valid	1	73	43.5
	1, 2	14	8.3
	2	48	28.6
	3	3	1.8
	3, 2, 1	2	1.2
	4	5	3.0
	4, 5	1	.6
	5	7	4.2
	6	15	8.9
	Total	168	100.0

Table 4.5 Regions where farmers have their fields

Regions	
1	Northern region
2	Western region
3	Northern Harbour region
4	Southern Harbour region
5	South Eastern region
6	Gozo

Table 4.6 Explanation of region numbers

Complimentary to the previous results, the majority of farmers have their fields in the Northern Region and the Western Region. Most of the participants have fields in different localities, usually in districts close by. Most of the fields are inherited from one generation to another, becoming smaller in size and in some cases inheriting fields even from the wife's/husband's family, possibly in a different locality.

#### 4.1.1.6 Years of experience

Years of experience	Frequency	Percent	
Valid	1-10	34	20.2
	11-20	43	25.6
	21-30	29	17.3
	31-40	30	17.9
	41-50	27	16.1
	Over 50	3	1.8
	Total	166	98.8
Missing	System	2	1.2
Total	168	100.0	

Table 4.7 Respondents according to years of experience

The results for this category were quite varied, almost 25% of the participants having between eleven to twenty years of experience (25.6%), followed by one to ten years of experience (20.2%). Most of the farmers commented that although some have not worked full-time for a long period of time in this sector, since their families worked in farming, most went to help in the fields, adding to their experience and practice in the field. Growing up in the fields, helping out with the chores at a young age, helped the current farmers familiarise themselves with farming practices, even gaining an insight into indigenous knowledge and traditional farming practices.

### 4.1.2 Statement Analysis

The following statistics represents data collected through statements using a likert scale. The table below represents the likert scale used.

S.D.	D.	N.	A.	S.A.
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Table 4.8 Explanation of Likert Scale

**Variable 8. I understand what sustainable farming practices are. (Sustainable means that farmers safeguard the environment whilst guaranteeing a good livelihood and quality produce).**

		Frequency	Percent
Valid	S.D.	2	1.2
	D.	0	0
	N.	13	7.7
	A.	78	46.4
	S.A.	74	44.0
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.9 Frequency and percentage of respondents for variable 8



Figure 4.6 Percentage of participants' response for variable 8

The majority of the farmers answered positively to this statement, verifying that over 90% of the participants agree or strongly agree that they do understand what sustainable farming practices are. On the contrary, 2 participants strongly disagreed (1.2%) while 13 participants (7.7%) chose to remain neutral. Only one of the participants decided not to answer this question.

**Variable 9. I understand what unsustainable farming practices are. (Unsustainable means that making a good profit and producing fruits/vegetables, comes at the cost of the environment).**

		Frequency	Percent
Valid	S.D.	10	6.0
	D.	23	13.7
	N.	19	11.3
	A.	68	40.5
	S.A.	43	25.6
	Total	163	97.0
Missing	System	5	3.0
Total		168	100.0

Table 4.10 Frequency and percentage of respondents for variable 9

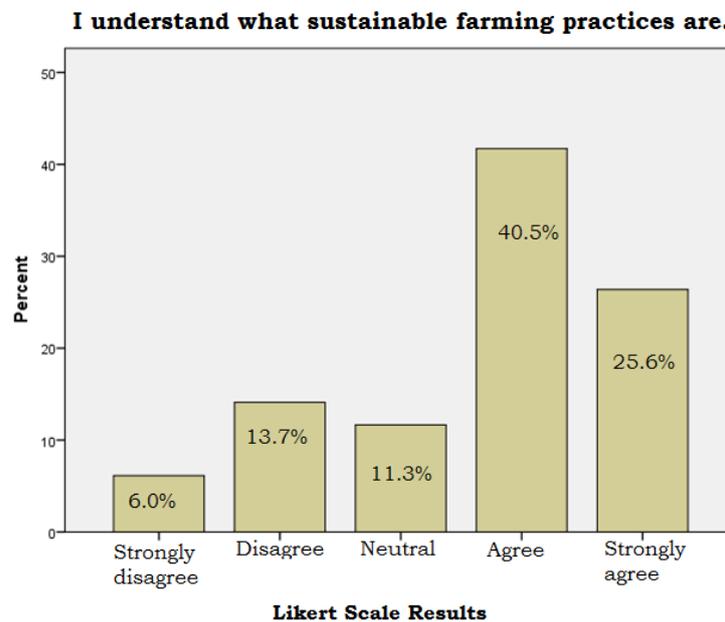


Figure 4.7 Percentage of participants' response for variable 9

The results for this statement were more varied than the previous one. The majority agreed (40.5%) or strongly agreed (25.6%) with this statement, positively confirming that they are aware of what unsustainable farming practices are. The minority (6.0%) strongly disagreed with the statement while others disagreed (13.7%). More participants opted to choose a neutral answer (11.3%) and another 5 participants opted out of this statement.

**Variable 10. I am aware that water is a limited resource in the Maltese Islands.**

		Frequency	Percent
Valid	S.D.	0	0
	D.	8	4.8
	N.	6	3.6
	A.	73	43.5
	S.A.	79	47.0
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.11 Frequency and percentage of respondents for variable 10

**I am aware that water is a limited resource in the Maltese Islands**

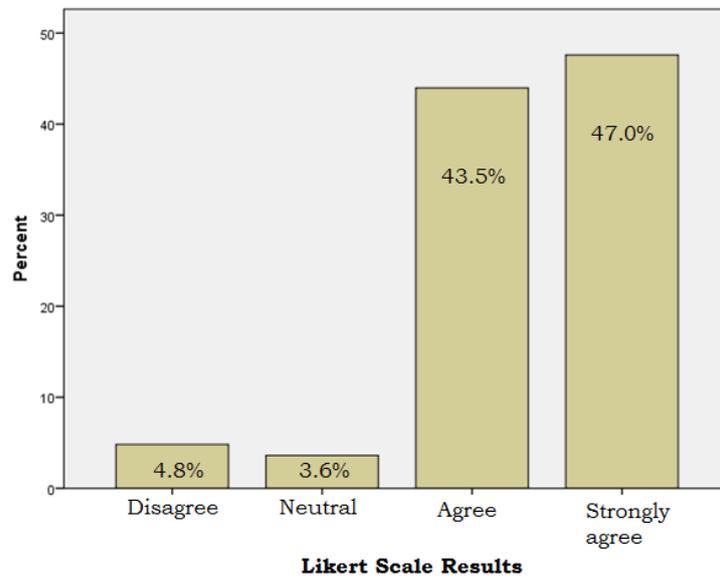


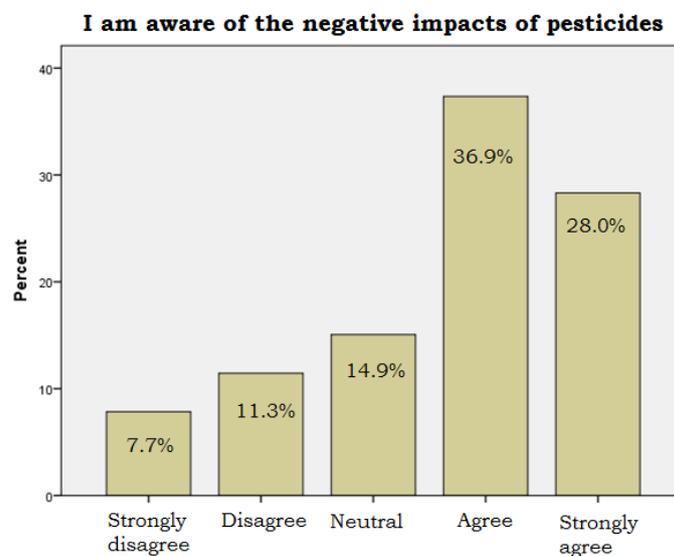
Figure 4.8 Percentage of participants' response for variable 10

The majority of the results for this statement were positively skewed with 43.5% of the participants agreeing with the given statement, while 47% answered that they strongly agree. In contrast, 4.8% answered that they disagree with the statement, while 3.6% opted for a neutral answer. Two participants chose not to answer this question. The results show that the great majority of farmers are conscious of the fact that this natural resource is very limited on the Islands, depending only on groundwater and seasonal rainwater.

**Variable 11. I am aware of the negative impacts pesticides leave on our environment and local habitats.**

		Frequency	Percent
Valid	S.D.	13	7.7
	D.	19	11.3
	N.	25	14.9
	A.	62	36.9
	S.A.	47	28.0
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.12 Frequency and percentage of respondents for variable 11



**Likert Scale Results**

Figure 4.9 Percentage of participants' response for variable 11

Although the results show that they are positively skewed, the results are more varied. Overall, half of the participants opted to choose to agree (36.9%) or strongly agree (28%) with this statement. However, some of the participants strongly disagreed (7.7%) or disagreed (11.3%) with the statement. More participants chose to remain neutral (14.9%), while another two participants chose not to answer. The increase of participants who chose to remain neutral may be a result of the controversy related to such a statement, thus opting not to provide an opinion.

**Variable 12. I am aware that artificial fertilisers can have a negative impact on the environment.**

		Frequency	Percent
Valid	S.D.	9	5.4
	D.	19	11.3
	N.	25	14.9
	A.	80	47.6
	S.A.	34	20.2
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.13 Frequency and percentage of respondents for variable 12

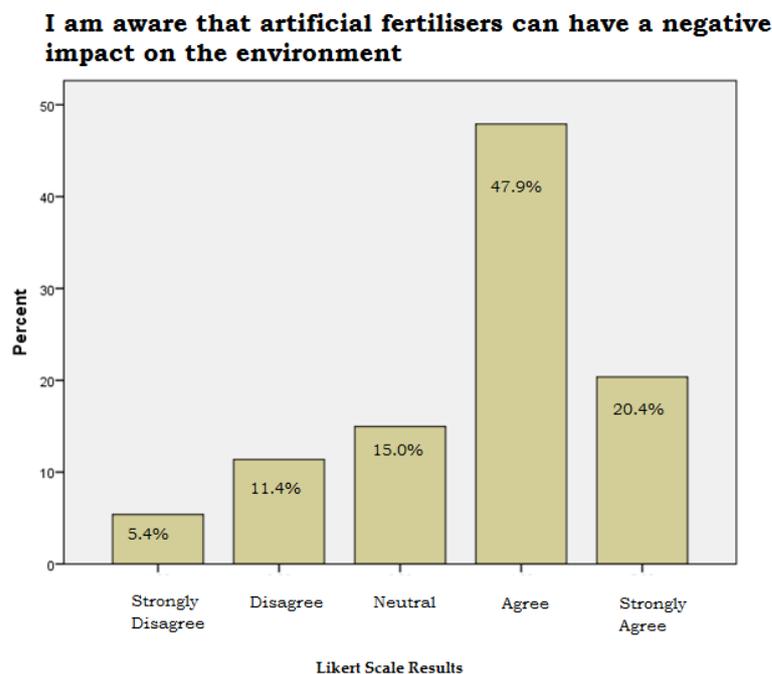


Figure 4.10 Percentage of participants' response for variable 12

Almost half of the participants answered that they agreed (47.9%), while others stated that they strongly agreed (20.4%) with the statement that artificial fertilisers can have an impact on the environment. Meanwhile, other participants disagreed (11.4%), while others strongly disagreed (5.4%) with the statement. 15% opted to remain neutral to this statement. Only one person decided not to answer.

**Variable 13. I am aware of the time frame when I should spread manure on fields.**

		Frequency	Percent
Valid	S.D.	1	.6
	D.	8	4.8
	N.	7	4.2
	A.	78	46.4
	S.A.	72	42.9
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.14 Frequency and percentage of respondents for variable 13

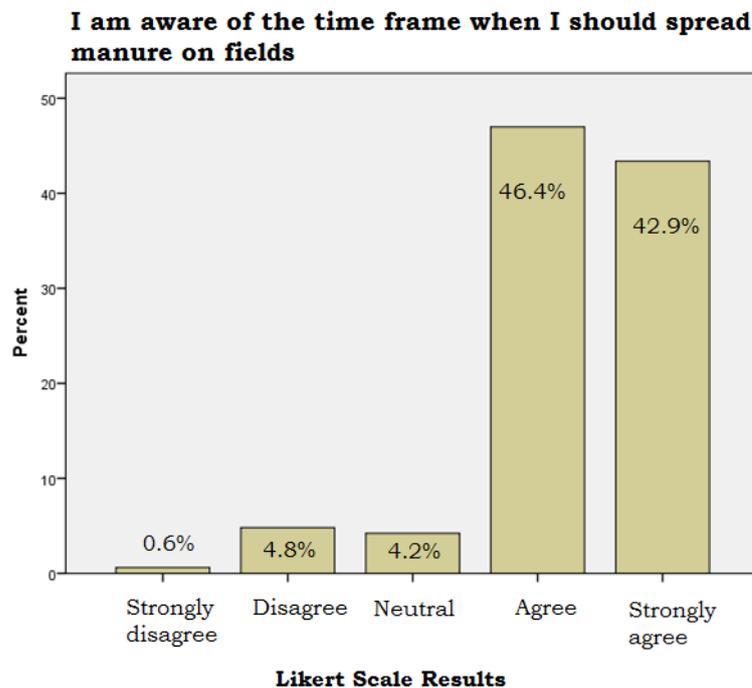


Figure 4.11 Percentage of participants' response for variable 13

The results for this statement are positively skewed. The majority agreed with this statement (46.4%), followed by those who strongly agreed (42.9%). Only one participant strongly disagreed (0.6%), while eight participants disagreed (4.8%). Seven participants chose to remain neutral (4.2%) to this statement, with only two participants choosing not to answer. This shows that the majority of the farmers are conscious of the time-frame set up by the nitrates directive to limit the levels of nitrates reaching the water-table.

**Variable 14. I am aware of the effects of excessive use of manure on the quality of underground water.**

		Frequency	Percent
Valid	S.D.	8	4.8
	D.	24	14.3
	N.	18	10.7
	A.	74	44.0
	S.A.	42	25.0
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.15 Frequency and percentage of respondents for variable 14

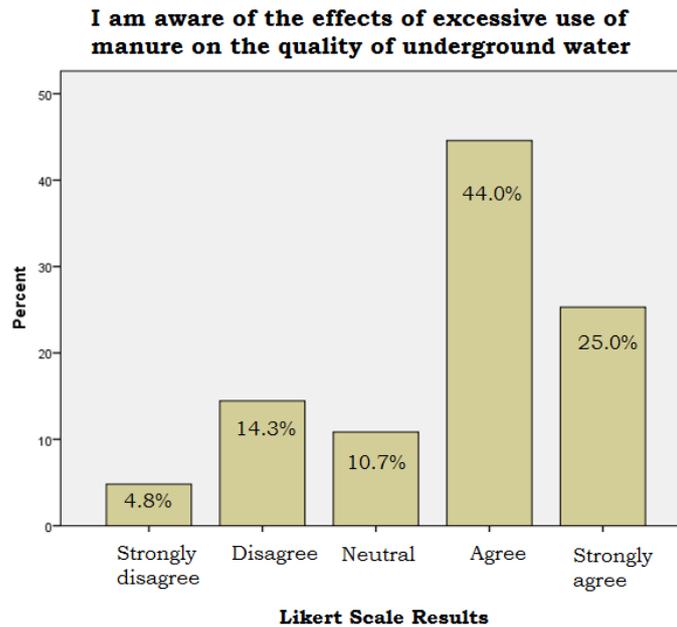


Figure 4.12 Percentage of participants' response for variable 14

As shown in this graph, 44% of the participants agreed while 25% strongly agreed that they are aware of the effects that excessive use of manure has on nitrate levels in underground water. On the contrary, 14.3% disagreed while another 4.8% strongly disagreed with this statement. 10.7% chose to remain neutral, while 2 participants chose not to answer. The issue of excessive nitrates in groundwater is a controversial issue, with farmers having different opposing opinions as to why nitrates are found in water. This issue was discussed in chapter 2, the literature review.

**Variable 15. I believe that the sale of agricultural land to land developers is not a threat to the farming industry in Malta.**

		Frequency	Percent
Valid	S.D.	106	63.1
	D.	35	20.8
	N.	9	5.4
	A.	10	6.0
	S.A.	7	4.2
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.16 Frequency and percentage of respondents for variable 15

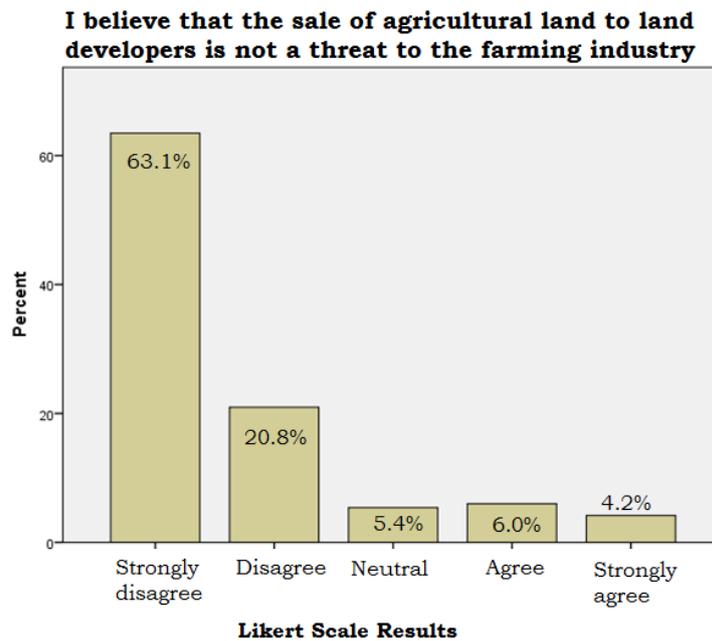


Figure 4.13 Percentage of participants' response for variable 15

As the graph shows, the results were more negatively skewed when it came to this statement, which results in over half of the participants strongly disagreeing (63.1%) with this statement while others disagreed (20.8%). Only a minority chose to agree (6%) or strongly agree (4.2%) with the given statement. A few others chose to remain neutral (5.4%) while only one participant did not answer. Being negatively skewed shows that the majority of farmers believe that the sale of agricultural land to land developers is in fact a threat to the farming industry, as arable land is decreasing.

**Variable 16. All farmers should regulate the use of pesticides to guarantee well-being of the natural environment and consumers.**

		Frequency	Percent
Valid	S.D.	1	.6
	D.	1	.6
	N.	6	3.6
	A.	72	42.9
	S.A.	87	51.8
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.17 Frequency and percentage of respondents for variable 16

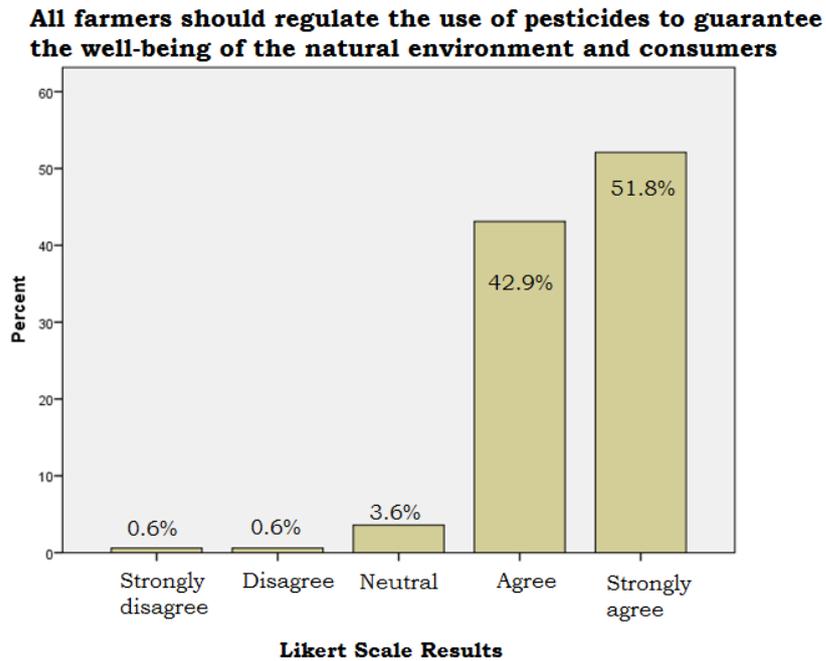


Figure 4.14 Percentage of participants' reponse for variable 16

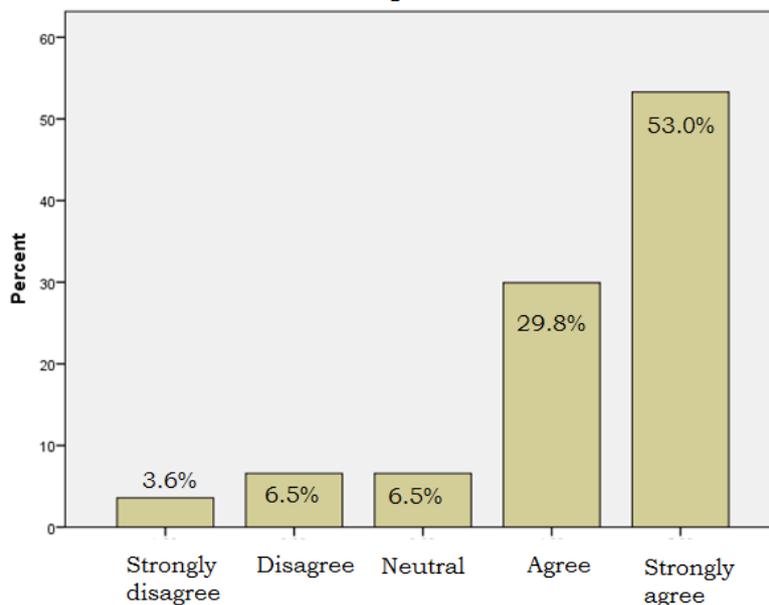
As the graph depicts, the results are very positively swayed, with a total of over 90% of the participants agreeing (42.9%) or strongly agreeing (51.8%) to the proper regulation of the use of pesticides in order to guarantee the well-being of both the environment and those consuming the produce. Only one participant respectively chose to strongly disagree (0.6%) or disagree (0.6%), while a few others remained neutral (3.6%). Only one participant chose not to provide an answer to this statement.

**Variable 17. There is a bad image of local produce containing excessive amounts of pesticides and fertilisers.**

		Frequency	Percent
Valid	S.D.	6	3.6
	D.	11	6.5
	N.	11	6.5
	A.	50	29.8
	S.A.	89	53.0
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.18 Frequency and percentage of respondents for variable 17

**There is a bad image of local produce containing excessive amounts of pesticides and fertilizers**



**Likert Scale Results**

Figure 4.15 Percentage of participants' response for variable 17

Over half of the farmers strongly agree (53%) while others agree (29.8%) with the given statement, that there is a bad image of local produce containing excessive amounts of pesticides and fertilisers. The results are positively skewed with the great majority showing agreement. The minority strongly disagree (3.6%) with this statement, while the same number of participants have chosen to disagree (6.5%) or remain neutral (6.5%) to this statement. Only one participant chose not to answer this question.

**Variable 18. Organic farming should be widely practiced on the Maltese islands.**

		Frequency	Percent
Valid	S.D.	17	10.1
	D.	25	14.9
	N.	44	26.2
	A.	61	36.3
	S.A.	19	11.3
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.19 Frequency and percentage of respondents for variable 18

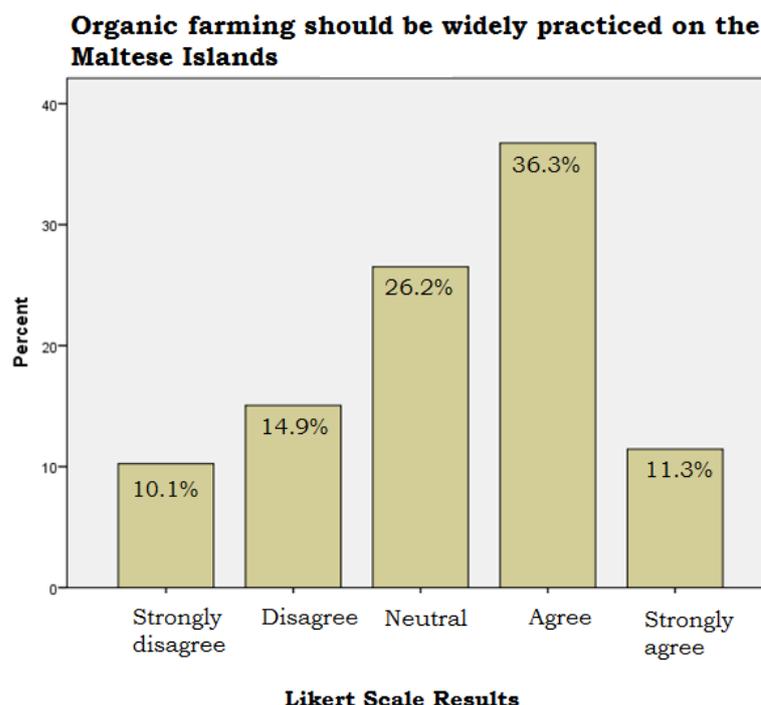


Figure 4.16 Percentage of participants' response for variable 18

The responses for this statement were quite varied. The majority (36.3%) agreed that organic farming should be widely practiced on the Maltese Islands. The percentage of those who strongly agreed was of 11.3%. The second most common choice was to remain neutral (26.2%), so choosing neither to agree or disagree. The minority chose to strongly disagree (10.1%) while the remaining disagreed (14.9%). Organic farming is still not widely practiced on the Maltese Islands and conventional farmers have various opinions with regards to such a practice.

**Variable 19. Consumers prefer organic produce over inorganic.**

		Frequency	Percent
Valid	S.D.	6	3.6
	D.	33	19.6
	N.	57	33.9
	A.	54	32.1
	S.A.	17	10.1
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.20 Frequency and percentage of respondents for variable 19

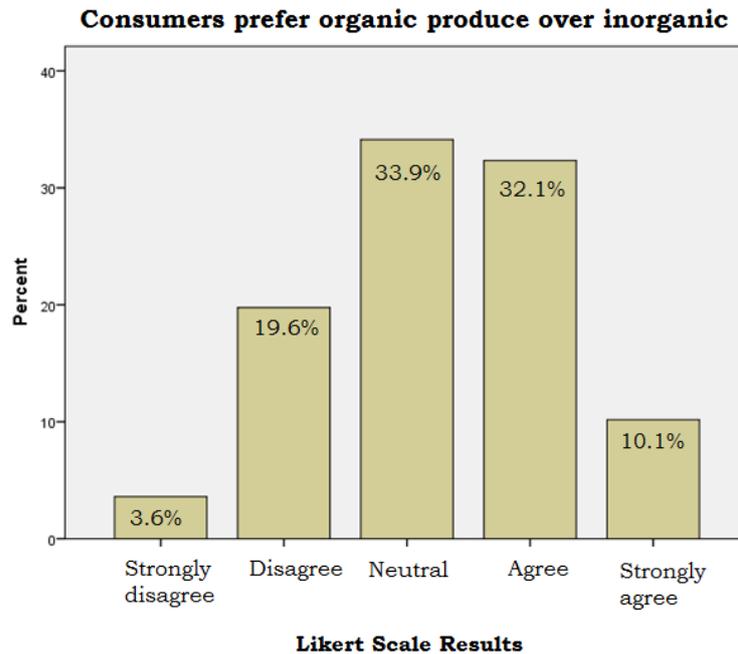


Figure 4.17 Percentage of participants' response to variable 19

Once again the answers were varied. The majority opted to remain neutral (33.9%) showing that they could neither agree or disagree to whether consumers opted to choose organic produce over inorganic produce. The second most popular choice was to agree (32.1%) showing that farmers are recognising the trend within consumer choices, while others chose to strongly agree (10.1%). On the contrary, 19.6% chose to disagree while 3.6% strongly disagreed with the statement. Only one participant did not answer the question.

**Variable 20. Consumers prefer local produce over foreign produce.**

		Frequency	Percent
Valid	S.D.	10	6.0
	D.	19	11.3
	N.	32	19.0
	A.	61	36.3
	S.A.	46	27.4
	Total	168	100.0

Table 4.21 Frequency and percentage of respondents for variable 20

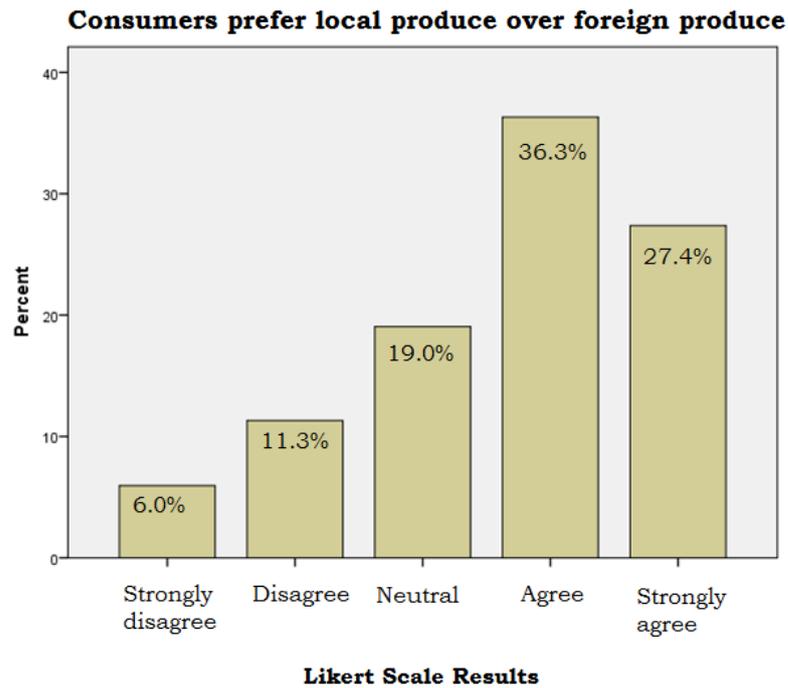


Figure 4.18 Percentage of participants' response for variable 20

As the results on the graph show, the majority opted to agree (36.3%) or strongly agree (27.4%) with the statement, making the results positively skewed. Farmers still believe that local produce is still greatly preferred by local consumers. 19% opted to take a neutral stance, with some of those whose questionnaire was conducted face-to-face stating that there is a mixture of both preferences so they could neither agree or disagree. 11.3% disagreed while 6% strongly disagreed, thinking that consumers prefer foreign over local produce.

**Variable 21. Local produce is of a much better quality than foreign imported produce.**

		Frequency	Percent
Valid	S.D.	0	0
	D.	1	.6
	N.	6	3.6
	A.	48	28.6
	S.A.	111	66.1
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.22 Frequency and percentage of respondents for variable 21

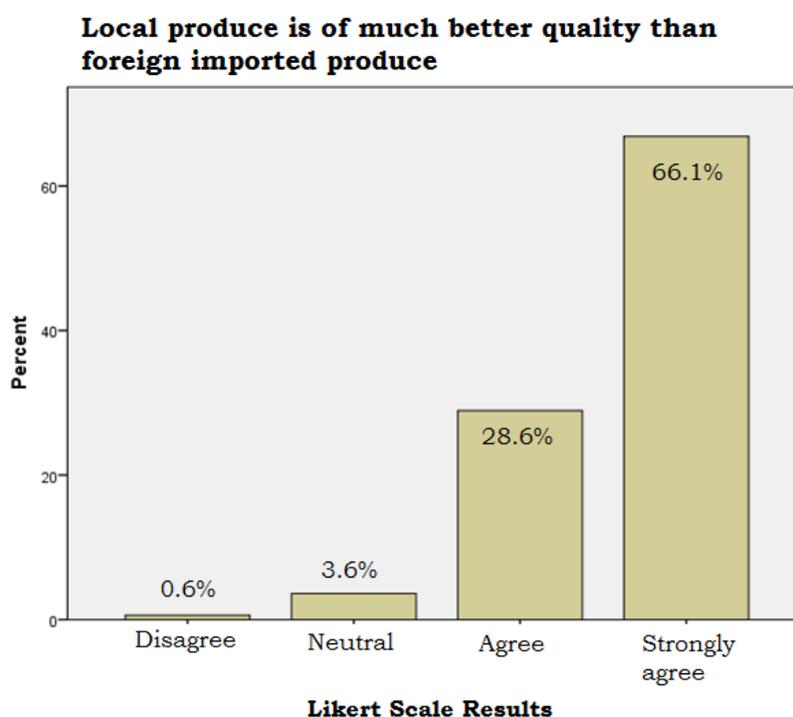


Figure 4.19 Percentage of participants' response to variable 21

Showing a positive majority of answers, more than half of the participants have chosen to strongly agree (66.1%) to the given statement, while the second most popular choice was to agree (28.6%). A few participants chose to remain neutral (3.6%) while only one participant chose to disagree (0.6%). Another two participants chose not to answer. The results show that the great majority of farmers do believe that their produce is of a better quality over that which is being imported.

**Variable 22. Consumers should be encouraged to buy local produce.**

		Frequency	Percent
Valid	S.D.	0	0
	D.	1	.6
	N.	0	0
	A.	30	17.9
	S.A.	137	81.5
	Total	168	100.0

Table 4.23 Frequency and percentage of respondents for variable 22

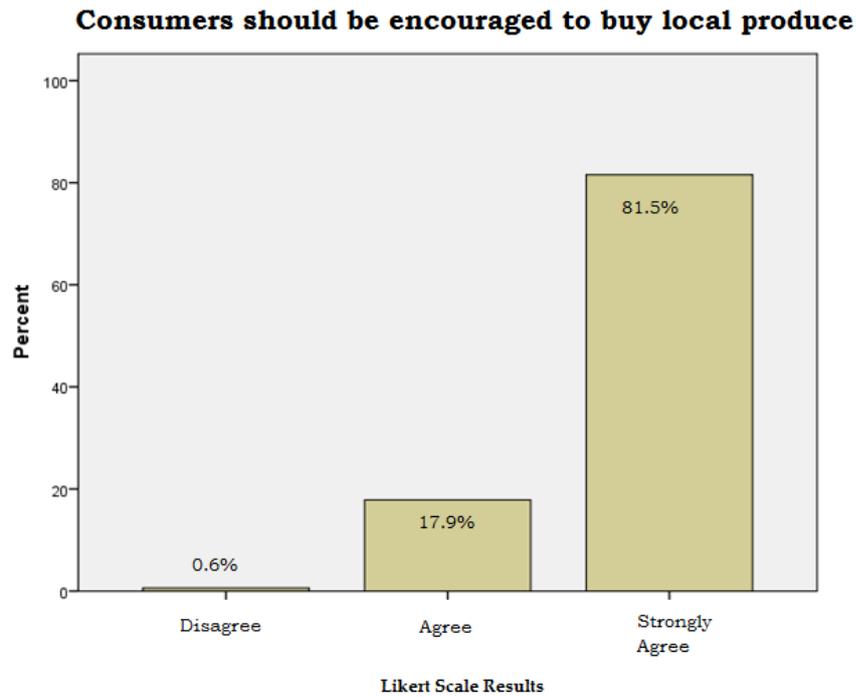


Figure 4.20 Percentage of participants' response for variable 22

The response for this statement was greatly positive, with 81.5% of the participants choosing to strongly agree while 17.9% choosing to agree. Only 1 participant chose to disagree, while no data was missing, meaning that everyone gave their opinions about this statement. Farmers show that consumers should greatly be encouraged to opt for local produce. Buying local has a great impact not only on the well-being of farmers but also on the environment in general.

**Variable 23. The importation of fruits and vegetables from the European Union has impacted us negatively.**

		Frequency	Percent
Valid	S.D.	2	1.2
	D.	3	1.8
	N.	6	3.6
	A.	28	16.7
	S.A.	129	76.8
	Total	168	100.0

Table 4.24 Frequency and percentage of respondents for variable 23

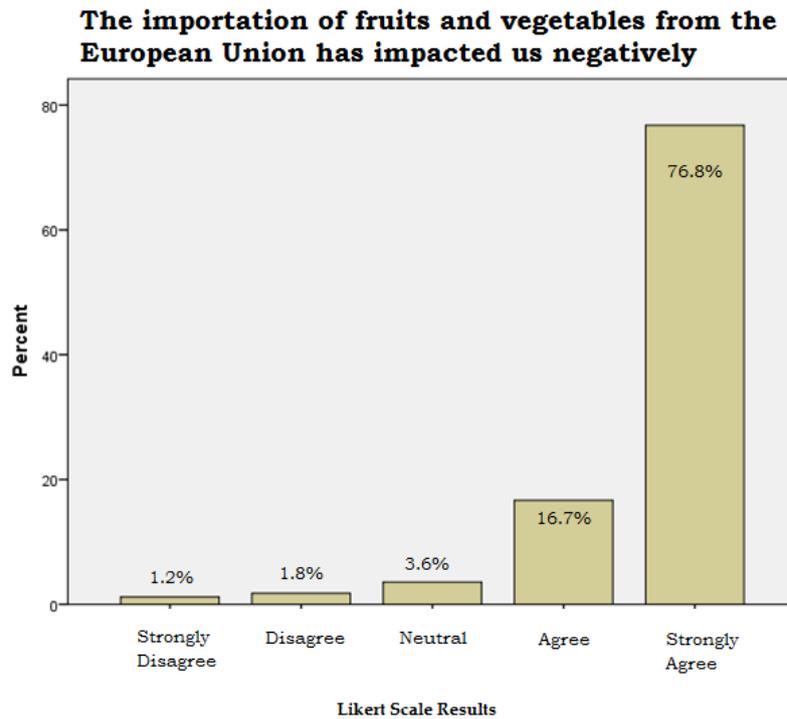


Figure 4.21 Percentage of participants' response for variable 23

The results, being positively skewed, show that the great majority of farmers strongly agree (76.8%) that the importation of fruits and vegetables since Malta joined the European Union has left a negative impact on the local farming industry. 16.7% agreed, 3.6% opted for neutral, while the minority chose to disagree (1.8%) or strongly disagree (1.2%). All participants gave an answer to this statement. The results show that most of the farmers in Malta feel that the importation in quantities, from abroad has had a negative impact, which will be discussed in greater detail in the qualitative part.

**Variable 24. Foreign competition has encouraged local farmers to invest more in this industry.**

		Frequency	Percent
Valid	S.D.	36	21.4
	D.	50	29.8
	N.	25	14.9
	A.	43	25.6
	S.A.	12	7.1
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.25 Frequency and percentage of respondents for variable 24

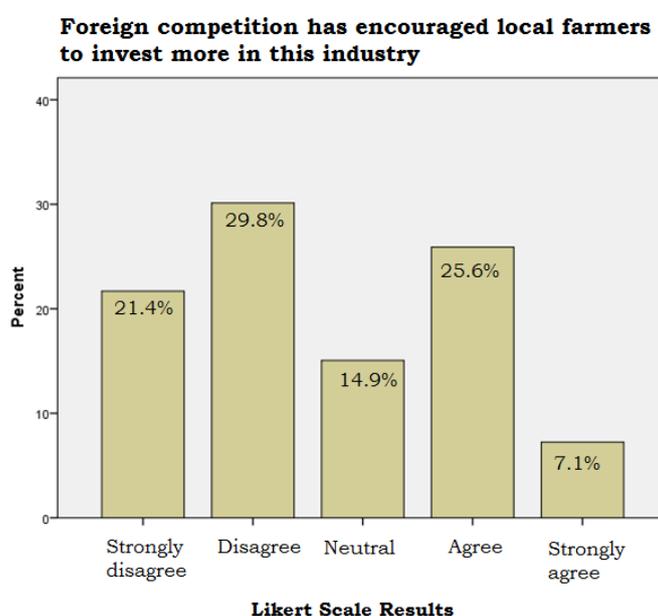


Figure 4.22 Percentage of participants' response for variable 24

The farmers' opinions with regards to whether foreign competition has encouraged local farmers to invest more in their farming practices were quite varied. 29.8% have chosen to disagree, meaning that they did not feel encouraged to invest, complimented by 21.4% who strongly disagreed. Therefore, over half of the participants felt disheartened to invest more. On the contrary, 25.6% agreed while 7.1% strongly agreed, meaning that yes, they felt more encouraged to invest. 14.9% chose to remain neutral, while another two participants opted not to answer.

**Variable 25. I have considered changing my job because of the working conditions.**

		Frequency	Percent
Valid	S.D.	27	16.1
	D.	48	28.6
	N.	32	19.0
	A.	37	22.0
	S.A.	22	13.1
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.26 Frequency and percentage of respondents for variable 25

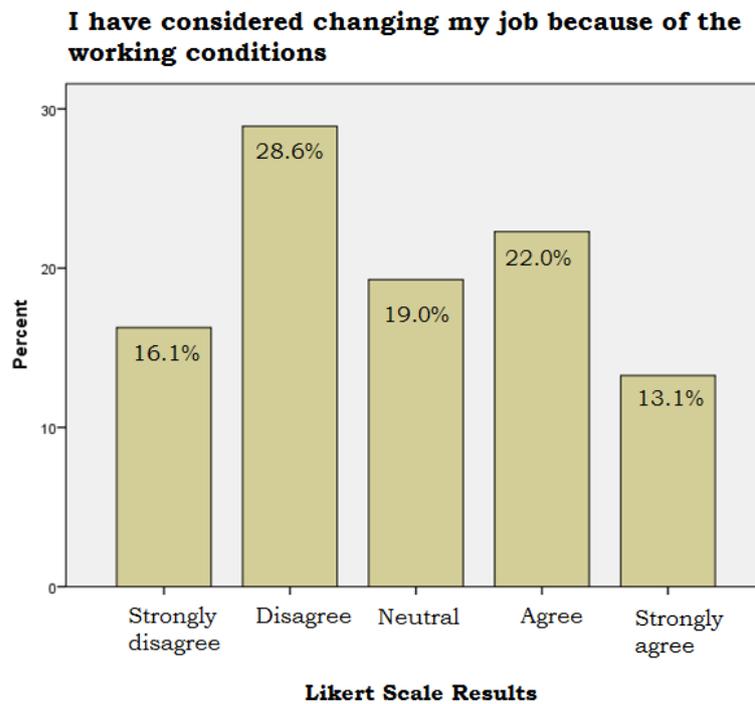


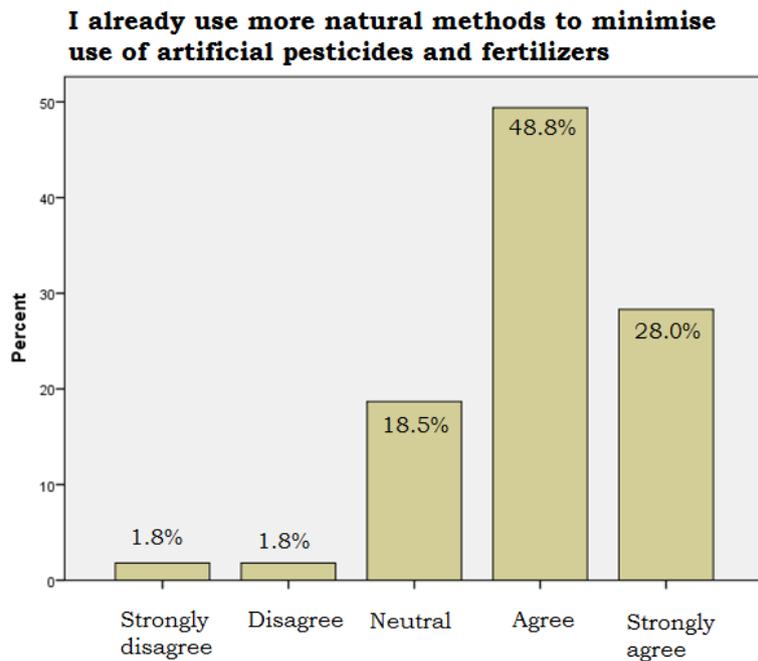
Figure 4.23 Percentage of participants' response for variable 25

The results show quite a variety of opinions. The majority chose to disagree (28.6%) with this statement, complimented by those who strongly disagreed (16.1%), meaning that they have not considered to change their farming job. On the contrary, those who agree (22%) or strongly agree (13.1%) have considered changing their job and opting to go work in another industry other than farming. 19% chose to remain neutral while two participants chose not to answer.

**Variable 26. I already use more natural methods to minimize the use of artificial pesticides and fertilisers.**

		Frequency	Percent
Valid	S.D.	3	1.8
	D.	3	1.8
	N.	31	18.5
	A.	82	48.8
	S.A.	47	28.0
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.27 Frequency and percentage of respondents for variable 26



**Likert Scale Results**

Figure 4.24 Percentage of participants' response for variable 26

The results are positively skewed, with 48.8% choosing to agree and 28% choosing to strongly agree with this statement. This shows that the majority of farmers are already using more natural methods to minimise the use of artificial pesticides and fertilisers. Only the minority disagreed (1.8%) or strongly disagreed (1.8%) with the given statements, meaning that these do not currently use natural methods. 18.5% chose neutral while 2 participants did not answer.

**Variable 27. I use crop-rotation (newba) as a means of sustaining nutrients in soil over a long period of time.**

		Frequency	Percent
Valid	S.D.	5	3.0
	D.	3	1.8
	N.	25	14.9
	A.	80	47.6
	S.A.	53	31.5
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.28 Frequency and percentage of respondents for variable 27

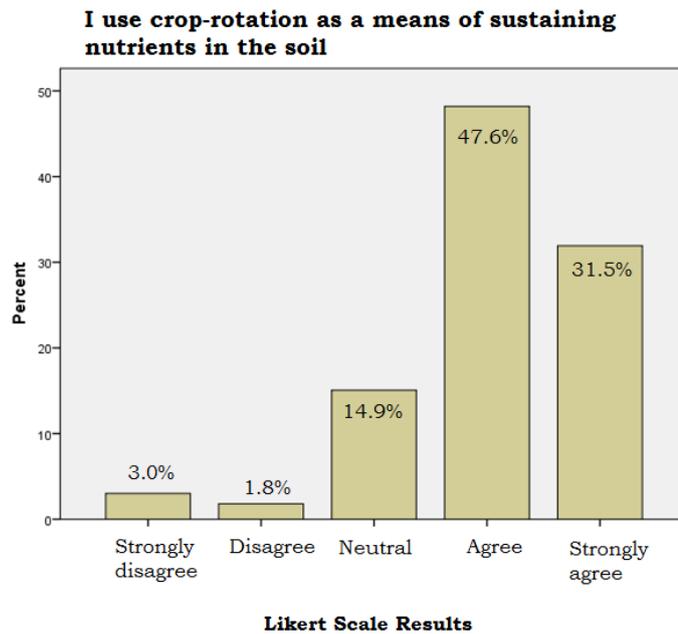


Figure 4.25 Percentage of participants' response for variable 27

The results were once again positively skewed with the majority of farmers agreeing (47.6%) or strongly agreeing (31.5%) to the statement, meaning that these farmers do practice crop-rotation and are aware of its benefits for maintaining or returning nutrients in the soil. Only the minority chose to disagree (1.8%) or strongly disagree (3%). Some of the farmers commented that those who have greenhouses, not open fields, find it more challenging to practice crop rotation as the structure inside the greenhouse, caters for a particular product so it would be more difficult to change. Others commented that having fields small in size makes it more difficult. 14.9% chose to remain neutral, while 2 did not answer.

**Variable 28. I believe that farmers can do away with pesticides and artificial fertilisers.**

		Frequency	Percent
Valid	S.D.	53	31.5
	D.	71	42.3
	N.	31	18.5
	A.	10	6.0
	S.A.	3	1.8
	Total	168	100.0

Table 4.29 Frequency and percentage of respondents for variable 28

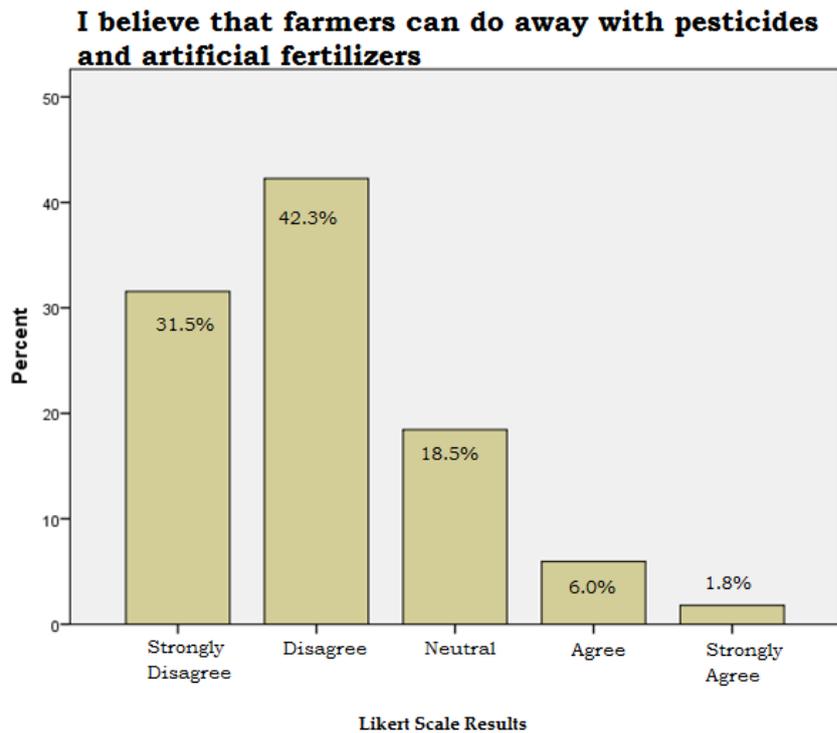


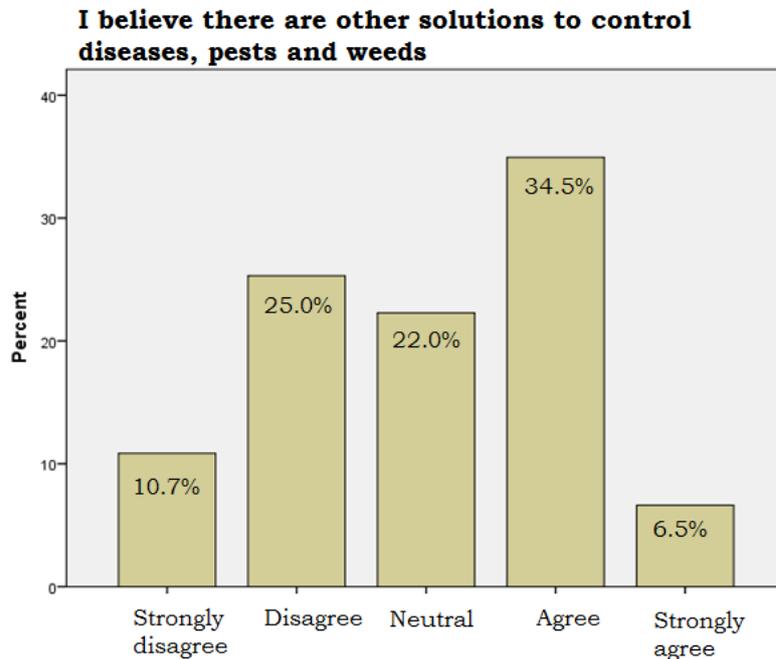
Figure 4.26 Percentage of participants' response for variable 28

The results show a negative skew, meaning that farmers do not agree with the given statement that they can do away with pesticides and artificial fertilisers, showing that they still believe that the use of pesticides and artificial fertilizers is of great importance. The great majority of farmers disagree (42.3%) with the statement, coplimented by those who strongly disagree (31.5%). The third most common option chosen was to remain neutral (18.5%) to the statement. The remaining chose to agree (6%) or strongly disagree (1.8%) to the statement. All participants gave their opinions.

**Variable 29. I believe there are other solutions to control diseases, pests and weeds in the fields.**

		Frequency	Percent
Valid	S.D.	18	10.7
	D.	42	25.0
	N.	37	22.0
	A.	58	34.5
	S.A.	11	6.5
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.30 Frequency and percentage of respondents for variable 29



**Likert Scale Results**

Figure 4.27 Percentage of participants' response for variable 29

The opinions to this statement were quite varied. Most of the farmers chose to agree (34.5%), complimented by those who strongly agree (6.5%), totalling to 41% of the participants believing that there are other solutions to control diseases, pests and weeds. Having no great discrepancy, 25% chose to disagree and another 10.7% strongly disagreeing, totalling to 35.7% who do not agree with the statement. 22% remained neutral, with two participants not answering.

**Variable 30. I believe that commercial farming has led to unsustainable farming within the last years.**

		Frequency	Percent
Valid	S.D.	8	4.8
	D.	19	11.3
	N.	30	17.9
	A.	76	45.2
	S.A.	28	16.7
	Total	161	95.8
Missing	System	7	4.2
Total		168	100.0

Table 4.31 Frequency and percentage of respondents for variable 29

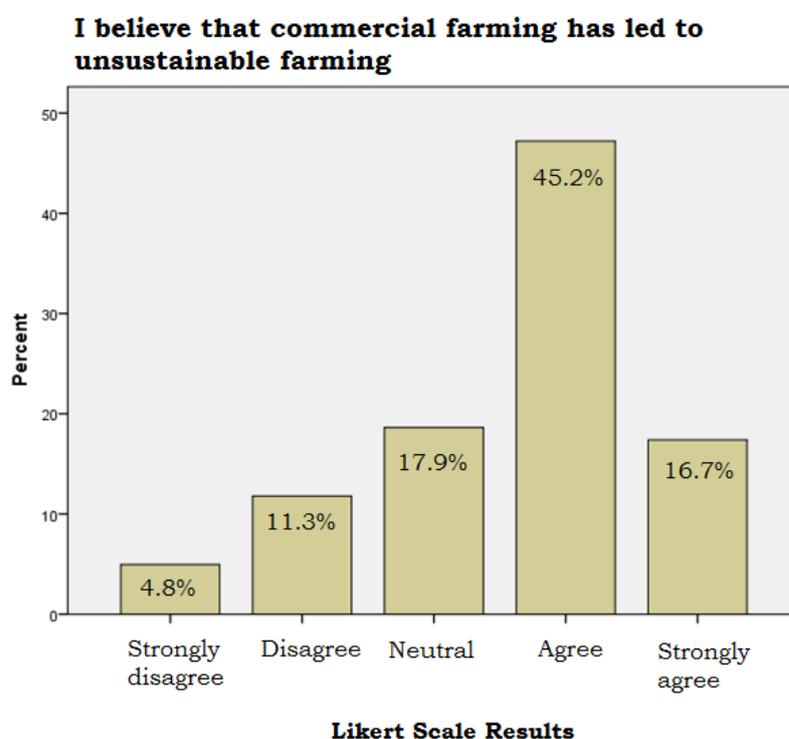


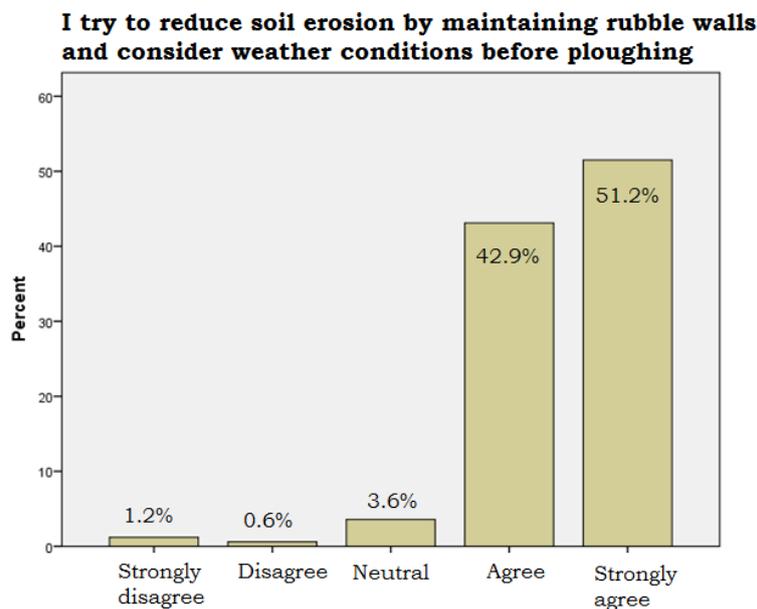
Figure 4.28 Percentage of participants' response for variable 30

The majority of farmers agree (45.2%) with others who strongly agree (16.7%) to this statement, believing that commercial farming has led to unsustainable farming practices. While conducting the questionnaire, a number of farmers commented that since they have to compete with a foreign market, they had to commercialise their practices to increase the amount of production. 17.9% chose to remain neutral, 11.3% disagreed while 4.8% strongly disagreed.

**Variable 31. I try to reduce soil erosion by maintaining rubble walls and consider weather conditions before ploughing fields.**

		Frequency	Percent
Valid	S.D.	2	1.2
	D.	1	.6
	N.	6	3.6
	A.	72	42.9
	S.A.	86	51.2
	Total	167	99.4
Missing	System	1	.6
Total		168	100.0

Table 4.32 Frequency and percentage of respondents for variable 31



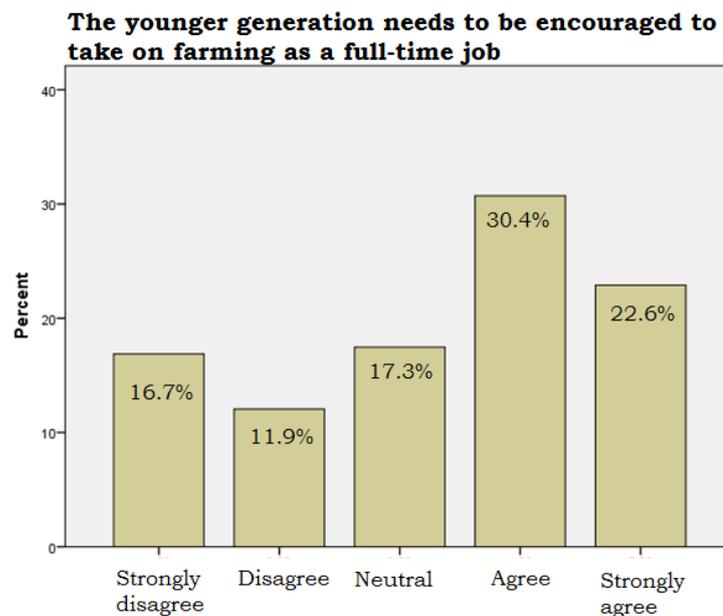
**Likert Scale Results**  
Figure 4.29 Percentage of participants' response for variable 31

The results show that they are positively skewed, with over 90% of the farmers agreeing (42.9%) or strongly agreeing (51.2%) to this statement. This shows that almost all farmers are conscious of the risks of soil erosion, maintaining their rubble walls in good condition and considering the weather conditions (especially wind force) before ploughing their fields. Only a minority of farmers chose to remain neutral (3.6%), disagree (0.6%) or strongly disagree (1.2%) to this statement. Only one farmer chose not to answer this statement.

**Variable 32. The younger generation needs to be encouraged to take on farming as a full-time job.**

		Frequency	Percent
Valid	S.D.	28	16.7
	D.	20	11.9
	N.	29	17.3
	A.	51	30.4
	S.A.	38	22.6
	Total	166	98.8
Missing	System	2	1.2
Total		168	100.0

Table 4.33 Frequency and percentage of respondents for variable 32



**Likert Scale Results**  
Figure 4.30 Percentage of participants' response for variable 32

The opinions on this statement were quite varied. Over half of the farmers either agreed (30.4%) or strongly agreed (22.6%) that the younger generation needs to be encouraged to take on farming as a full-time job. Farmers could not help but comment on the fact that the situation needs to be improved in order to encourage prospective farmers. Only 28% of the farmers either strongly disagreed (16.7%) or disagreed (11.9%), meaning that they feel that the younger generations should not be encouraged to take on farming as a full-time job. 17.3% remained neutral, with two farmers choosing to not give an opinion about this statement.

**Variable 33. Agricultural courses should be highly advertised to encourage the younger generations to take on farming.**

		Frequency	Percent
Valid	S.D.	4	2.4
	D.	9	5.4
	N.	23	13.7
	A.	65	38.7
	S.A.	67	39.9
	Total	168	100.0

Table 4.34 Frequency and percentage of respondents for variable 33

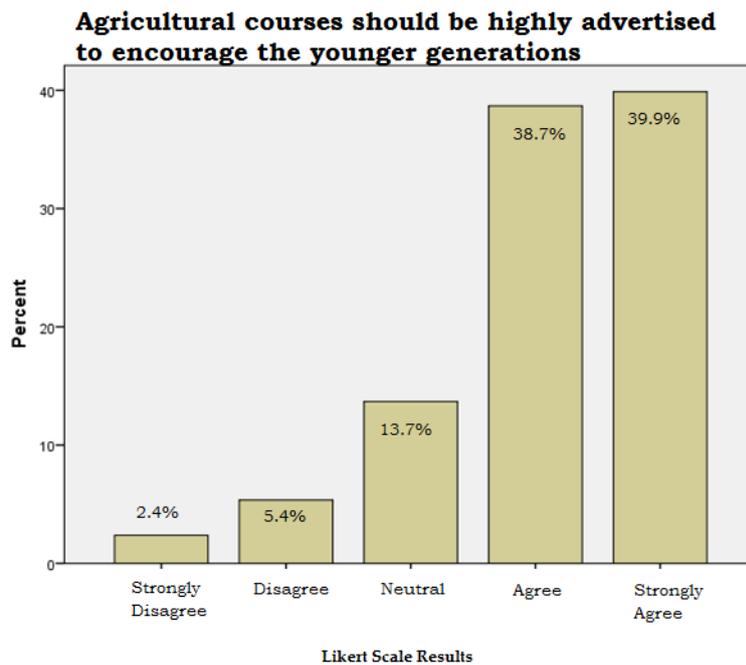


Figure 4.31 Percentage of participants' response to variable 33

The results show a positive skew, with the majority of farmers strongly agreeing (39.9%) or agreeing (38.7%) that agricultural courses should be highly advertised to encourage the younger generations to take on farming. Only a minority of farmers chose to strongly disagree (2.4%) or disagree (5.4%) to this statement. 13.7% opted to remain neutral, having all participants give their opinion on this statement. This shows that farmers feel that agricultural courses, both at secondary levels and tertiary levels, can help encourage younger farmers to continue their family's legacy or invest to set up a farm themselves.

**Variable 34. The general public is well aware of all the hard work farming entails.**

		Frequency	Percent
Valid	S.D.	56	33.3
	D.	57	33.9
	N.	19	11.3
	A.	20	11.9
	S.A.	16	9.5
	Total	168	100.0

Table 4.35 Frequency and percentage of respondents for variable 34

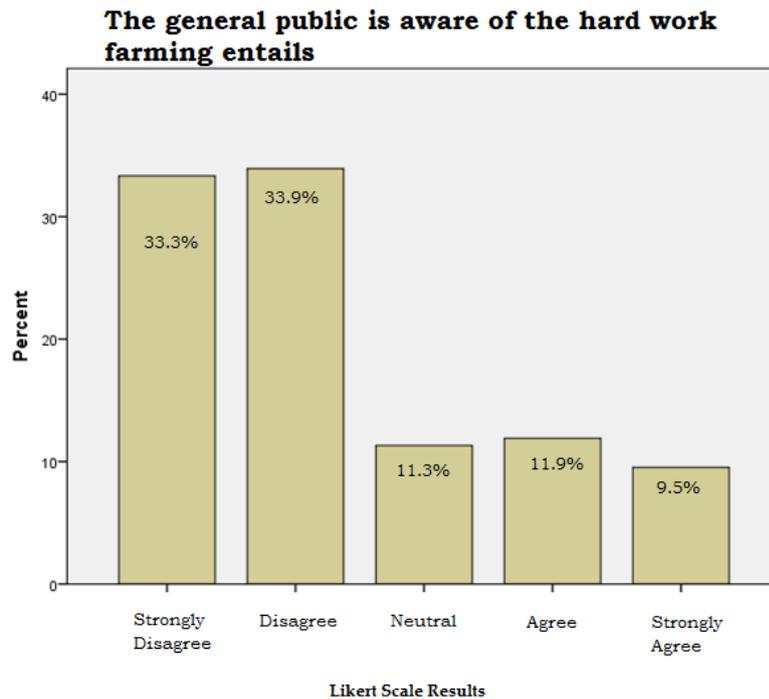


Figure 4.32 Percentage of participants' response for variable 34

The results show a negative skew, meaning that the majority of farmers feel that the general public is unaware of the hard work farming entails. Those who strongly disagree amount to 33.3% while those who disagree amount to 33.9%. Almost the same number of participants chose to remain neutral (11.3%) or to agree (11.9%) with the statement. The minority of the farmers, strongly agree (9.5%) to this statement. The results show that farmers believe that they have a hard working job, but feel that the general public is not aware of this, with some commenting that this has led to less appreciation of farming as a full-time job.

**Variable 35. I believe that farmers are well respected within our society.**

		Frequency	Percent
Valid	S.D.	72	42.9
	D.	65	38.7
	N.	16	9.5
	A.	6	3.6
	S.A.	9	5.4
	Total	168	100.0

Table 4.36 Frequency and percentage of respondents for variable 35

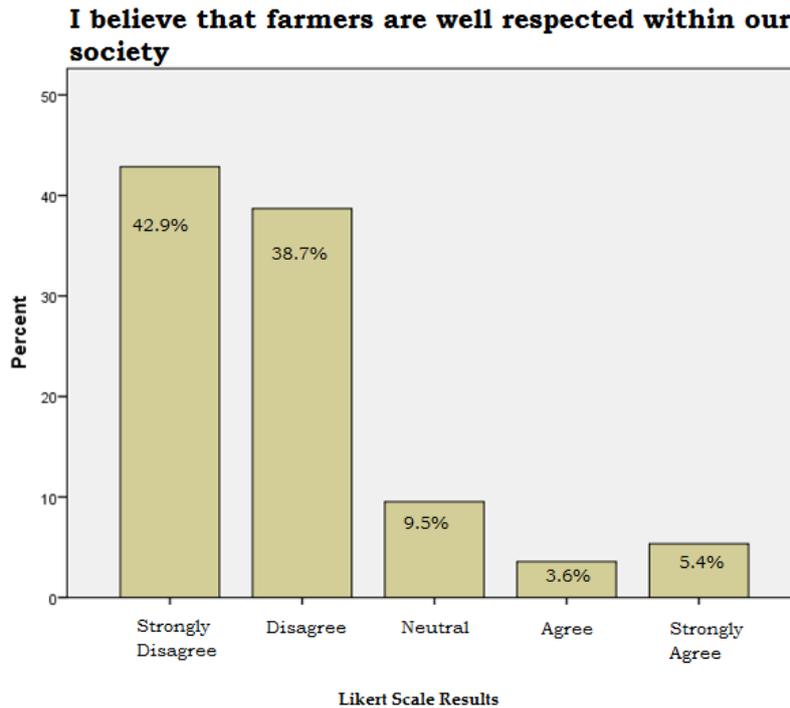


Figure 4.33 Percentage of participants' response for variable 35

Similarly to the results of the previous statement, the results are negatively skewed, meaning that the majority of farmers do not feel respected within society. The great majority of farmers chose to strongly disagree (42.9%) while others chose to disagree (38.7%) to the statement, with some adding on that farmers are often regarded as low-class individuals, who are uneducated and chose farming as they have no other skills. Only a minority of farmers agree (3.6%) or strongly agree (5.4%) to this statement, feeling that they are respected within society. 9.5% chose to remain neutral, having all farmers give their opinion on this statement.

### 4.1.3 Inferential Statistics

#### Gender

11. I am aware of the negative impacts pesticides leave on our environment and local habitats.	$\chi^2(1)=4.048, p=0.044$ Significant
12. I am aware that artificial fertilisers can have a negative impact on the environment	$\chi^2(1)=4.259, p=0.039$ Significant
34. The general public are well aware of all the hard work farming entails.	$\chi^2(1)=5.071, p=0.024$ Significant

Table 4.37 Farmers' gender significant differences with other variables

The variable of 'Gender' showed significant differences with three of the statements, while no other significance was shown with the other twenty-five variables. With respect to variable number 11, showing whether farmers are aware of the negative impacts pesticides leave on the environment, the mean rank varied from the score of 102.95 for females, and 80.84 for males, showing that there is a significant difference, with a p-value of 0.044. Variable number 12, representing awareness on the negative impacts of artificial fertilisers, the results obtained with a p value of 0.039 also show that there is a relevant significance. The mean rank varied from 103.60 for females and 81.33 for males. As for variable number 34, showing whether the general public is aware of the hard work farming entails, a p-value of 0.024 was obtained. The mean rank varied from 62.45 for females and 87.48 for males. The Kruskal Wallis test for these variables suggests that the differences are significant and are not attributed to chance. Thus, there is a significant difference between the perceptions of female and male farmers when it comes to awareness of the negative impacts of pesticides, the awareness of the negative impacts

of fertilisers on the environment and whether the general public is aware of the hard work farming entails.

### Age Group

11. I am aware of the negative impacts pesticides leave on our environment and local habitats.	$\chi^2(8)=17.918$ , $p=0.022$ Significant
31. I try to reduce soil erosion by maintaining rubble walls and consider weather conditions before ploughing fields.	$\chi^2(8)=17.156$ , $p=0.029$ Significant
32. The younger generation needs to be encouraged to take on farming as a full-time job.	$\chi^2(8)=16.683$ , $p=0.034$ Significant

Table 4.38 Farmers' age group significant differences with other variables

The variable of 'Age Group' showed significant differences with three other variables, while no other significance was shown with the other twenty-five variables. With respect to variable number 11, showing awareness on the negative impacts of pesticides on the environment, the mean rank varied from the score of 108.10, for the youngest age group between the age of 18 till 23, and a value of 32.25 for the second age group between the age of 24 till 29 years old. The p-value while comparing age with variable 11 is that of 0.022, showing a significant difference.

As with variable 31, representing the issue of soil erosion, the results obtained with a p value of 0.029 also show that there is a relevant significance. The mean rank varied from 103.89 for the age group between 60 and 65, and a mean rank of 45.50 for the age group between 24 till 29. When it comes to variable 32, where participants were asked whether the younger generation should be encouraged to work as farmers, having a p-value of 0.034, the mean rank varied from 138.60 for

the youngest age group, between 18 and 23, and a mean rank value of 61.07 for the age group between 48 and 53 years old.

The Kruskal Wallis test for these variables suggests that the differences are significant and are not attributed to chance. Thus, there is a significant difference between the perceptions of different age groups of farmers when it comes to awareness of the negative impacts of pesticides, soil erosion and whether the younger generations should be encouraged to become farmers.

### **Level of Education**

15. I believe that the sale of agricultural land to land developers is not a threat to the farming industry in Malta	$\chi^2(2)=6.837$ , $p=0.033$ Significant
20. Consumers prefer local produce over foreign produce.	$\chi^2(2)=9$ , $p=0.011$ Significant
21. Local produce is of a much better quality than foreign imported produce.	$\chi^2(2)=7.73$ , $p=0.021$ Significant
23. The importation of fruits and vegetables from the European Union has impacted us negatively	$\chi^2(2)=10.026$ , $p=0.007$ Significant
24. Foreign competition has encouraged local farmers to invest more in this industry	$\chi^2(2)=6.265$ , $p=0.044$ Significant
27. I use crop-rotation (newba) as a means of sustaining nutrients in soil over a long period of time.	$\chi^2(2)=9.945$ , $p=0.007$ Significant

Table 4.39 Farmers' level of education significant differences with other variables

The variable of 'Level of education' showed the most significant differences with a total of six variables out of twenty-eight variables. With regards to variable number 15, stating that the sale of agricultural land to developers is not a threat to farming, the mean rank varied from the score of 87.66, for those in the secondary level of education group, and a value of 65.68 for those in the tertiary level of education. The p-value

while comparing level of education with variable 15 is that of 0.033, showing a significant difference.

As with variable 20, stating that consumers prefer local over foreign produce, a p-value of 0.011 shows that there is a relevant significance. The mean rank varied from 107.74 for those with a primary level of education and 73.22 for those with a tertiary level of education. When it comes to variable 21, representing the difference between the quality of local over foreign produce, having a p-value of 0.021, the mean rank varied from 98.92 for those with primary level of education and 68.25 for those with tertiary level of education. Variable 23, stating that the importation of produce from abroad has impacted the farmers negatively, obtained a p-value of 0.007, with the mean rank varying from 89.50 for those with a primary level of education and 62.54 for those with tertiary level of education. When it comes to variable 24, on whether competition encouraged local farmers to invest in their business, the p-value was that of 0.044, with the mean rank varying from 98.02 for those with tertiary level and 76.12 for those with a secondary level. As for variable 27, regarding the use of crop-rotation, the p-value obtained was that of 0.007. The mean rank differed from 93.96 for those with primary level of education and 57.96 for those with tertiary level of education.

The Kruskal Wallis test for these variables suggests that the differences are significant and are not attributed to chance. Thus, there is a significant difference between the perceptions of farmers' level of education when compared to their opinions and perceptions on whether

the sale of agricultural land for developmental purposes is a threat to the farming industry, whether consumers prefer local over foreign produce, whether local produce is of a much better quality than imported produce, whether the importation of produce from European Union countries has impacted the farmers negatively, whether the competition from imported produce encouraged local farmers to invest more and if farmers apply crop-rotation in their practices to sustain the soil's nutrients over a longer period.

### **Regions where the farmers live**

12. I am aware that artificial fertilisers can have a negative impact on the environment	$\chi^2(5)=11.963$ , $p=0.035$ Significant
22. Consumers should be encouraged to buy local produce.	$\chi^2(5)=15.817$ , $p=0.007$ Significant
23. The importation of fruits and vegetables from the European Union has impacted us negatively	$\chi^2(5)=17.492$ , $p=0.004$ Significant
32. The younger generation needs to be encouraged to take on farming as a full-time job.	$\chi^2(5)=13.498$ , $p=0.019$ Significant

Table 4.40 Farmers' gender significant differences with other variables

The variable of 'regions where the farmers live' showed significant differences with four other variables, while no other significance was shown with the other twenty-four variables. With respect to variable number 12, showing awareness on the negative impacts of artificial fertilisers, the p-value is of 0.035, showing that it is significantly different. The mean rank varied from the score of 111.63 for farmers living in Gozo and a score of 57.57 for farmers living in the Northern Harbour area. The p-value while comparing regions with variable 22, on whether consumers should be encouraged to buy local produce, is that of 0.007, with the

mean rank varying from 100.00 for farmers living in the Northern Harbour area and a score of 40.36 for farmers living in the Southern Harbour area. Variable 23, stating that importation from the European Union impacted farmers negatively, also showed a statistical significance with a p-value of 0.004, the mean rank varying from 92.79 for farmers living in the Northern Harbour region and a value of 31.21 for farmers living in the Southern Harbour region. As for variable 32, whether the younger generation should be encouraged to practice farming, the p-value was that of 0.019, having a mean rank variable between 112.86 for farmers in the Northern harbour area and a value of 72.25 for farmers living in the Northern area.

The Kruskal Wallis test for these variables suggests that the differences are significant and are not attributed to chance. Thus, there is a significant difference between the perceptions of farmers based on the locality where they live when it comes to their views on the negative effects of fertiliser use, whether consumers should be encouraged to buy local produce, if farmers were impacted negatively from produce being imported from the European Union and their opinion on whether the younger generations need to be encouraged to take on farming as their full-time job.

## Years of experience

10. I am aware that water is a limited resource in the Maltese Islands.	$\chi^2(5)=12.504$ , $p=0.028$ Significant
23. The importation of fruits and vegetables from the European Union has impacted us negatively	$\chi^2(5)=15.18$ , $p=0.01$ Significant
27. I use crop-rotation (newba) as a means of sustaining nutrients in soil over a long period of time.	$\chi^2(5)=16.316$ , $p=0.006$ Significant
32. The younger generation needs to be encouraged to take on farming as a full-time job.	$\chi^2(5)=16.312$ , $p=0.006$ Significant
35. I believe that farmers are well respected within our society.	$\chi^2(5)=11.321$ , $p=0.045$ Significant

Table 4.41 Farmers' years of experience significant differences with other variables

When it comes to farmers' 'Years of experience', this variable showed statistical significance with five other variables, out of a total of twenty-eight other variables representing statements from the Likert scale. Variable 10, stating whether farmers are aware that water is a limited resource, showed that there is a significant difference, having a p-value of 0.028, obtained the highest mean value, of 100.50 with farmers having between 41 and 50 years of experience, and the lowest mean value of 65.00 with farmers having over 50 years of experience. Variable 23, stating that the importation of produce from the European Union impacted farmers negatively, also showed statistical significance with a p-value of 0.01. The highest mean score, 91.62 was obtained by farmers having between 41 and 50 years of experience, while the lowest mean score of 63.26 was obtained by farmers having between 1 and 10 years of farming experience. As for variable 27, regarding the use of crop-rotation, statistical significance was shown through a p-value of 0.006.

The mean score for this variable varied between 105.00 for farmers having over 50 years of experience and a mean score of 59.80 for farmers having between 1 and 10 years of experience.

With regards to variable number 32, once again, whether the younger generation need to be encouraged to take on farming as a full-time job, a p-value of 0.006 shows that the difference is statistically significant. The highest mean score, of 117.00 was obtained by farmers having over 50 years of experience and the lowest mean rank score, that of 59.02 was obtained by those farmers having between 41 and 50 years of experience. When it comes to variable number 35, stating that farmers are well respected within our society, statistical significance was shown by a p-value of 0.045. The mean rank difference ranged between 101.65 for farmers having between 1 and 10 years of experience and the lowest mean rank of 65.72 for farmers having between 41 and 50 years of experience. The results obtained through the Kruskal Wallis test show that the variables suggest that the differences are statistically significant and not by chance. This means that there is statistical difference between the years of farming experience and the farmers' perceptions on whether they are aware that water is a limited resource on the Maltese Islands, whether the importation of produce from the European Union has impacted farmers in a negative manner, whether crop-rotation is used to sustain nutrients in soil, their view on whether younger generations need to be encouraged to practice farming and whether farmers are respected within society.

Variables	Gender	Age Group	Level of Education	Regions where they live	Years of experience
8.I understand what sustainable farming practices are.	$\chi^2(1)=0.465$ , $p=0.496$ Not Significant	$\chi^2(8)=12.717$ , $p=0.122$ Not Significant	$\chi^2(2)=3.476$ , $p=0.176$ Not Significant	$\chi^2(5)=5.54$ , $p=0.354$ Not Significant	$\chi^2(5)=2.223$ , $p=0.818$ Not Significant
9.I understand what unsustainable farming practices are.	$\chi^2(1)=0.072$ , $p=0.788$ Not Significant	$\chi^2(8)=4.867$ , $p=0.772$ Not Significant	$\chi^2(2)=2.977$ , $p=0.226$ Not Significant	$\chi^2(5)=2.432$ , $p=0.787$ Not Significant	$\chi^2(5)=3.609$ , $p=0.607$ Not Significant
10.I am aware that water is a limited resource in the Maltese Islands.	$\chi^2(1)=0.035$ , $p=0.851$ Not Significant	$\chi^2(8)=9.374$ , $p=0.312$ Not Significant	$\chi^2(2)=1.153$ , $p=0.562$ Not Significant	$\chi^2(5)=6.415$ , $p=0.268$ Not Significant	<b><math>\chi^2(5)=12.504</math>, <math>p=0.028</math> Significant</b>
11.I am aware of the negative impacts pesticides leave on our environment and local habitats.	<b><math>\chi^2(1)=4.048</math>, <math>p=0.044</math> Significant</b>	<b><math>\chi^2(8)=17.918</math>, <math>p=0.022</math> Significant</b>	$\chi^2(2)=0.717$ , $p=0.699$ Not Significant	$\chi^2(5)=7.592$ , $p=0.18$ Not Significant	$\chi^2(5)=8.205$ , $p=0.145$ Not Significant
12.I am aware that artificial fertilisers can have a negative impact on the environment	<b><math>\chi^2(1)=4.259</math>, <math>p=0.039</math> Significant</b>	$\chi^2(8)=9.644$ , $p=0.291$ Not Significant	$\chi^2(2)=1.342$ , $p=0.511$ Not Significant	<b><math>\chi^2(5)=11.963</math>, <math>p=0.035</math> Significant</b>	$\chi^2(5)=3.919$ , $p=0.561$ Not Significant
13.I am aware of the time frame when I should spread manure on fields.	$\chi^2(1)=0.4$ , $p=0.527$ Not Significant	$\chi^2(8)=5.978$ , $p=0.65$ Not Significant	$\chi^2(2)=3.799$ , $p=0.15$ Not Significant	$\chi^2(5)=4.126$ , $p=0.531$ Not Significant	$\chi^2(5)=3.346$ , $p=0.647$ Not Significant
14.I am aware of the effects of excessive use of manure on the quality of underground water.	$\chi^2(1)=0.905$ , $p=0.341$ Not Significant	$\chi^2(8)=5.609$ , $p=0.691$ Not Significant	$\chi^2(2)=2.017$ , $p=0.365$ Not Significant	$\chi^2(5)=5.759$ , $p=0.33$ Not Significant	$\chi^2(5)=5.58$ , $p=0.349$ Not Significant
15.I believe that the sale of agricultural land to land developers is not a threat to the farming industry in Malta	$\chi^2(1)=1.264$ , $p=0.261$ Not Significant	$\chi^2(8)=10.902$ , $p=0.207$ Not Significant	<b><math>\chi^2(2)=6.837</math>, <math>p=0.033</math> Significant</b>	$\chi^2(5)=0.836$ , $p=0.975$ Not Significant	$\chi^2(5)=9.849$ , $p=0.08$ Not Significant
16.All farmers should regulate the use of pesticides to guarantee well-being of the natural environment and consumers	$\chi^2(1)=1.851$ , $p=0.174$ Not Significant	$\chi^2(8)=7.197$ , $p=0.515$ Not Significant	$\chi^2(2)=0.061$ , $p=0.97$ Not Significant	$\chi^2(5)=2.014$ , $p=0.847$ Not Significant	$\chi^2(5)=4.178$ , $p=0.524$ Not Significant
17.There is a bad image of local produce containing excessive amounts of pesticides and fertilisers.	$\chi^2(1)=0.784$ , $p=0.387$ Not Significant	$\chi^2(8)=9.781$ , $p=0.281$ Not Significant	$\chi^2(2)=1.879$ , $p=0.391$ Not Significant	$\chi^2(5)=11.008$ , $p=0.051$ Not Significant	$\chi^2(5)=3.414$ , $p=0.636$ Not Significant
18.Organic farming should be widely practiced on the Maltese islands.	$\chi^2(1)=1.073$ , $p=0.3$ Not Significant	$\chi^2(8)=8.475$ , $p=0.389$ Not Significant	$\chi^2(2)=2.49$ , $p=0.288$ Not Significant	$\chi^2(5)=7.889$ , $p=0.162$ Not Significant	$\chi^2(5)=6.541$ , $p=0.257$ Not Significant

Variables	Gender	Age Group	Level of Education	Regions where they live	Years of experience
19. Consumers prefer organic produce over inorganic.	$\chi^2(1)=1.437$ , p=0.231 Not Significant	$\chi^2(8)=10.302$ , p=0.244 Not Significant	$\chi^2(2)=0.389$ , p=0.823 Not Significant	$\chi^2(5)=2.547$ , p=0.769 Not Significant	$\chi^2(5)=6.174$ , p=0.29 Not Significant
20. Consumers prefer local produce over foreign produce.	$\chi^2(1)=2.62$ , p=0.106 Not Significant	$\chi^2(8)=13.126$ , p=0.108 Not Significant	<b><math>\chi^2(2)=9</math>, p=0.011 Significant</b>	$\chi^2(5)=9.298$ , p=0.098 Not Significant	$\chi^2(5)=1.136$ , p=0.951 Not Significant
21. Local produce is of a much better quality than foreign imported produce.	<b><math>\chi^2(1)=0.464</math>, p=0.496 Significant</b>	$\chi^2(8)=9.556$ , p=0.298 Not Significant	<b><math>\chi^2(2)=7.73</math>, p=0.021 Significant</b>	$\chi^2(5)=9.737$ , p=0.083 Not Significant	$\chi^2(5)=6.481$ , p=0.262 Not Significant
22. Consumers should be encouraged to buy local produce.	$\chi^2(1)=0.031$ , p=0.861 Not Significant	$\chi^2(8)=12.977$ , p=0.113 Not Significant	$\chi^2(2)=5.016$ , p=0.081 Not Significant	<b><math>\chi^2(5)=15.817</math>, p=0.007 Significant</b>	$\chi^2(5)=6.426$ , p=0.267 Not Significant
23. The importation of fruits and vegetables from the European Union has impacted us negatively	$\chi^2(1)=0$ , p=0.987 Not Significant	$\chi^2(8)=7.128$ , p=0.523 Not Significant	<b><math>\chi^2(2)=10.026</math>, p=0.007 Significant</b>	<b><math>\chi^2(5)=17.492</math>, p=0.004 Significant</b>	<b><math>\chi^2(5)=15.18</math>, p=0.01 Significant</b>
24. Foreign competition has encouraged local farmers to invest more in this industry	$\chi^2(1)=2.626$ , p=0.105 Not Significant	$\chi^2(8)=13.007$ , p=0.112 Not Significant	<b><math>\chi^2(2)=6.265</math>, p=0.044 Significant</b>	$\chi^2(5)=10.256$ , p=0.068 Not Significant	$\chi^2(5)=8.535$ , p=0.129 Not Significant
25. I have considered changing my job because of the working conditions.	$\chi^2(1)=0.194$ , p=0.66 Not Significant	$\chi^2(8)=5.398$ , p=0.714 Not Significant	$\chi^2(2)=3.495$ , p=0.174 Not Significant	$\chi^2(5)=7.364$ , p=0.195 Not Significant	$\chi^2(5)=7.008$ , p=0.22 Not Significant
26. I already use more natural methods to minimize the use of artificial pesticides and fertilisers.	$\chi^2(1)=0.108$ , p=0.743 Not Significant	$\chi^2(8)=8.031$ , p=0.43 Not Significant	$\chi^2(2)=4.46$ , p=0.108 Not Significant	$\chi^2(5)=4.318$ , p=0.505 Not Significant	$\chi^2(5)=6.627$ , p=0.25 Not Significant
27. I use crop-rotation (newba) as a means of sustaining nutrients in soil over a long period of time.	$\chi^2(1)=0.672$ , p=0.412 Not Significant	$\chi^2(8)=8.646$ , p=0.373 Not Significant	<b><math>\chi^2(2)=9.945</math>, p=0.007 Significant</b>	$\chi^2(5)=5.83$ , p=0.323 Not Significant	<b><math>\chi^2(5)=16.316</math>, p=0.006 Significant</b>
28. I believe that farmers can do away with pesticides and artificial fertilisers.	$\chi^2(1)=0.633$ , p=0.426 Not Significant	$\chi^2(8)=5.527$ , p=0.7 Not Significant	$\chi^2(2)=5.253$ , p=0.072 Not Significant	$\chi^2(5)=4.619$ , p=0.464 Not Significant	$\chi^2(5)=3.71$ , p=0.592 Not Significant
29. I believe there are other solutions to control diseases, pests and weeds in the fields.	$\chi^2(1)=0.18$ , p=0.671 Not Significant	$\chi^2(8)=8.496$ , p=0.387 Not Significant	$\chi^2(2)=0.566$ , p=0.754 Not Significant	$\chi^2(5)=3.862$ , p=0.569 Not Significant	$\chi^2(5)=2.636$ , p=0.756 Not Significant

Variables	Gender	Age Group	Level of Education	Regions where they live	Years of experience
30.I believe that commercial farming has led to unsustainable farming within the last years.	$\chi^2(1)=1.361$ , $p=0.243$ Not Significant	$\chi^2(8)=8.285$ , $p=0.406$ Not Significant	$\chi^2(2)=0.569$ , $p=0.752$ Not Significant	$\chi^2(5)=3.046$ , $p=0.693$ Not Significant	$\chi^2(5)=7.632$ , $p=0.178$ Not Significant
31.I try to reduce soil erosion by maintaining rubble walls and consider weather conditions before ploughing fields.	$\chi^2(1)=0.112$ , $p=0.738$ Not Significant	<b><math>\chi^2(8)=17.156</math>, <math>p=0.029</math> Significant</b>	$\chi^2(2)=0.245$ , $p=0.885$ Not Significant	$\chi^2(5)=7.135$ , $p=0.211$ Not Significant	$\chi^2(5)=5.393$ , $p=0.37$ Not Significant
32.The younger generation needs to be encouraged to take on farming as a full-time job.	$\chi^2(1)=0.628$ , $p=0.428$ Not Significant	<b><math>\chi^2(8)=16.683</math>, <math>p=0.034</math> Significant</b>	$\chi^2(2)=2.97$ , $p=0.227$ Not Significant	<b><math>\chi^2(5)=13.498</math>, <math>p=0.019</math> Significant</b>	<b><math>\chi^2(5)=16.312</math>, <math>p=0.006</math> Significant</b>
33.Agricultural courses should be highly advertised to encourage the younger generations to take on farming.	$\chi^2(1)=0.311$ , $p=0.577$ Not Significant	$\chi^2(8)=11.778$ , $p=0.161$ Not Significant	$\chi^2(2)=0.152$ , $p=0.927$ Not Significant	$\chi^2(5)=4.288$ , $p=0.509$ Not Significant	$\chi^2(5)=5.076$ , $p=0.407$ Not Significant
34.The general public are well aware of all the hard work farming entails.	<b><math>\chi^2(1)=5.071</math>, <math>p=0.024</math> Significant</b>	$\chi^2(8)=6.381$ , $p=0.605$ Not Significant	$\chi^2(2)=1.36$ , $p=0.507$ Not Significant	$\chi^2(5)=5.451$ , $p=0.363$ Not Significant	$\chi^2(5)=9.048$ , $p=0.107$ Not Significant
35.I believe that farmers are well respected within our society.	$\chi^2(1)=0.481$ , $p=0.488$ Not Significant	$\chi^2(8)=8.528$ , $p=0.384$ Not Significant	$\chi^2(2)=4.24$ , $p=0.12$ Not Significant	$\chi^2(5)=8.855$ , $p=0.115$ Not Significant	<b><math>\chi^2(5)=11.321</math>, <math>p=0.045</math> Significant</b>

Table 4.42 Farmers' gender, age group, level of education, regions and years of experience in significant and non-significant variables

#### **4.1.4 Synopsis of Quantitative Data Results**

- The majority of farmers are male, middle-aged, having a secondary level of education, living in the Northern and Western districts of Malta.
- Most of the farmers are aware of the meaning of sustainable and unsustainable farming practices.
- Farmers acknowledge the fact that water is a limited resources on the Maltese Islands.
- Farmers are conscious of the negative impacts of the use of pesticides and artificial fertilisers, and agree with the regulation of their use.
- Farmers are aware of the nitrates problem in water and know of the period they are to spread natural fertilisers in their fields.
- Farmers have a mixed opinion on organic farming in Malta.
- Farmers feel that consumers still prefer local produce over imported produce due to the better quality of their produce. The majority strongly agree that consumers should be encouraged to buy local produce.
- Farmers believe that the importation of produce from abroad has impacted them negatively, some feeling the need to invest in their industry, while others are not so encouraged by the situation.
- The majority make use of natural methods instead of using pesticides and fertilisers whenever possible. However, they still feel that they cannot do away with the use of pesticides and fertilisers.

- They believe that the public is not aware of the hard work farming entails and do not feel as much respected.

## **4.2 Qualitative Data Analysis**

Thematic analysis was used to encode all the qualitative data available through all of the twelve interviews (Boyatzis, 1998). The twelve farmers interviewed came from different districts from across Malta and Gozo; Six from the Northern Region, two from the Western Region, one from the South-Eastern Region and three from Gozo.

By transcribing all the audio recordings, the researcher was able to get familiarised with the data to facilitate coding. Through the use of open coding, a variety of themes began to emerge from the data, followed by axial coding sub-categories were identified, and finally selective coding led to five major themes (Strauss & Corbin, 2008; Neuman, 2006). Through these themes the data was organised using colour coding and highlighting.

The themes are:

- Challenges in farming
- Impacts of farming on the environment
- Indigenous farming knowledge
- A sustainable farming future
- ESD and farming

To preserve the authenticity of the semi-structured interviews, the original language used by the informants was not adapted to standard Maltese.

#### **4.2.1 Challenges in Farming**

From all the interviews carried out with full-time farmers, various issues emerged which farmers considered as challenging. The most prevalent challenges faced by farmers which were mentioned by practically all of the farmers interviewed included: long hours of work without rest on Sundays; changing weather patterns and storms which destroy their crops; small land parcels; competition from abroad and the quantity of imported produce; the ever increasing diseases and pests coming along with imported produce. All these different issues will be tackled in the following paragraphs.

##### **4.2.1.1 Long hours of work and changing weather patterns**

When farmers were asked to explain their job, it was evident that while they considered their job to be very challenging, most would not consider taking on any other job than the one they have.

Being self-employed as full-time farmers entails long hours of work, cultivating and tending the crops in order for them to produce the best product to be sold within the local market. It is risky having all one's money invested in an open field, exposed to all weather elements and conditions. Evidence of this are such comments:

**Farmer 1:** Farmers do not have specific working hours, it is hard work, and you risk having all your produce taken away by storms. One day you have crops in your field, and the next everything may be taken away by storms.

*Ħinijet m'hemmx, tbatija kbira. Heqq, sugru joħodlok killix il-maltemp, filli għandik l-għalqa, filli m'għandik xejn għax joħodlok killix il-maltemp.*

**Farmer 2:** I am a farmer, people, storms and all the winds work against us. Even a mouse and a bird, everyone wants to eat at our expense.

*Jien bidwi, naqla' t-terturi mingħand in-nies, mill-maltemp u l-irjihat killha kuntra tagħna. Sa ġurdien u għasfur, kulhadd jrid jiekol minn fuq dahrna.*

**Farmer 3:** Even because of the fact that we are having harsher summers, rising temperatures because of global warming, these conditions are making it even more difficult to grow our produce, all due to the excessive heat. So, as I told you, the farmers are realising that it is better off if less produce is cultivated in summer.

*Anke minħabba l-fatt li sar jkollna aktar sjuf qliel hawn, it-temperatura, il- 'global warming', u l-prodott qiegħed ikellu ħafna problemi biex jikbir, minħabba s-sħana eċċessiva. Mela allura, jiġifieri għalhekk għidtlek qabel li l-bidwi qisu waħdu qiegħed jaqta' qalbu li fis-sajf jibqa' jkabbar.*

One of the farmers who has both fields and animals to rear, commented on how the commitment has to be stronger, as the animals have to continuously be taken care of and fed.

**Farmer 9:** We have both cows and fields. So it is more of a commitment. You have three hundred and fifty-six days working days with no holidays.

*Aħna għandna l-baqar ukoll u r-rabgħa. Allura għandek r-rabta. Għandek tliet mija, ħamsa u sittin ġurnuta dejjem xogħol, m'għandekx 'holidays'.*

Farming has undergone major changes over the past century making it to a certain extent, easier for the farmers to tend to the land, but issues of increasing competition from imported produce worries the farmers:

**Farmer 5:** A farmer's job is pretty much hard work. Nowadays it is much less hard work than before but we have huge competition. You begin early in the morning, as early as you can, and you try to manage as much as possible.

*Ix-xogħol ta' bidwi huwa pjuttost xogħol iebes. Illum it-tbatija naqset pero għandna kompettitivita kbira. Tibda' filgħodu kemm għandek il-ħila tqum kmieni u tipprova tlahħaq kemm jista' jkun.*

Gozitan farmers have more of a challenge to deliver their produce to the Pitkali markets in Malta. There used to be a small Pitkali market in Gozo, but it was no longer viable and so Gozitan farmers can either choose to group up and take down their produce together or when they have larger quantities, come down to Malta themselves. Those farmers who have small quantities of produce to take to the Pitkali markets can choose to take their produce to designated persons who deliver the produce against a fee paid per box.

**Farmer 9:** There are persons who deliver the produce for others from Gozo to Malta. You have to pay and sometimes the price offered for the product at the Pitkali market does not even cover the cost you have to pay for delivery to Malta. It all depends on which produce.

*Hawn xi ftit li jgurr ta' haddieħor u jniżżlu hu. Trid tħallas eh, u taf gieli tal-prodott ma tiġburx haq li tħallas biex iniżżilhulek Malta. Skond xi jkun, eh.*

**Farmer 10:** It is difficult and has its own challenges, it is not easy. You have to wake up early to pick up the produce. Here in Gozo, we are more disadvantaged because we have to go down to Malta so you have to wake up earlier. The Pitkali market opens at half past four in the morning, so we have to wake up at two. You have to catch the ferry; in Summer you have the sun and in Winter the stormy weather. What's more is that sometimes you grow the produce and it is destroyed by storms.

*Heqq iebis hux u fiħ l-isfidi tiegħu, fhimt? Mhux 'easy'. Speċi trid tbakkar filgħodu biex taqta' ċertu hxejjex. Għandna l-iżvantaggi tagħna għax aħna Għawdix trid toqgħod tmur Malta għal-ċertu xogħol, trid tqum kmieni. Eżempju l-pitkalija tiftaħ fl-erbgha u nofs u allura trid tqum fis-sagħtejn. Trid taqsam il-vapur u dun, fis-sajf, imbagħad għandek ix-xemx u fix-xitwa imbagħad għandik il-maltemp, voldiri u gieli tkun kabbart prodott u malajr joħodulik il-maltemp, imma.*

#### **4.2.1.2 Competition from produce imported from abroad**

Since Malta's membership in the European Union in 2004, farmers were able to benefit from various funding but at the same time the local market

had to open up to free-trade of produce from EU member states. One of the most visible impacts of the importation of produce from abroad, which was mentioned by all the farmers who were interviewed, was the influence of the imported products on the price offered for the local produce at the Pitkali markets.

They commented that when for example, local marrows were scarce because of the cold weather, the prices offered at the market were good, but once they import the same product from abroad, the prices drop drastically. This impacts the farmers tremendously as they rarely get a good price for the product which covers all the costs to offer such a product on the market.

Evidence of this are such statements by farmers:

**Farmer 1:** Farming is decreasing, they import produce, and suddenly (the market) is full. When the (local) produce is at a good price and the farmer can say that some of the costs will be covered, they start importing produce. The farmer can never stand on his feet.

*Il-biedja qieghda tonqos, igibulek minn barra, filli m'hawn xejn filli jimtela' kull m'hawn. X'hin jiswa, ikun ser jifdi naqra x-xoghol il-bidwi jgibulu ta' barra. Ma jista' jiehu r-ruh qatt il-bidwi.*

**Farmer 1:** In the past years, we were not better off in the sense that nowadays it is easier to work the fields, but we were better off because there was no foreign produce coming in. It was only Maltese produce; not like nowadays because they import from abroad. They call the catamaran in the evening and by morning it will be here. The prices suddenly drop.

*Le mhux ahjar ghax illum hawn biex taħdem iżjed, imma konna ahjar ghax ma kienx hawn ta' barra, prodott ta' barra. Ta' Malta biss, mhux bhal-lum igibulek ta' barra. Iċempillu filghaxija bil-catamaran u filghodu jkun hawn. Iwaqqgħu l-prezz f'salt.*

**Farmer 2:** Produce imported from abroad impacted us very negatively because many pests and diseases came along with it. For example the white fly and the red spider did not exist in Malta before. All of these came because of the produce from abroad. One of the worst things, which I noticed this year is the importation of carrots and oranges with leaves. This is not supposed to happen because it is a way to

distinguish between local and foreign produce, and to reduce the risk of diseases being imported.

*Li ngibu minn barra hafna għamil hażin għax dun il-mard killu gie miegħu, hux. Għax per eżempju l-ewwel li bdejna nsemmu. Per eżempju għandek 'white fly', 'red spiders'. Dawn ma kienux jeżistu. Dawn killha ġew mal-ħxejjex li jġu minn barra. Li waħda li hemm hażin, per eżempju li rajtha dis-sena li għaddiet, li kien qed jiġi l-laring u karrotti ta' barra, bil-weraq b'kollox. Dun mhux sippust biex ikun jingħaraf minn ta' Malta u tnaqqas mard.*

Recently, consumers are being offered prepared salads and other ready-to-use vegetable in bags, which farmers feel have encouraged consumers to buy foreign produce rather than local produce:

**Farmer 3:** They have begun importing lettuce in bags, all cut and ready to use, mixed with other salads, and it has taken over. They have also begun to import whole lettuce, same as the one I used to grow, but these are different because they are in plastic bags!

*Beda' ġej il-ħass fil-boroż, u għax imqatta' u imbagħad għax imħallat b'salads oħrajn, u ħa over. Beda' diehel il-ħass is-ših bħal ma' kont inkabbar jien hawn, imma dak għax qed fil-borża hi!*

The importation of produce from abroad has not only affected farmers in the means of profits and how much they get paid for their produce at the Pitkali markets, it has even effected their working hours. Most of the farmers commented that nowadays, they have to work on Sundays, whether they like it or not, whereas before they could opt to work early on Monday mornings instead. The situation is explained by the following farmer:

**Farmer 4:** The work of a farmer is very hard work, because for example since we joined the European Union, we are importing many foreign produce without any limits. We had to take a decision, because the foreign produce comes along on Sunday's catamaran. We used to take the produce (to Pitkali market) on Monday mornings until noon, and the buyers would enter at two in the afternoon to buy local produce. So what happened? The foreign produce was being sold on Monday mornings, from early on in the morning, and the local produce from two in the afternoon. So the local produce was being disadvantaged

and buyers were preferring to buy foreign produce so that they could start selling earlier on Mondays, because they could go and buy the produce imported by the catamaran.

So we tried another system where as the farmers would enter Pitkali markets at four-thirty in the morning, so that by six o'clock the buyers could come in and choose. The thing is that now the farmers have to work on Sundays, the only day off they could take. It wasn't an off day but at least you could decide to take it off. Nowadays, even if you want to take Sundays off, you can't because you have to prepare the produce for early Monday mornings.

*Lx-xogħol ta' bidwi hu xogħol iebes. Tghidli għala? Eżempju fis-sitwazzjoni li qegħdin illum, kemm ilna li dħalna fl-Unjoni Europea, qed jiġu hafna prodotti minn barra mingħajr rażan. Li x-xogħol ta' barra jidhol il-Ħadd mal-catamaran. ... Il-biegha t-Tnejn filgħodu u sa nofsinhar mmorru noħduha l-Pitkalija t-Tnejn stess, u x-xerreja jidhlu fis-sagħtejn jixtru l-prodott lokali. Issa x'għara? Gara li l-prodott ta' barra t-Tnejn qed jibda' jinbiegħ minn filgħodu u l-prodott lokali jibda jinbiegħ mis-sagħtejn, allura gara li kien hemm żvantaġġ kbir li jmorru jixtru ta' barra biex t-Tnejn jaqbad ibiegh wara nofsinhar jew filgħodu għax kien ikollu ċ-ċans ma' tal-katamaran jmur jixtri dak il-ħin. Biex nippruwaw din is-sistema', il-bidwi biex tmur t-Tnejn fl-erbgha ta' filgħodu, kmieni, biex sas-sitta jkun jista' jidhol jixtri x-xerrej. Gara li l-bidwi kellu jaħdem il-Ħadd, voldiri l-uniku gurnata li kellna, ma kinitx off daqshekk imma tista' toħodha off, illum jekk trid ma tistax, għax jkollok il-prodott trid bilfors tillestih il-Ħadd.*

One of the farmers commented that there needs to be some major changes in the way the local produce is presented on the market, so that it is competitive with the produce being imported. He even commented on how farmers could have been prepared beforehand on how the market from the EU was likely to affect them, taking in the case of improved grading, labelling and packaging of the local products.

**Farmer 5:** The importation of produce from abroad affected us directly, it is the reason behind today's farming situation. It affected us badly, but more than the importation in itself, the problem is that we were not prepared beforehand. It is not the farmer's fault, but rather the policy makers', as they could have prepared us before joining the European Union. We need certain tools, such as a local laboratory where we could test our produce against pesticides, an improved grading system and a packaging system for local produce, so that we can compete with the imported product.

*L-importazzjoni ta' barra affettwatna direttament. Waħda mill-konsegwenzi, fiex tinsab il-biedja illum. Affettwatna hażin, pero naħseb aktar milli giet l-importazzjoni naħseb aħna, minn hawn ma konniex ippreparati. Mhur tort tal-bdiewa imma naħseb il-policy makers tul iż-żminijiet minn qabel dħalna, fl-Unjoni Europea, lill-bidwi ma ppreparawhx tajjeb. Għandna bżonn ċertu għodda eżempju laboratorju biex jiċċekkjaw il-bexx, kif qed ngħidu fejn isir il-packing u grading station, biex inti tiġi kompetittiv ma' ta' barra.*

Local farmers feel that they cannot compete with the large quantities of produce imported, resulting in a drop-in prices for the local produce. Local fields, being small in size, limit the type and amount of machinery farmers can use to aid them in their work, unlike fields abroad where mass production is aided by large machineries.

**Farmer 10:** I do not consider it as a threat, but we just cannot compete with what is being produced abroad. There are drops-in prices, since mass production is used abroad and they use large machinery. Locally we cannot use such machinery. Even if you consider buying such machinery, it will cost thousands. There simply is no space where to use it.

*Mhux theddida propja, il-kompetizzjoni ta' barra fhimt. Ta' barra theddida voldiri għax ma tistax tikkumpeti ma' ta' barra. Irahhsulek il-prezz fhimt, peress li ta' barra mass production ngħidlu jien, makkinarju kbir, aħna makkinarju kbir ma tistax tuża makkinurju kbir. U jekk tiġi biex tixtri l-makkinurju jiswa' ħafna flus, eluf jiswa' l-makkinurju. U anqas hawn spuzju, ma tistax.*

Both full-time organic farmers interviewed, agreed with the other conventional farmers that the importation of produce has left an impact on local farming. They continued by stating that since they have a separate market, they did not feel as big an impact as the others had.

**Farmer 8 Organic:** Importation is one of the biggest threats we have. It has tremendously affected us. Compared to the more conventional farmers, it did not have such a great impact on us since we have a separate market, but the conventional farmers were impacted greatly. The other farmers are having a hard time because of importation.

*L-importazzjoni hija l-akbar theddida li għandna. Affetwatna ħafna, mhux lina biss anzi aħna ma tantx taffetwana lilna għax għandna market separat mill-bdiewa konvezzjonali, imma għall-bidwi l-ieħor iwa. Il-bidwi l-ieħor bħalissa qed ibati ħafna mill-importazzjoni.*

#### 4.2.1.3 Diseases and pests coming in the islands from importation

Farmers commented on how over the past years they saw an increase in the number of pests and diseases which affected their crop production. They lamented that most of such diseases or pests came along with the increase in importation of produce from foreign countries. Ultimately, they stated that in most cases this led in loss in crop production and a loss in profits, because farmers had to invest in more pesticides and other pest controls. The issue on the use of pesticides will be discussed later in the following paragraphs.

Some of the farmers commented on how such diseases were inexistent in the past years and how one may consider the consequences of the progress taking place together with the increasing importations:

**Farmer 2:** For example, let me mention the past twenty years. If you go and speak to an elderly farmer, he won't know that these diseases which we have seen in the past twenty years even exist. How is it arriving in Malta? Today's commerce has made the world a smaller place. All of these containers coming in, not only agriculturally related, even through sea transportation. Sometimes you hear that they found a new species in local waters. It is not only related to agriculture, it is rather general progress bringing along destruction.

*Issa per eżempju jiena, li ha nsemmi minn għoxrin sena l' hawn. Il-mard li gie dawn l-aħħar għoxrin sena tithaddet ma' xi bniedem li għadu ħaj u għandu tmenin jew disgħin, qas juf bihom dawn li jeżistu, dun il-mard. Issa per eżempju biex qed jiġi l-mard? Illum bil-kummerç li hawn, id-dinja tant giet żgħira. Eżempju għandek il-containers ġejjin, li mhux il-biedja biss anke l-baħar bil-vapuri, ġieli tisma daħal ċertu bram, gie hekk. Din mhux il-biedja, il-proċess li għaddej, il-progress u l-qerda hux!*

Such diseases and pests have left their mark not only on seasonal crops, but also on local tree species. Some farmers even stated that they are witnessing other farmers taking out stone fruit trees, such as peaches,

because it is being attacked by a pest and farmers have to use pesticides, making it unviable to continue their production.

As mentioned by farmers, one of the most devastating new pests is the Tuta Absoluta, which had a tremendous impact on the production of local tomatoes, especially in the summer months:

**Farmer 6:** Different species of insects have entered Malta from abroad, along with the imported produce. Nowadays we have a huge problem with tomatoes, palm trees, fig trees, we have loads of issues. They did not exist in Malta before, they all came from abroad. Beforehand, we had unlimited fig trees, we would never have dreamt that the palm trees will be under attack, once you planted tomatoes it would start producing. Nowadays it is difficult to produce tomatoes in summer because of the Tuta Absoluta.

*Daħlu speċi ta' insetti differenti hawn Malta minn barra, mal-importazzjoni tal-affarijiet. Illum il-ġurnata għandna problema kbira bit-tadam, għandek tal-palm, il-bajtar, hawn ħafna problemi. Dawn ma kienux Malta, dawn killa ġew minn barra. Dawn fl-antik xejn kien hawn bajtar ta' San Gwann kemm tird, il-palm qas kinna neħilmu li dak, it-tadam kif titgħu fl-art kien jagħmel it-tadam, illum diffiċli biex tkabbar it-tadam fis-Sajf minħabba s-susa.*

**Farmer 10:** For example, last year we had a lot of problems in cultivating tomatoes, because it was attacked by insects, so we had to throw away everything. It is called Tuta Absoluta and it cannot be controlled. It has not existed for more than three years in Malta. It came along either with imported tomatoes or tomato plant. It is a very small mosquito, recognisable from the others. It is useless using sulphur against it, we mainly use it against mold.

*Eżempju s-sena l-oħra kellna ħafna ħsura fit-tadam, għax dak aktar insetti jattakawh, u armajna killix. Tuta absoluta jgħidulha u ma tikkontrolluwhiex. Dik sa tliet snin ilu ma kinitx teżisti hawn. Daħlit jew ma xi tadam jew max-xitil. Nemusa żgħira, tintaraf minn fejn l-uħra. Il-kubrit għal xejn, dak għall-moffa nużawh.*

#### **4.2.1.4 Small land parcels**

As mentioned in previous chapters, Malta has one of the smallest agricultural land holdings within the European Union, with an average size of just over a hectare (10,000m<sup>2</sup>). The following figure represents the most common units of measurement used by local farmers.

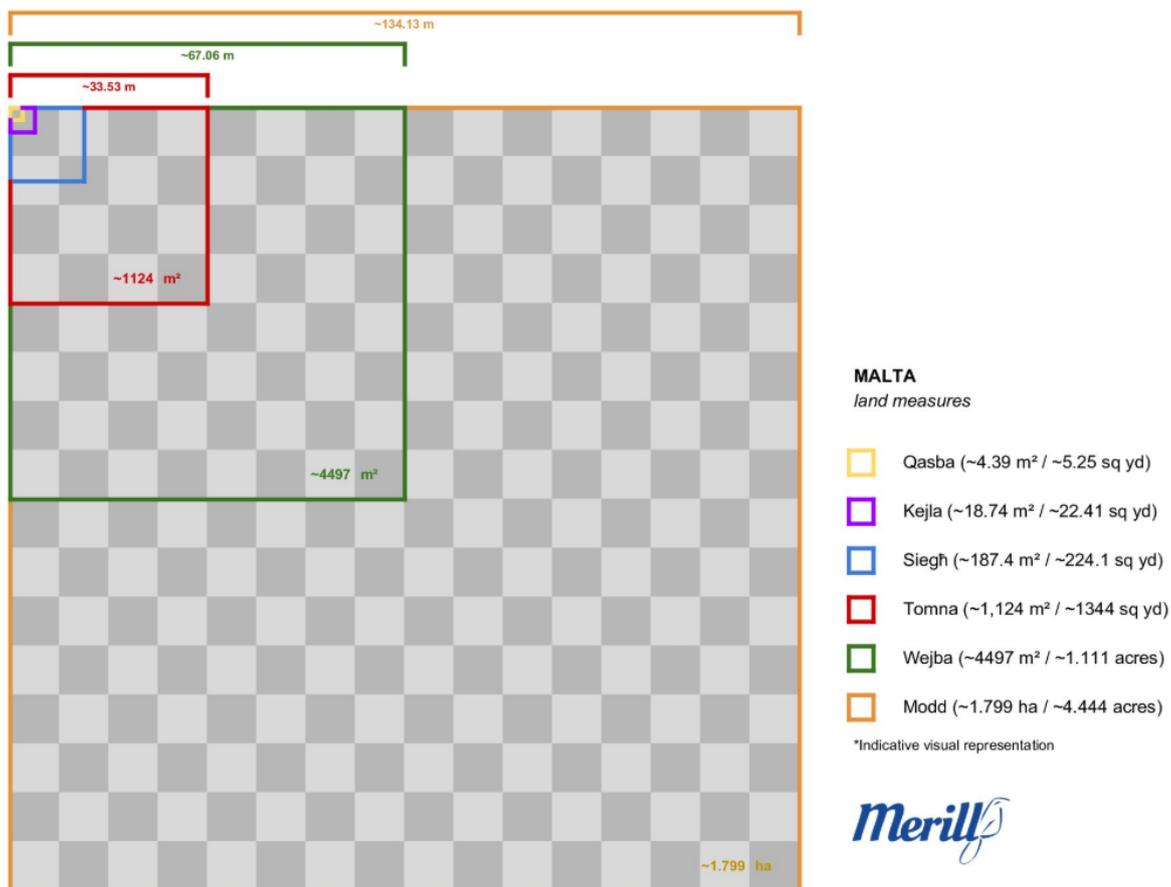


Figure 4.34 Common units of measurements used by Maltese farmers

Source: Merill (n.d.)

To make matters worse, usually the sizes of fields decrease as they are inherited from one generation to another. This happens because the fields are divided between siblings, and followed by their children, and so it continues. This has created a lot of problems, not only because of the time lost due to travelling between one field to another, but mostly because of the fact that some fields become inaccessible by agricultural machinery. This is an issue some farmers have to deal with, either because of the small size of the field or having no road access to the field thus having to pass over neighbouring fields. This has created issues, especially for full-time farmers who have to live off the land:

**Farmer 3:** The fields have always been fragmented, how shall I say, divided. The land has been divided, and a farmer who wants to genuinely live off the fields, has a problem of lack of fields.

*Ir-rabgħa dejjem gie ħafna fragmentat, kif tgħid, maqsum. L-art maqsuma, u bidwi illi jrid, ġenuwinament jgħix minnu għandu problema ta' nuqqas ta' rabgħa.*

A number of farmers discussed how the small sizes of fields contribute towards higher costs for the farmer, especially when agricultural machinery is bought to aid in the work. This makes it even more difficult for local farmers to compete with the foreign market:

**Farmer 2:** Let me give you an example by comparing us to a foreign farmer. When we go and buy a tractor, sometimes we have to pay more. Let's say it is the same price, however, the foreign farmer uses it for six months per year while I use it for two hours. How will I be able to cover the costs for that tractor or that machine that I bought? It is one of the problems we have locally, because our fields are small.

*Per eżempju, ħa ntik eżempju ma' bidwi ta' barra u aħna. Immoru nixtru tractor ġieli nixtruh għoli iżjed aħna minn tagħhom. Mela għamilhom l-istess prezz, dak jhaddmu sitt xhur f'sena u jien nħaddmu sagħtejn, jien kif ser ngħib l-ispejjeż li ħallast ta' duk it-tractor? Jew dik il-machine biex taħdem? Dik waħda mill-problemi li għandna aħna għax il-għalqa żgħira.*

**Farmer 9:** We cannot compete with foreign farmers. Abroad the land is big and ours is small, and so our expenses are higher than the fields abroad. To irrigate the plants, everything needs work, and then once it is ready you will not even cover the costs. Not only will you not make profits, but you won't even cover the costs you had spent.

*U ma ta' barra aħna ma nistgħux nikkompetu. Barra għandim l-art kbira u aħna l-art tagħna żgħira u jiġuna ħafna spejjeż, aktar minn ta' barra. Biex issaqqi u killix xogħol, imbagħad tlaħħqu u ma tiġburx ħaq l-ispejjeż, mhux taqla' l-flus, ma tiġburx ħaq li tkun infaqt.*

Ideally, an agreement is reached between the dividing parties so that the same fields (area) is not divided into smaller fragments, but rather they take land parcels as a whole in different areas. Obviously, this depends on the number of fields present and how the lands had been divided

previously. One farmer spoke about this issue and how they tackled it within their family:

**Farmer 5:** I can only speak for myself. We are three siblings and my father was a farmer. We are two brothers and a sister, all of us full-time farmers, so we divided our fields between three, as precisely as possible. Where it was possible, we did not divide the same field, some took at one site and others at another. So like that we avoid dividing the land. Yes, it is a threat for farming because if the fields are too small, then no machinery can be used inside. It is already small, so I do not know what will happen in the future, whether farming will remain viable or not.

*Jien nista' ngħidlek fuqi nnifsi. Ahna tlett aħwa, missieri kien bir-rabgħa, żewġ subien u tifla. Full-time farmers, u qsamna bejn tlieta, bl-eżatt, kemm jista' jkun. Heq, u kemm jista' jkun l-istess għalqa ma qsamnijiex, min ħa post u min ħa post ieħor. Halli ma noqgħodux naqsmu. Issa, iwa hija theddida għax jekk ir-rabgħa jickien ma tkunx tista' tidhol b'makkinarju. Diġa huwa żgħir biżżejjed, ma tkunx tista' tidhol allura għada pitt għada ma nafx jien kemm ħa tibqa' viabbli.*

Organic farming in Malta is mainly limited because of the issue of the closeness of fields. To be certified as an organic farmer you must have a buffer zone, away from conventional farmers who make use of pesticides and artificial fertilisers. Land fragmentation has rendered it even more difficult for farmers who wish to switch to organic farming. One of the recommendations offered by one of the organic farmers, is that farmers may group up and take on organic farming as a group of farmers, rather than as individual farmers:

**Farmer 8 Organic:** Unfortunately, the fields are very small and are divided between different holders. Over time, when the land is inherited and is divided, it is one of the biggest problems we have. What farmers have to do is that they have to agree with one another and decide to turn their fields into organic fields as a whole group.

*Sfortunatament l-għelieqi ħafna żgħar u maqsumin bejn ħafna nies. Dik biż-żmien meta jirtu l-art, dejjem tinqasam u tinqasam u dik l-akbar problema li għandna. Il-bdiegħa li jridu jagħmlu issa jiftehmu bejniethom biex jaqilbu kollha bhala grupp biex jsiru organic.*

#### 4.2.1.5 Pitkali Markets

None of the farmers interviewed were keen on how the Pitkali markets is being operated. As stated, a reform is needed and an upgrade in how the produce is being presented on the market is also a must. Farmers explained that Pitkala (the middle man) have 8% commission over the produce which is sold from their stalls. They do not take any commission if the produce is not sold.

Some spoke about the discrepancy in prices offered by auction to the farmers for their produce and the prices at which their produce is then sold to consumers. Since there is more than one middle man until the produce arrives to the customer, this ultimately leads to a rise in price, but still farmers are the least paid, as they are at the bottom of the chain. As discussed in previous paragraphs, farmers are usually not offered the same price for the same produce on the same day.

**Farmer 3:** At the Pitkali market, there is nothing going on well. That is for sure! I am amazed, when the market is doing badly because there is a huge discrepancy between what the farmer is paid and how much that produce is sold to a customer. There is something not working well!

*Il-pitkalija, jekk issemmi sistema' oħra b'xi mod jew ieħor għaddejja sewwa, il-pitkalija ma baqa' xejn għaddej sewwa. Dik żgur! Imma, kultant niskanta, kważi kważi sirt ngħid li meta jkun suq ħażin, għax hemm diskrepanza qawwija bejn kemm jieħu ħlas hu il-bidwi u kemm jinbiegħ lill-mara tad-dar. U tgħid imma xi ħaġa ħażina sejra!*

**Farmer 5:** With regards to the Pitkali markets, I personally would say that we need them, even the central cooperative is needed. What we need is that there is more traceability.

*Fuq il-pitkalija ifhimni, jien għalija personali il-pitkala għandna bżonnhom, il-koperattiva ċentrali għandna bżonnhom. Illi jkun hemm aktar traceability qed tifhem.*

As for traceability, all produce going into the market, in Pitkali crates, are allocated a code, usually displayed by a sticker showing the locality the farmer is coming from and a number, such as MĠR for farmers from Mġarr and RBT for farmers from Rabat. All buyers, also have a number. Through this system, the buyer is aware from which farmer the produce is coming from, and the farmer is aware who bought his produce. On the other hand, one of the farmers suggested that since all produce is registered on a computer, farmers should have same day access to trace their produce.

**Farmer 4:** When I go to the Pitkali market with the green crate, there is a sticker with for example MĠR 27 and someone else would have MĠR 30. If from Rabat, RBT and a number. The buyer would know from which farmer he is buying from. Each buyer has his own code, so if I want to check, I would know who bought my produce.

*Jiena x'hin immur minn hawn fuq il-kaxxa l-ħadra jkun hemm MGR 27 u inti jkollok MGR 30. Jekk jkun Rabat jkollu RBT u n-numru. Biex jagħzel ta' min hu, ix-xerrej jkun jaf mingħand min qed jixtri. X'hin jixtrih ix-xerrej, ix-xerrej jerġa għandu l-code number tiegħu, voldiri jiena jekk irrid niċċekkja min xtrah nkun naf.*

**Farmer 11:** If I take my product in on Monday, I call them on Tuesday to check how it did. It is my own produce. We are going to keep on going the same way. Why shouldn't we have access to it, if it is on the computer, why don't we have access to our own produce? It belongs to us. We give it to the Pitkali markets to sell it and make a profit out of it.

*Jekk nieħu xogħol t-Tnejn, t-Tlieta nċemplilhom biex nara kif mar ix-xogħol. Hwejġi dak. Għandi dritt nkun naf. Ħa nibqgħu l-istess sejrjn. Għax m'għandniex nidħlu u naraw kif mar u ma marx jekk inhu qiegħed fuq il-kompjuter, għax m'għandniex aċċess għall-prodott tagħna? Mhux hwejjiġna. Il-pitkul aħna ntuwulu biex jbiegħu biex jieħu l-profitt minn fuq li jaqla'.*

Farmers still feel that the Pitkali markets is needed so that they have a market to collectively offer their produce at. One of the farmers stated that whenever a reform was supposed to take place, there were people from within that opposed. An upgrade in the grading system is needed

for a better presentation of the local produce, and as already mentioned some farmers want a reform in the opening hours.

**Farmer 4:** I think that the Pitkali markets should be there, but there needs to be someone who manages it well. Every time the government tried to make a reform, it found opposition, especially from the private sectors. From the cooperative section we are doing well. What should be organised better, for example are the vouchers because they are not given straight away, some of them even take up to eight days, giving them enough time to mix things up, and there are some who do mix things up, I know what I am saying. Most of the opposition (to government reform) come from here, as they are not sincere, as if one is sincere, one would not oppose.

*Jien naħseb li għandha tibqa' hemm il-pitkalija imma jiena naħseb li l-pitkalija jrid jkun hemm veru min jmexxi u jekk il-gvern kull meta jgħati s-salt jew jipprova jirranġa xi haġa l-pitkalija jsib trouble kbir, speċjalment minn dawġ privati. Minn naħa tal-koperattiva nimxu sew. Li għandu jitranġa per eżempju anka il-voucher ma jtijilekx dak il-ħin, ġieli jdumu anke tmien tjiem biex jtijilek minn ċertu minnhom, biex jkun jista' jhawwad, u ssib naf x'jien ngħid. Hawn jsib oppożizzjoni kbira għax mhux sinċieri, għax kieku sinċieri mhux ha jsib problema.*

**Farmer 6:** The system needs to be organised in various things. As mentioned, the grading system needs to be up to date, with regards time, if possible, one adjusts the time to be more adequate for farmers, as farmers work long hours and sometimes we need to take the produce at night. There are farmers who agreed with it (regarding time), but for me personally it is too much. Early morning hours, Monday morning so on Sunday you have to work.

*Is-sistema għandha bżonn titranġa f'diversi affarijiet. Kif semmejna, il-grading irid jiġi naqra oħra iżjed up- to-date, ħinijiet jekk jista' jkun, wieħed jirranġa naqra l-ħinijiet li jkunu adegwati għall-bidwi, għax il-bidwi jagħmillek siegħat twal jaħdim u l-ħinijiet trid tmur billejl bil-biegħa u hekk. Hawn min jaqbel magħha, jiġifieri ta' imma jien personali ngħid għalija qiegħda wisq. Ħinijiet kmieni filgħodu, għandek tat-Tnejn filgħodu allura l-Ħadd trid taħdem bħal ċuċ.*

One of the farmers commented that since local produce is not yet labelled, there are a few people who buy foreign produce and sell it as if it is local. No produce should be imported with leaves, as the local ones are usually left with leaves on, so that they can be recognised.

**Farmer 10:** They are not supposed to import products with leaves, so that it can be recognised (from local produce). They put it in Pitkali crates, which they are not supposed to do, take it to Pitkali markets, which they are not supposed to do. We are not finding enough help from Pitkali markets.

*Suppost bil-weraq ma jidholx minn barra biex jintaraf. Dik kienet ligi mill-gvern, ligi qadima. Jitfgħuh fil-kaxxi tal-Pitkali, li mhux suppost, jidhol il-pitkali, li mhux suppost. Il-pitkali mhux nsibu għajjnuna biżżejjid.*

As for both the organic farmers interviewed, they prefer to sell their produce themselves, rather than taking it to the Pitkali markets. At Pitkali, there is no distinction made between organic and inorganic produce and they are both offered the same price.

**Farmer 7 Organic:** I do not take produce to the Pitkali markets, but I used to take it, and we can. Until I had enough customers, I had no market for my produce, and I took it to Pitkali. It is sold, nothing special, sold same as all other produce.

*Le, jien ma nieħux imma ġieli ħadt, nistgħu nieħdu. Sakemm qbadt mal-klijenti ma kellix suq u kont nieħu l-pitkali. Imma jinbiegħ, xejn speċjali, bħal prodott l-iehor kien jinbiegħ.*

## **4.2.2 Impacts of farming on the environment**

Human activity, in this case the use of land for agricultural purposes, inevitably brings along both positive and negative changes in the natural state of the environment. The following paragraphs will focus on both the positive and negative impacts of farming on the environment, based on the farmers' opinions.

### **4.2.2.1 Positive impacts of farming on the environment**

#### **4.2.2.1.1 Upkeep of the environment**

Most of the farmers expressed their opinion that without farming the Maltese landscape, would take on a totally different scenario. Farming helps maintain the fields in a good condition, at least visually. Some of the farmers expressed that it is of utmost importance that farmers

understand the environment around them and work to maintain it in the best possible manner through proper care.

**Farmer 1:** ... farmers work the fields, you take care of the fields and rubble walls, you have to take care of everything...

*... tagħmel l-uċuh tar-rabgħa, tagħmel l-uċuh, tieħu ħsieb ir-rabgħa, tieħu ħsieb il-ħitan, trid tieħu ħsieb kollox..*

**Farmer 2:** The trees are a great help to the environment and working the fields and maintaining rubble walls so the soil is not lost, ending up in the sea. Aren't all of these the farmer's work? Everything for the benefit of the environment.

*Is-siġar mhux għajnuna għall-ambjent u taħdem l-art u nagħmlu l-ħitan biex il-ħamrija ma tmurx ġol-baħar. Mhux killu xogħol il-bidwi dun? Mhux killu għall-ambjent.*

**Farmer 5:** No, I cannot imagine that farming will end in Malta because otherwise it would be of detriment to the environment, as at the end where one can see worked fields they are being taken care of, along with the environment. One can see well maintained fields, ploughed and producing food. The food which we produce also helps to reduce emissions from imported food from abroad.

*Le jiena ma nimmagīnax li tispicċa l-biedja Maltija għax l-ambjent jieħu daqqa ta' ħarta żgur għax naħseb illi l-bdiewa, fl-aħħar mill-aħħar fejn tara rabgħa maħrut heq jieħdu ħsiebu u jkun qed jieħdu ħsieb l-ambjent. Għax tarah mnaddaf jkun maħrut u jipproduċu l-ikel. Bl-ikel li nipproduċu aħna l-bdiewa jonqsu l-emmissjonijiet biex jiġi impurat minn barra.*

**Farmer 7:** Farming helps the environment. First of all, it takes care of the environment. Whether it is rubble walls and fields which are being worked and kept clean at least there is life rather than everything left on its own. There is a sense of organisation, when there are farmers working the fields.

*Il-biedja lill-ambjent ħafna tagħmillu tajjeb. L-ewwel nett, l-ambjent jiġi ikkurat. Jekk ħitan tas-sejjeħ, għelieqi maħdumin u nodfa, u hemm ħajja milli kollox mitluq. Ċertu organizzazjoni, meta jkun hemm il-bdiewa għaddejjin jaħdmu l-art milli meta jkun mitluq.*

One of the organic farmers interviewed stated that when farmers adopt organic practices, one is working more positively with the environment as natural methods are adopted.

**Farmer 8 Organic:** We do have an impact on the environment. It depends on the kind of processes we use. In organic farming, we try to respect

the environment, we help it out. In other types of agriculture, where chemicals are used, using synthetic chemicals harm the biodiversity, work against the environment, water and even ourselves.

*Għandha impatt fuq l-ambjent. Skont x'tip ta' proċessi li nużaw. Fl-'organic', l-ambjent aħna nirrispettawh, jiġifieri nagħmlulu l-għid. F'tip ta' agrikoltura oħra fejn jużaw il-kimiki, kimiki sintetiċi jsir ħafna ħsara kontra l-biodiversità, kontra l-ambjent, l-ilma u anke ħsara lilna nnifisna.*

#### **4.2.2.1.2 Maintenance of rubble walls**

One of the most prominent aspects of the positive impacts of farming on the environment which was mentioned by most of the farmers, were rubble walls. Rubble walls may act for the purpose of dividing one field from another, or otherwise help in reducing soil erosion due to runoff. Rubble walls also act as an ecological habitat within themselves. Farmers understand the importance of keeping rubble walls intact.

**Farmer 1:** Rubble walls help reduce soil erosion due to rainfall and also help the field maintain itself at one level.

*Il-ħitan tas-sejjeħ jgħinu biex ma jgorrx il-ħamrija l-ilma u tkun l-għalqa pjana.*

**Farmer 3:** I decided to rebuild all my rubble walls and organise the fields I have. Rubble walls help keep the soil in place. I had a lot of clayey soil in my fields, so it kept water in it and I could not easily work the field. I put in a layer of shingles to help drain the soil. I did all that work.

*Qbadt u rranġajt il-ħitan kollha, irranġajt l-għelieqi kollha li għandi. Il-ħitan tas-sejjeħ biex tilqa' għall-ħamrija. Kelli ħafna rabgħa fit-tafal hawn, u jiġifieri jzomm l-ilma u ma tkunx tista' taħdmu. Trid titfalu layer xaħx taħt ħalli jkun jista' jiddrenja, u għamilt dak ix-xogħol kollu.*

#### **4.2.2.2 Negative impacts of farming on the environment**

Agricultural progress along the years has seen the development of new machinery and equipment to aid in easing the work of the farmer. Over the past years, conventional farmers had to take on a more of a

commercial role, increasing the quantities of their produce in order to be able to compete with the imported produce. This has, inevitably, led to more pressure on the available natural resources of the Islands, especially soil and natural water resources, that is groundwater. Added production has also led to an increase in use of artificial chemicals and nitrates.

Pesticides used in conventional farming, the extraction of groundwater resources for irrigation, nitrate levels in ground water and the use of New Water as an alternative source will be discussed in the following paragraphs.

These two farmers discussed how, unavoidably, progress in the agricultural field has brought along its negative impacts.

**Farmer 2:** I do not think (there are negative impacts) as farming has to work with nature... As farming works like a chain. For example, when I was younger, I remember, we had sheep, we cut the grass growing on rubble walls and gave it to the sheep. We took the cheese, we took the manure and returned it back to the fields, and the cycle continues. Nowadays you can say that all of this has ended. Three thirds of the rubble walls were cleared (from weeds) by workers from the Local Council who came and killed the grass with pesticides to avoid work, poor bees. I do not agree that on such sites pesticides should be used.

*Ma naħsibx għax il-biedja maħluqa qisa min-natura t'Alla...Għax il-biedja katina waħda mal-oħra. Per eżempju fi żmien meta konna żgħar waħda li niftaker jiena, kien ikillek in-naghġa, qtajt il-ħaxix ta' mal-ħitan, tajtu lin-naghġa, ħadt il-gbejniet, ħadt id-demel, ergajt waddabtu ġol-għalqa u terġa rutina dejjem iddur. Illum dawn l-affarijiet tista' tgħid killa spiċċaw. Il-ħitan tliet kwarti jiġi l-kunsill u jbixxlek biex jiffranka x-xogħol u msieken in-naħal bil-bexx. Hemm jien ma naqbilx miegħu li nbixxu hu.*

**Farmer 3:** In any type of progress made, including the farming industry, there are negative impacts, so if you are using pesticides, which there is a lot of turmoil about, it is leaving certain impacts. But, can you mention anything which can be done without it? If you mention the manoeuvring of machinery it also has an impact on the environment. But if you do not work the fields, considering the current situation

and the progress made, what will happen to the environment? Will it progress or will everything be abandoned?

*F'kull tip ta' progress li sar bħal ma huwa inkluz tal-biedja, hemm impatti negattivi bilfors, jġifieri jekk inti qed tuża l-bexx li tant hawn aħa fuqu, hemm l-impatti, qed jhalli ċertu impatti. Imma semmili inti jġifieri x'tista' tagħmel mingħajru? Jekk issemmi heq ħafna immanuvrar ta' inġenji mhux impatt fuq l-ambjent. Heq, imma jekk inti ma taħdimx l-għelieqi jġifieri għall-argument ta', għax qed fis-sitwazzjoni ta' illum qed ngħidu aħna, jġifieri fis-sitwazzjoni tal-progress li sar illum, jekk ma taħdimx l-għelieqi speċi x'jigri mill-ambjent? Jġifieri mmorru għall-aħjar jew jiġi abbandunat?*

**Farmer 4:** Negative impacts are maybe caused by (some farmers) who do not care enough about the environment, but only a few. For example, regarding cleanliness, we use plastic for tunnels and to put on the bottom to increase the temperature (in Winter) and reduce weeds from growing. Everything used to be burned. Nowadays, we bring a number of containers at Żebbiegħ and anyone can throw plastic in. We have another station at Pitkalija, so that plastic can be collected there rather than burned. Only a few farmers are not making use of this new system. Bad practices have almost come to none.

*L-impatti ħżiena forsi jkun hawn min, li huma ftit ħafna li jiġi jaqa u jqum mill-ambjent imma ftit ħafna. Eżempju indafa, aħna nużaw il-plastik għat-tunnels u biex tagħmel taħt biex jkollu s-sħana u ma jitlax ħaxix. Dak kollu kien jinħaraq. Illum għamilna sistema li ngħibu containers iż-Żebbiegħ u min jrid jitfa' ġo fihom. Għandna stazzjon fejn il-pitkalija biex x'hin trid plastik li għandek tmur titfghu hemm mhux taħarqu. Ftit ħafna bdiewa mhux jużaw din il-prattika l-ġdida. Li hu ħażin kwazi inqata' kollu.*

#### 4.2.2.2.1 Use of Pesticides and Herbicides

One of the most controversial topics in conventional farming practices is the use of pesticides to control insects considered as pests and the use of herbicides to control the growth of wild plants in fields.

As discussed in the previous paragraphs, the number of diseases and pests have increased throughout the past years, and this, as farmers claim, has led to an increase in the use of pesticides, as otherwise their produce would diminish drastically due to losses. Farmers also claimed that the variety of pesticides and herbicides available at the local suppliers is much less than that available abroad. The majority of farmers mentioned the use of sulphur and copper sulphate, which are both used

as anti-fungal treatments, both organic pesticides, as are naturally derived chemicals (Refer to Appendix F for photo). Both of these chemical are used by conventional and organic farmers.

**Farmer 1:** A lot of diseases have come from abroad, such as that of tomatoes, and trees. One is forced to buy pesticides. Compared to the foreign farmers, we have no variety of pesticides locally. It is not as strong as those used abroad.

*U jidhol hafna mard minn barra ukill, dahhlu hafna mard minn barra bhal tat-tadam, u tas-sigar u hekk, killu minn barra gibuh dak il-mard. Mhux bilfurs, trid tixtri l-pesticidi imbaghad. Hdejn ta' barra m'ghandna xejn bexx ahna. Mhux b'sahhtu bhal ta' barra.*

**Farmer 4:** I cannot (not use pesticides). Less use of pesticides means that you will have less produce.

*Ma tistax. Inqas uzu mil-pesticidi ma tiehux il-prodott.*

**Farmer 5:** It is impossible to work without using pesticides! Can a doctor work with natural remedies and not give us any medicines? He could and he tries to as much as possible and so do the farmers! I can assure you, and it is important to understand, that the majority of farmers know what they are doing and they do not use pesticides for nothing. Pesticides are very expensive, very, and if one could not use pesticides, he would not!

*Impossibli li tahdem minghajr bexx! Lilek taf x'nghidlek. It-tabib jista' jahdem naturali u ma jtinix medicina? Jista' u jipprova jaghmel hekk kemm jista' jkun, anke l-bidwi! U nassigurak illi l-bidwi, din importanti li tifimha, il-bidwi, l-maggor parti li jafu x'inhuma jaghmlu ma juzawx bexx ghalxejn. Il-bexx huwa gholi hafna, hafna u inti jekk tista' ma tuzahx ma tuzahx!*

**Farmer 6:** From our part we cannot do anything special. It is important that one is careful not to use any extra amounts. Nowadays, we have restrictions on the amounts of pesticides... On the other hand, nowadays the environment is more polluted and we cannot not use certain products, whereas before we only used sulphur and copper sulphate. We used to have less produce, but the air was cleaner, in a sense that you could leave the produce to grow on its own without much care. Nowadays, the air is so polluted that it is becoming difficult for us to grow produce without using certain things. One has to use them cautiously and pay attention to how you are using them.

*Min-naha taghna ma nistghu naghmlu xejn speċjali. L-importanti wiehed joqghod attent illi ma juzax certu pesticidji zejda. Illum il-gurnata, jigifieri ghandna r-restrizzjonijiet fuq il-bexx u hekk... Minn naħa l-oħra llum il-gurnata l-ambjent, thammeġ, u ahna ma nistghux ma nużawx certu affarijiet fejn dari konna, kull ma konna nużaw, dak li ngħidulu kubrit u l-kupru. Ikellna ftit, ftit affarijiet, imma dari l-arja kienet nadifa illi prodott tista' thawwlu u titfgħu hemm fl-ghalqa u kien jibqa' ġej u jasal kif għandu jkun. Illum le, illum il-gurnata, l-ambjent tant huwa mnigges illi għalina sar diffiċli illi l-prodott tkabbru u ma tuzax certu affarijiet. Trid tuzahom dejjem bil-ghaqal, sintendi u allura wiehed joqghod attent kif juzahom.*

Several farmers conversed about how they try to avoid chemical use as much as possible, not only because of costs but also to reduce the input of chemicals in their soils. Manual work is preferred over the use of pesticides, especially to eliminate weeds from growing in fields. Ploughing the fields and making use of plastic mulch all help reduce the growth of wild plants.

**Farmer 10:** We try to pick up by hand as much as possible, to reduce spraying the fields as that leaves the chemicals in the soil. When you plough the fields, you are mixing up the soil and increasing oxygen in soil while working the soil. When you spray you are leaving chemicals behind and it is much more expensive than ploughing. It is cheaper when you plough the soil. We use pesticides on rubble walls as they cannot be ploughed.

*Kemm jista' jkun naqilgħu b'idejna, ma nbixxuhx għax int ser thalli l-kimika ġol-ort. Meta tahrat eżempju ser thawwad hamrija, ser iddahhal l-ossignu ġol-ort, taħdimha ngħidu mhux titballat fhimt. Meta ħa tbixx int speċi hallajt il-pestiċidi u huma għaljin iżjid milli kieku tahratha. Tahratha 'cheaper', tiġik irħas. L-aktar li nużaw pestiċidi biex nbixxu hitun għax il-hitun mhux ser tahrathim.*

**Farmer 8 Organic:** We use a lot of methods which were used by our ancestors. We use the same methods as them. We make use of sulphur (*kubrit*) and copper sulphate (*kupru*), the method used before chemical pesticides were used in Malta.

*Aħna nużaw ħafna metodi li qabel kienu jużaw in-nanniet tal-bdiewa ta' llum u l-bużnanniet. Aħna nużaw l-istess sistemi li kienu jużaw huma. Li jintuża l-kubrit, l-kupru, u sistemi hekk li kienu jużaw l-antiki qabel ma daħal il-bexx kimiku Malta.*

Most of the farmers claim that all farmers, whether they like it or not, have to limit the use of pesticides because of the high cost of buying such products. They state that all of these products are very costly and thus all farmers take caution on using the right amount, not only to avoid fines, but also to limit their expenditure.

**Farmer 2:** Pesticides are a huge detriment to the farmers, as one goes to buy a packet he will immediately be at a loss because of its price. When compared to abroad, as they tell us during the courses, we use minimum amounts. Abroad they spray the fields using huge tractors

or airplanes and spray everywhere, over large fields. We spray one plant at a time, not spray over the whole field, using an airplane.

*Il-mediċini dawn il-bexx ferita kbira għall-bidwi għax x'hin imur jixtri pakkett ifalli mal-ewwel. Habba l-prezzijiet li għandna. U x'hin nikkumparuh ma' ta' Multa jien għalija, kif dejjem kienu jgħidulna meta mmurru nagħmlu l-laqqgħat, li hawn Multa mill-inqas li nbixxu. Barra meta jidholluk ibixx, jew b'xi 'tractor' m'ogħla hawn jgħaddi u jbixx kullimkien, jew b'xi ajruplun, tarhom fejn jkun rabgħa kbir. Ahna, nbixxu pjanta pjanta, waħda waħda, mhux bħal meta tgħaddi u bixx kull m'hemm, qabad bit-tajjeb u l-ħażin, bl-ajruplun għadda jigru fuq kullimkien.*

**Farmer 5:** Pesticides are very expensive, they have to understand that they are a huge expense. If the farmer can avoid its use he would, but sometimes he has to do what he doesn't want to..

*Il-bexx huwa għoli, din tal-bexx iridu jifhmu illi l-bexx huwa għoli, jekk jista' jkun il-bidwi jgħaddi mingħajru imma kultant jkollu jagħmel li ma jridx.*

Farmers are requested to attend courses to educate them on the use of pesticides and herbicides. They are also given a licence to be able to buy such products. Instructions on the packaging are also provided in Maltese, so that all farmers understand what quantity has to be given and the time period the farmer has to wait before taking the produce out on the market.

All farmers are also aware of the consequences of cutting produce before the stipulated period after administering pesticides or herbicides. Samples are randomly taken at the Pitkali markets and if caught, farmers are prosecuted in court and are not allowed to take in that type of produce for a whole year to the market.

**Farmer 1:** You must give the exact amount and check what the stipulated period is to cut the produce, as written in Maltese.

*Kollox trid taqti bl-eżatt u kollox trid tara kemm iddum biex taqta' skont x'hemm miktub bil-Malti.*

**Farmer 4:** There are less tests on imported produced when compared to the amounts being imported. For example, a container... maybe ten containers come from abroad and one is tested, which is too little. For example, regarding pesticides we have those taken to the Pitkali markets. If tests are carried out, when you are entering the Pitkali

market, you are stopped and a sample of that certain product is taken to be tested for pesticides. They check everyone who had that particular product.

*Ta' barra qed isiru hafna inqas testijiet akkont il-prodott li diehel. Per eżempju jekk kontejner... ta' barra forsi jidhlu ghaxar kontejners u forsi jsirlu wiehed test minn ghaxra li hu ftit hafna. Eżempju fuq il-pesticidi ahna ghandna dak li ndaħhlu il-pitkalija. Jekk il-pitkalija isiru t-testijiet fuq il-prodott, tkun diehel jwaqqfek u johodlok 'sample' milli jkollok u jittestjahulek, jara x'fih u ma fihx. Kienu qed jiċċekkjaw lil kulhadd, mhux lilek le u l-ieħor iwa, jew inti ghandek dak il-prodott allura jiċċekkjawk.*

**Farmer 6:** Obviously, as farmers, nowadays we attend courses on the use of pesticides and everyone has his own card. We just completed one, three years ago, I have all the papers and a permit. Nowadays you cannot go and buy pesticides without attending this course, as it is important. Meanwhile, when you go to buy, the person selling (pesticides) helps in educating you on the dose to be given, and such other things. You are not going to use extra amounts as it is extremely expensive!

*Ovjament ahna bhala bdiewa, illum il-gurnata nohdu l-korsijiet tal-bexx, kulhadd ghandu l-card tieghu. Ghandna kif ghamilnieh, ilna tliet snin, ghandi l-karti u bil-permess. Ghax illum ma tistax tmur tixtri bexx minghajr ma tkun hadt dan il-kors, ghax huwa mportanti. U fl-istess hin meta tiġi biex tixtri, min ibiegħlek, jedukak u jghidlek kemm trid tati doża u dawn l-affarijiet. Illum m'intix ser tharbat bexx żejjed ghax il-bexx huwa għoli immens!*

Recently, there were various articles on the newspapers discussing the excessive amounts of pesticides found on tested produce at the local Farmer's Market. As farmers discuss, this bad publicity has effected them tremendously, as they feel that all farmers were blamed.

**Farmer 3:** People make bad publicity because they think we are not responsible for the food we are producing. When the first article was published on a local newspaper, it immediately had an effect on us. There were others as well, which also left their effect. I still believe that since then, even more with the organisation we have formed, "Għaqda Bdiewa Attivi", there has been more awareness. I speak to consumers, explaining that they want a healthy product and that I am responsible enough to offer such a product.

*Din li n-nies jagħmlu isem ħażin ghax jidrilhom li ahna m'ahniex responsabbli tal-ikel li qed niproduċu. Meta giet mxanntra f'gazzetta lokali, deher l-ewwel artiklu, mill-ewwel aghmel impatt. Kien hemm oħrajn ukoll, għamel impatt qawwi hafna. Xorta nemmen li minn dakinhar l'hawn, anke bl-għaqda li ffurmajna, Għaqda Bdiewa Attivi, li reġgħet nholqot awareness. Jien nitkellem ma' konsumaturi biex tispjegalhom huma jridu jieklu prodott healthy u jiena responsabbli biżżejjed biex nofrilhom dawn il-prodotti.*

**Farmer 5:** There may be people who may have interests saying that we spray without caution, but research shows that if you go to Sicily, farmers there are still using pesticides which have long been banned in Malta. They have been banned in Malta but are still used over there.

*Ikun hawn min forsi jkollu interessi oħra li nbixxu bl-addoċċ, mir-riċerka jekk tmur Sqallija hawn pass, il-bdiewa għadhom jużaw bexx li hawn ilu ma jiġi Malta snin twal. Minn Malta inqata' u hemm għadhom jużawh.*

**Farmer 6:** They are trying to make bad publicity because of the pesticides. It may be true that there may be farmers who abuse, but just because two or three farmers are caught, you cannot generalise all farmers. As I told you, responsible farmers are very careful because the penalty is no joke. You have one whole year of not taking the product you are caught with, to the Pitkali markets, so you must be careful.

*Minn ħabba pestiċidi hawn min qed jipprova jagħmel il-ħsara, vera jista' jkun li jkun hawn xi bidwi jabbuża imma ma tistax għax qabdu żewġt ibdiewa jew tlieta tiġġeneralizza lil kulhadd. Aħna kif semmejtlek, bdiewa tal-affari tagħna noqgħodu attenti għax illum hemm penali mhux taċ-ċajt. Illum tagħmel sena sħiħa ma tersaqx lejn il-pitkalija b'dak il-prodott li jaqbdek bih, allura trid toqgħod attent.*

#### **4.2.2.2.2 Use of groundwater**

Ground water is the only natural water resource available all year round in the Maltese Islands. Another seasonal water resource available, which farmers may utilise, is the water available during the rain period in valleys across Malta and Gozo. Due to the dependence on mainly groundwater, the Maltese Islands experience water scarcity, especially in harsh Summer months, where the demand on water increases drastically.

Although farmers are aware that we do have water scarcity on the Islands, they continue by adding that, especially in the drought season, which is basically between May and September, they cannot not make use of groundwater.

**Farmer 5:** One of the negative impacts of farming I can see is that we make use of boreholes to pump up water. Once you are a full-time farmer and you have to maintain yourself from the field, you have to (pump up water), because you have to have a good quantity of produce to make some profit. So, if we do not use boreholes it would be better.

*Impatti negattivi l-aktar li nara li hemm illi llum għandna l-boreholes u ntellgħu l-ilma mill-boreholes. La tkun trid tiekol minn hemm, la tkun full-time bilfors jrid jkollok għax inti trid tkabbar bil-kwantità illum biex jibqagħlek xi haġa żgħira allura kieku ma ntellgħux l-ilma mill-'boreholes' naħseb aħjar.*

One of the farmers conversed about the fact that the increase in tarmac and concrete surfaces across the islands also leaves its own impact on the amount of rainwater percolating in the rocks, eventually reaching groundwater table. He continued by adding that all of this led to a decrease in groundwater available on the Islands.

**Farmer 2:** Buildings and roads are both a threat. These large concrete roads. As water is not percolating through the rocks, it runs off. When we talk about table water, there are many who say that farmers are using the table water. But before, rain water had permeable surfaces to pass through, for example in valleys where a lot of water collects, water seeps slowly through. But nowadays if you have roads, or ceilings, water runs off and ends up being lost at sea, as we are not collecting such water. So, that is one thing against agriculture, as you must water the fields, just as we have to eat and drink.

*Il-bini u anke t-toroq theddida. Habba l-ilma. Dawn it-toroq kbar bil-konkos. Għax l-ilma mhux qed jidhol gol-blut, l-ilma għaddej jigr. X'hin nibdew ngħidu għat-table water, hawn ħafna jgħidu l-bdiewa qed jtellgħu ħafna mit-table water. Imma jekk qabel l-ilma kellu dak il-blut fejn jinżel, eżempju gol-widien nuf ħafna kien jkun gej ħafna ilma, dejjem niezze bil-mod l-ilma. Imma llum jekk għandek triq, saqaf, narah kemm jiġi l-ilma malajr, killu jitlaq għall-baħar mhux naħżnuh. Allura dik waħda li ħażin għall-biedja, għax inti l-biedja trid ittiha tixrob, bħal ma nieklu u nixorbu aħna.*

Over the past years, farmers have adopted more sustainable water irrigation systems, the most popular one mentioned by all farmers is the use of drip irrigation. Drip irrigation helps limit the amount of water used as well as adds water available to the crops by watering close to the roots.

This system is efficient as pipes can be used repeatedly, collected and used in other fields as necessary. Most farmers only use sprinklers nowadays to water potatoes, but prefer drip irrigation for all other produce.

**Farmer 4:** I believe, that water loss has been reduced drastically. Nowadays, we use the drip and you only use as much as is needed, watering exactly next to the plant. So, through drip irrigation we are reducing water loss. For example, there were sprinklers, some still use them, and there is no water loss as well. Whereas before, we used to make gullies in the soil to pass water through, and then form squares and fill them up with water, leading to more water loss compared to nowadays.

*Jien naħseb li ħela tal-ilma llum tnaqqset drastikament. Illum nużaw id-drip u d-drip assolutament tuża kemm jkollok bżonn u eżatti ttih fejn iz-zokk. Voldiri d-dripp l-ilma qed jiġi ffrankat ħafna ħela t'ilma. Eżempju, kien hemm sprinklers, hawn min għadu jużhom, m'hemmx tharbit anqas. Qabel konna biz-zappuna, timla' l-kaxxa, konna nagħmlu seqja ngħidulha, jgħaddi l-ilma minn ġol-kanal imbagħhad jkollok kaxxi, kaxxi, kaxxi iddawwarlu biz-zappuna jimtela, dak kien jitharbat ħafna ilma fejn illum.*

**Farmer 8 Organic:** I think that farmers, whether they like it or not, have learned to preserve water as water is very scarce. We have just come out of a drought spell of almost three years, and even though it has rained this year, we still have not recovered. Farmers adapted to preserve water by using plastic mulch, drip irrigation and even use chemicals to make water more disposed to plants. They use certain products which they add to water to reduce lime from groundwater so it helps in its uptake by the plant.

*Naħseb li l-bdiewa jridu jew ma jridux tgħallmuha din biex jibżgħu għall-ilma għax l-ilma sar skars ħafna. Għadna kif ġejjin minn nixfa ta' kwazi tliet snin, nixfa kerha kienet u avolja għamlet ix-xita dis-sena xorta ma ħriġnix mill-problema. Il-bdiewa adattati issa biex jibżgħu għall-ilma jiġifieri jużaw il-'plastic mulch', 'drip irrigation' u jużaw ħafna kimiki biex jgħin l-ilma jkun aktar disponibbli lill-pjanti. Hemm prodotti li jżidu mal-ilma li jiġi aktar 'available' lill-pjanta biex inehħilu l-ġebbla u allura tieħdu aktar malajr il-pjanta.*

One of the farmers discussed how it would be more viable if farmers did not grow any produce in the Summer period, so as to avoid the uptake of groundwater to continuously water the crops during the dry period. He states that the government should encourage this practice by giving subsidies and helping out the farmers.

**Farmer 3:** Drip irrigation is the most efficient means to use the least possible amount of water, but if agriculture in general had to be more sustainable, in the financial means... It is already moving forward in that direction. If the farmers in general have subsidies in summer or other diverse aid, it would be better. We are told that in Summer we should leave our fields empty. We save up large bowsers, millions of gallons of water.

*Bid-drip irrigation l-aktar sistema effiċjenti hux biex tuża l-inqas ilma possibli, pero li kieku l-biedja ingenerali hija sostenibbli, jiġifieri fis-sens, finanzjarju għall-biedja... Hi diġa qieghda riesqa l' hemm jiġifieri, l-bdiewa ingenerali hekk qieghdin, kieku fis-Sajf, jkollok ċertu tip ta' sussiedju, jew għajnuniet diversi, xi haġa oħra, u fis-Sajf jgħidlek ir-raba' hallih vojta. Tiffranka, baużers kbar hawn, jiġifieri miljuni ta' glalen.*

Other farmers argued that although farmers are mainly blamed for the uptake of large quantities of groundwater, they state that there are many other industries who are taking up groundwater for other purposes.

**Farmer 5:** For example, they say that farmers take up a lot of water from the boreholes. OK we do pump up water but we put it back in the soil and some of it will go back down and ultimately we are producing food. What do we say about those taking up water from boreholes, to use it for hotels, pollute it and throw it away? How much more expensive is it for the government? They are attracting tourists, but we are producing food!

*Eżempju waħda minnhom jgħidu għax il-bdiewa jtellgħu hafna ilma mill-boreholes. Ok aħna ntellgħu mill-borehole l-ilma, nerggħu nitfgħuh fil-ħamrija u f'it minn ser jerga jinżel, u qed nipproduċu l-ikel. Mela xi ngħidu għal daww li jtellgħu l-ilma mill-borehole, jużawh għal-lukandi, jħammgħuh u jarmuh. Kemm qed tiġih għola aktar lill-gvern? Qed iġġib it-turisti u qed jahdmu n-nies, imma aħna qed nipproduċu l-ikel!*

**Farmer 6:** I can say that there are too many companies and industries using water from boreholes, and I can tell you that the percentage of water used by farmers is not so alarming.

*Jien għalija hawn wisq kumpaniji u industrij li għandhom l-'boreholes', u jien ngħidlek li persentaġġ tal-bidwi mhux daqshekk alarmant żgur.*

#### 4.2.2.2.3 Nitrates in water

Another prominent issue related to the agricultural industry and farming, is the level of nitrates present in groundwater. To limit the level of nitrates, present in water, solid manure must be stored between the 15<sup>th</sup>

of October until the 15<sup>th</sup> of March. During the remaining period, the dry season, farmers can apply organic matter and fertilisers to their fields. All the farmers interviewed were aware of this Nitrates Action Programme and the time frame they are allowed to fertilise their fields.

**Farmer 8 Organic:** Nitrates are a big problem in the local water table, as over the years, soluble fertiliser was being used, mixed with water. So when it rains or is used with irrigation, it ends up in the water table. We know of this problem because when we fill up a bucket of water from our borehole in Summer, after six or seven hours it becomes greenish, as it has a lot of nitrates. It is a problem but farmers, slowly, slowly, are learning to limit the use of excessive nitrates.

*In-nitrati problema kbira fl-ilma, fil-‘water table’ ta’ Malta għax dawn is-snin kollha li kien qed jintuza dan il-‘fertiliser’ li huwa ‘soluble’ allura jithallat mal-ilma imma meta tagħmel ix-xita jew isaqqu u jispicča fil-water table. Nafu b’din il-problema għax l-ilma tal-‘borehole’ tagħna per eżempju meta ntellgħuh u nħallu barmil fix-xemx fis-sajf, wara sitt siegħat jew sebgha jibda’ jihdar, narawh, għax fih hafna nitrati. Problema kbira li bil-mod il-mod il-bdiewa qed jitgħallmu ma jitgħux nitrati eċċessivi.*

**Farmer 10:** In Summer we spread cow manure. I do not use (fertilisers) in Winter, as I give out properly in September, August and in Summer I spread manure and plough it. First it dries up, in Summer everything dries up, we spread it and plough the field. For example, the best I use is natural manure, I do not like the artificial one. Natural is best, and when you put manure in the field, you are returning material to the soil, when you take out produce from the field, you are taking away material and return it when putting manure. When you put in artificial fertiliser it is like all of it melts in water.

*Fis-sajf nitfgħu d-demel tal-baqar. Jien ma nitfux fix-Xitwa, jservi, għoti sewwa f’Settembru, Awwissu, fis-Sajf, ferrix minnu u aħartu voldiri. L-ewwel jinxif, fis-Sajf jinxif killix, iferxu bil-karru u taħartu. Eżempju jien l-aħjar li nuza huwa demel naturali, l-artifiċjali ma jegħjibnix voldiri. Aħjar in-naturuli, u meta titfa’ d-demel qed titfa l-materjul ġol-art, meta ħriġt il-prodott minn ġol-għalqa ħriġt il-materjul u meta titfa’ d-demel tfajt il-materjul. Issa meta tfajt l-artifiċjali kull ma tfajt qisu jinħall mal-ilma duk.*

Almost all the farmers, admitted that they may be contributing to a small part of this nitrates issue in local groundwater but also claimed that the issue is not to be blamed on farmers only. They stated that there is another underlying issue happening locally, and that is the leakage from

the drainage system and underground pipes across the islands, leading to increased nitrates reaching groundwater.

**Farmer 5:** They think that the problem of nitrates in water is caused by us farmers. Everyone points their fingers at us, but in reality from studies conducted, as far as I know, it is true that it came out that it is caused by farmers, but they are not specific, as we do not know how much drainage is leaking.

*Il-problema tan-nitrati fl-ilma ħa ngħidlek jaħsbu li aħna l-bdiewa kulħadd jippona subgħajh lejna, meta fir-realtà l-istudji li hemm, sa fejn naf jiena, veru ħarġu li aħna l-bdiewa, imma m'humieq speċifiċi eżatt għax aħna ma nafux kemm hawn drenagġ ħiereg barra.*

**Farmer 10:** No, not all of it. Due to farming, there could be some places which had an impact but the problem, most of it, is caused by the leaking government drainage system. The drainage system is all damages. I know because I used to work in construction and we knew what was there. And my friends who work with the drainage department tell me, there and there, there are damages and it is leaking.

*Le! Mhux killha kemm hi. Mill-biedja hemm ċertu postijiet forsi kien hemm impatt imma l-problema ħafna minnhom ija dranaġġ tal-gvern. Is-sistema tad-dranaġġ tal-gvern imkissra killha kemm hi. Nuf għax meta kint naħdem fil-'construction' ġieli bagħtuni u kinna nkunu nufu x'hemm. U sħabi li jaħdmu ma' tad-dranaġġ jgħidulek hemm hemm il-ħsura, hemm jillikja.*

Several farmers claimed that although they are not allowed to use fertilisers to grow their crops in the Winter period, it is impossible for them to do so. They argued that crops need fertilisers to grow, so if the farmer notices that the crop has not got enough fertiliser, he will eventually apply fertiliser irrespective of the time period.

**Farmer 3:** There are regulations, and as long as they are justified, you abide. Why would I throw a load of manure in the field, and leave it there all Winter, if I know it is causing such a problem? We do not have any problems with that, but to come and tell me that in Winter I cannot use any sort of substances or fertilisers. I try to keep to organic as much as possible, but with organic only you won't do anything, you have to aid with the artificial, the synthetic.

*Għandek regolamenti, sakemm kienu ġustifikati, heq tmexxi bihom. Għalfejn jien għandi nwaddab vjeġġ demel fl-għalqa u nħallih hemm ix-xitwa kollha jekk naf li qed johloq dik il-problema? Fuq dik il-ħaġa m'għandekx problema imma, li tiġi fix-xitwa u*

*tghidli ma tistax titfa' s-sustanzi u fertilizzanti. Niprova nżomm naqra mal-organiku ta' imma, bl-organiku biss ma tagħmel xejn xorta, trid tghin naqra bl-artifiċjali, s-sintetiku.*

**Farmer 4:** Let me tell you since you are educating. Manure is being applied all the time when the plant needs it! If you can apply manure in March and the plant till March will be dead or the crop is cut, and you cannot apply (fertiliser) what happens then? Natural manure is to be applied in Summer, but we are not even supposed to apply artificial fertiliser in Winter.

*Imma ħa nghidha voldieri inti qed tagħmel it-tagħlim. Id-demel qed jintefa' l-ħin kollu! X'ħin jkollha bżonn il-pjanta. Din ma tistax il-pjanta għax tista' twaddab f'Marzu u l-pjanta sa Marzu tkun mietet jew tkun inqatgħet ma tistax tużah voldiri, allura x'tagħmel? In-naturali jinħarat fis-sajf biss imma qas l-artifiċjali suppost ma titfa' xejn fix-xitwa.*

**Farmer 5:** I agree but at the same time do not. I agree because natural manure should be spread in that period. But I do not believe that other substances and nitrates cannot be applied to fields in the other period. If we do not give anything during that period, you would be dying a natural death. If we do not want to apply anything, from October till March, you can go without natural manure as it would have been applied in Summer. But you cannot not give artificial nitrates during that period, as they would be killing it slowly.

*Naqbel u ma naqbilx. Naqbel għax id-demel naturali tal-bhejjem, naqbel li ttiħ dak il-perjodu. Pero s-sustanzi u nitrati, ma nemminx li dak il-perjodu ma tistax tagħti. Jekk f'dak il-perjodu ma nagħtu xejn, tkun qiegħed tmut mewta naturali. Jekk irridu li ma nagħtu xejn, minn Ottubru sa Marzu tista' ma tagħtix demel tal-bhejjem għax tkun ħsibt għalih fis-sajf, pero ma tistax ma żżidx nitrati artifiċjali dak iż-żmien, għax jkun qed joqtluna bil-mod.*

#### 4.2.2.2.4 The use of New Water

The treatment of waste water in Malta has not only led to an improvement in sea water quality, but also led to the production of Class A Secondary Water. This New Water is being offered to farmers in various localities across Malta and can be used for irrigation purposes. This is aimed to reduce the uptake of groundwater through boreholes.

**Farmer 5:** I believe that it is imminent as at the end, as time passes, no one knows what is going to happen. I think that yes, it is a solution for water shortage. The thing is that we do not have access to it all around Malta. For example, here in Rabat, they tell us that it will be delivered, but we do not have a framework of when it will be delivered. I expect that it will be available one time or another. I admit that it

will take a long time, but we still do not have a timeframe. We would reduce the extraction of water from boreholes, and I believe we would be able to work better. I simply hope that they keep the same quality of water they started with.

*Naħseb illi imminenti għax fl-aħħar mill-aħħar la jgħaddi ż-żmien ħadd ma jaf x'ser jigi. Naħseb iwa hija s-soluzzjoni għan-nuqqas t'ilma. Il-ħasra hi illi m'għandniex aċċess madwar Malta kollha. Per eżempju aħna r-Rabat jgħidulna ser jitla' imma m'għandnix 'framework' ta' meta ser jasal in-naħa tagħna allura jiena nippretendi illi jasal f'hin jew f'ieħor. Nafu, nammetti li trid ħafna żmien imma m'għandniex 'timeframe'. Kieku b'hekk innaqqsu l-estrazzjoni tal-ilma mill-'boreholes' u naħseb li naħdmu aħjar... Nispera biss illi jibqgħu jzommu l-istess livell li bdew bih.*

**Farmer 10:** Yes, it is a solution as it will reduce the extraction from boreholes. The only thing we have are boreholes. Every litre which will be used, will be reduced from extraction from boreholes. Whether it will be used on its own or mixed with groundwater, you are still reducing.

*Iwa, soluzzjoni għax ma jibqax jigi estratt mill-'boreholes' fhimt. L-uniku ħaġa il-borehole kien hawn. Kull litru li ser tuża minnu ser tnaqqsu milli tieħu mill-'borehole'. Issa tużah waħdu jew thalltu xorta qed tnaqqas.*

A few farmers commented on the fact that the water is too purified, in fact they choose to mix it up with groundwater to increase the minerals in it.

**Farmer 8 Organic:** Yes, I believe it is a good solution, as long as it is of good quality. So far, the new water provided by the government is very good, in fact it is too good as it has few minerals, so we add minerals from the borehole. It is so pure, that we had to mix it with water from the borehole to increase the number of minerals as otherwise it won't be so good. We have a borehole here, but in Summer sometimes we buy (New Water). The water is free of charge, but you have to pay for transport.

*Iwa naħseb li hija soluzzjoni tajba, sakemm tkun ta' kwalità tajba imma s'issa l-ilma ġdid li qed jagħtina l-gvern huwa tajjeb ħafna, filfatt huwa tajjeb wisq għax ma tantx fih minerali, allura aħna kellna nżidulu l-minerali minn tal-'borehole'. Allura tant huwa pur, li bilfors ridna nħalltuh ma' tal-'borehole' biex jkollu l-minerali, għax ma jkunx tajjeb ħafna. Hawn għandna l-'borehole', imma fis-Sajf ġieli nixtruh. Hu b'xejn imma xorta trid thallas għat-transport.*

**Farmer 9:** It will reduce the uptake of groundwater for sure. In Gozo, it was implemented this year, in September (2018). But here in Gozo it is a bit of a problem as there is one connection for five villages. One pipe to supply farmers from these five villages. I do not know the reason why they did not do more. We used it! Since it began in

September, we have not yet seen the effects. The water is too purified, and has no minerals, so you have to aid it. We did not add anything but you have to help it with fertilisers.

*Ha jnaqqas milli jitla' l-ilma tal-water table iżjed żgur. Dis-sena dahlet imma hawn Ghawdex problema ghax hawn wahda ghal hamist irhula, 'connection' wahda. Pajp wiehed u jridu jieħdu l-bdiewa ta' hamist irhula. Issa ma nafx x'inhi r-raġuni li m'ghamlux iżjed. Ahna wzajnih! Wasal s'hawn. F'Settembru li ghadda bdiet taħdem Ghawdex issa l-effetti għadna ma rajnihx. Illum li fih l-ilma msaffi hafna hafna u ma fih xejn minerali, trid tghinu. Ahna ma tfajnielu xejn imma trid tghinu bil-fertilizzant.*

The Sant Antnin sewage treatment plant, which is no longer in use, was the first to offer New Water for agricultural purposes. Some of the farmers are sceptical about the use of such water because of what happened at Sant Antnin, as they said that the water was not of good quality and so the produce was neither of a good quality.

**Farmer 4:** I believe that a they are saying that the water is of drinkable quality, but the facts show otherwise. For example, in Żabbar, no one wants a product from Żabbar. If someone comes to Pitkali markets, and he used to irrigate the crops using that water, no one buys it, as the next day it begins to rot.

*Jiena naħseb li kif qieghdin jghidu li l-ilma tista' tixorbu, hu tajjeb, imma l-fatti mhux hekk juru. Eżempju ta' Haż-Żabbar, hadd ma jrid prodott minn ta' Haż-Żabbar. Jekk jiġi wiehed il-pitkalija u kien jsaqqi b'dak l-ilma hadd ma jixtrih, ghax wara ġurnata jithassar.*

**Farmer 6:** In my opinion, the New Water is not going to solve this problem (of water). I only have one thing to say, in the past, our ancestors did not have so much water, but the little they had they used it with caution. The first thing, in Malta it is a pity. We are investing millions to treat sewage water, but we are not catching rain water, in our vicinities or in water reservoirs. This New Water will not solve the problem, because I myself, am sceptical of using it, as God forbid, the same thing as before happens.

*Jiena għalija l-ilma tad-drenaġġ mhux ser jsolvi din il-problema. Jiena wahda ngħid, fl-antik ma kienx hawn hafna ilma imma xjuħ tagħna, imma l-ftit ilma li kien hawn kienu jużawh bilgħaqal. L-ewwel wahda hawn Malta għandna hasra. Mela qed ninvestu dan il-miljuni kbar ta' flus biex nitrattaw l-ilma imbagħad l-ilma naturali tax-xita mhux nilqgħuh, fl-akwati tagħna jew fil-ġwiebi. Dan l-ilma, 'new water', mhux se jsolvi l-problema essaċċ, ghax jien l-ewwel wiehed, xettiku biex nużah ghax jekk għada pitt għada, Allahares qatt jerġa' jiġri bhal ma ġara.*

**Farmer 12:** In the Northern parts they began using it and said that it is good. In the South, we are still a step behind, as Sant Antnin no longer works. Now we have one at Xagħjra (Ta' Barkat) and this year it is supposed to start functioning. Before, in the beginning, it used

to be good, but those taking care were no longer cautious, and they were putting in too much chlorine, damaging the crops.

*In-naħa ta' fuq bdew jużawh u qalu li sabuh tajjeb. In-naħa tas-South għadna lura, għax Sant Antnin m'għadux jaħdem. Issa li hawn tax-Xagħjra, u dis-sena suppost ħa jibdew jipproduċu. Qabel, fil-bidu kien tajjeb imma imbagħad min kien qed jieħu ħsieb l-impjant ma baqgħux jagħtu kasu bħal qabel u kienu qed jtugħ ħafna klorin u kienu qed jagħmlu ħsara lill-prodotti.*

## 4.2.3 Indigenous farming knowledge

### 4.2.3.1 Accounts of past farming practices

#### 4.2.3.1.1 Ploughing of fields

A few of the farmers, especially the elderly farmers, remember a lot of different farming practices which were used in the past but are no longer in use nowadays. Most of the methods used in the past have now been replaced by machinery or other methods which make life easier for the farmers.

**Farmer 1:** We used to plough the fields using animal-powered ploughs, coming back and forth, all manual labour.

*Taħrat bil-moħriet, kienu jaħartu bil-bhejjim, duri bil-moħriet ġej u sejjir, kollox biz-zappuna u bl-idejn.*

**Farmer 2:** To start with, we used to plough the fields during the time of the Feast of Saint Mary. The fee for fields is paid during that period as well, as that is when fields will be prepared for the following year. Manure is applied to the field to prepare for cauliflower, tomatoes, potatoes, you start to lay the bed, give manure and plough to till the land. Nowadays we use tractors. There were the baylor tractors. We used to say fifty *ħamel*, or two hundred *ħamel*. Every *ħamel* is made up of ten bales. It is the language we use, no one knows what *ħamel* is. We used to say that the Goziton one contained eight bales.

*Biex tibda, dik hemm ħabta ngħidulu tintgħażaq, il-kelma tagħżaq. Dik f'Santa Marija. Għalhekk per eżempju l-qbiela tgħalaq f'Santa Marija għax id-dħul tar-rabgħa f'Santa Marija jibda. U jekk tagħti d-demel għal Santa Marija biex inti fis-Sajf, li jkun ġej is-sena ta' wara tagħmel pastard, tadum, patuta, f'Santa Marija tibda tifrex is-sidda, togħti id-demel, jgħidu għażaqha mela ferrixt id-demel u ħdimtha. Illum tigi taħratha bit-'tractor'. Kien hawn il-mugna tad-dries intuwħa bil-qattiet. Kinna ngħidu ħamsin ħamel, mitejn ħamel, kull ħamel għaxar qattiet. Lingwa Maltija. Qas ħadd juf x'inhu ħamel. Kinna ngħidu l-Għawdxin bi tmienja, tal-Għawdxin.*

#### 4.2.3.1.2 Irrigation of fields

Farmers spoke about how not all fields were irrigated, as some of the fields had no access to groundwater. There are two types of fields, which in Maltese are called *bagħli* and *saqwi*. *Bagħli* that it is dry-land, meaning it is not irrigated, is only watered when it rains. *Saqwi* on the other hand means irrigated, through groundwater resources. As one may expect, nowadays the number of non-irrigated fields have decreased drastically and basically the majority of fields are irrigated through different means, increasing the production of crops.

**Farmer 2:** Before, there were both dry-land (*bagħli*) and irrigated land (*saqwi*). Nowadays, you could say that all dry-land fields have ended, as everyone irrigates their fields.

*Qabel kien hawn settur ngħidulu biedja tas-saqwi u biedja tal-bagħli. Illum ir-rabgħa tal-bagħli tista' tgħid spiċċa, kulhadd isaqqi illum.*

**Farmer 10:** *Sukkan* means not irrigated. Dry-land. When you have dry-land, you leave it for whatever God sends your way, but when you plant crops in dry-land, we say we planted it *sukkan*, and so you do not water it.

*Bis-sukkun, sukkan, mhux bis-saqwi. Bil-bagħli. Raba' bagħli meta jkellek għalqa thalliha għal li jibgħat Alla imma meta jgħidu hawwilt bis-sukkun mhux ser issaqqi, bagħli xorta waħda.*

Farmers also spoke about changing irrigation practices throughout the past years (Refer to Appendix F for photo). The improvements in irrigation practices led to less water being lost as farmers use the appropriate amount necessary for the plant. One of the farmers even noted how the plant's roots evolved because water is available close by to the plant's root system. One must also note that the use of traditional windmills to pump

up water has been replaced by the use of fuel operated pumps. Slowly, some farmers are now reverting to solar powered energy.

**Farmer 2:** Nowadays we use drip irrigation. Before, the plant's roots used to go out for four to six metres, searching for water in dry land (non-irrigated fields). Since we use irrigation, the roots are four to six inches long now, when you pick it up you can see. Before, when ploughing the field, you would find long roots, in dry-land, as it searches for water.

*Illum insaqqu bil-pajp tad-drip. L-għeruq tal-pjanta, qabel kienu joħorġu sitt metri jew erbgħa metri jfittxu, għall-ilma ġot-tira. Illum imbilli tkun issaqqi, ġo sitt pulzieri, erba' pulzieri, il-pjanta l-għeruq tagħha, fil-fatt taqbadha u tarahom. Qabel x'ħin kint qed tkun taħrat tabda ssib, l-għeruq twul, ġol-baġħli, għax hi pjanta tfittex biex tgħix.*

**Farmer 7 Organic:** Before, they used to water using a water mill powered by a mule, going around with buckets, of water, filled up from the borehole. Nowadays, we use pumps. There used to be water channels, made of stone around fields to transport water.

*Qabel kienu jsaqqu eżempju bis-sienja wkoll, għad fadalli ukoll hemm fuq, bil-baġħal jdur bil-bramel, jtella' barmil, barmil. Illum bil-pompa, u qabel kien hawn il-kanali tal-gebel biex iwasslu l-ilma u jsaqqu.*

**Farmer 6:** Before, we used to use what we call *ħammiela*, and other similar things which are no longer used nowadays as we use drip irrigation. With the *ħammiela* we used to use a hoe (*zappuna*), to form squares next to each other and form a gulley for water to pass through (*sieqja*).

*Qabel konna speċjalment it-tisqija kienet tkun bil-ħammiela, u affarijiet hekk li illum inqatgħu għax illum għandek drip irrigation. Il-ħammiela li kinna nużaw biz-zappuna, kinna nisilġu l-art ngħidulha, tagħmilha qisha kaxxi kaxxi, tagħmel is-sieqja minn fejn jgħaddi l-ilma.*

#### 4.2.3.1.3 Specific past experiences

One of the farmers spoke to me about the system which was used before they had crates at the Pitkali markets. They even had them custom made as to be distinguished from one farmer to another.

**Farmer 2:** Instead of crates we used to use *mezez*. It is like a wicker basket, to give you an example. Then there was the small *mezza* for berries. It is like a small, elongated wicker basket, to put berries in. It was all made of cane. In fact, this valley was full of cane, and then in Summer, we used to do these baskets to be prepared. Every basket,

used to be worked in a different manner (pattern) to be recognised from one owner to another.

*Flok il-kaxxi bil-mezez. Kienet tkun qisha bixkilla, biex intik eżempju. Imbagħad kien hemm il-mezza żghira tat-tut. Tkun bixkilla żghira, ġejja twila, biex jaqtgħu t-tut ġo fiha. Killix dawk tal-qasab. Fill-fatt hawn, il-wied b'hekk kien hawn il-qasab, kulhadd jaqta' l-qasab u fis-sajf, noqogħdu nagħmlu dawn l-affarijiet biex jkellna l-mezez. Imbagħad kull mezza kien ikillha ċertu ħdiem, biex tintgħaraf ta' min hi.*

Another farmer spoke about another species of strawberries which are no longer produced locally, explaining why these types of strawberries were no longer favoured by the farmers, leading to its end, locally.

**Farmer 4:** I like to mention strawberries, as here in Mgarr we are renowned for strawberries. For example, we used to have a type of Maltese strawberry. It was a Maltese species, it was very thin, very tasty, used to be cut without the calyx, which is attached to the plant... It is no longer produced, as it is difficult to upkeep. One person today, will be able to cut around 100kg of strawberries in a day, but you would only be able to pick 4kg of that specific strawberry in a day, as it is very delicate, and even when picking it up you had to be extra careful as it could be easily squashed.

*Jien inħobb insemmi għall-frawli għax hawn l-Imgarr magħrufin għall-frawla. Per eżempju frawli kien hawn frawla ta' Malta. Speċi ta' Malta u din kienet frawla rqiqa ħafna, tajba ħafna, tinqata' mingħajr ħliefha, li tkun mqabbda mas-sigra. ... Inqatgħet għax ma jistax jkun li żżommuh. Illum bniedem wieħed jkun fiha frawli, taqta 100kg, dik kont taqta' 4kg f'gurnata u delikata mhux taqbad, ratba l-frawla allura anke x'hin tkun tiġbidha trid toqgħod b'sebgħa għajnejn għax tagħfasha f'idek, tgħaffiġha.*

One Gozitan farmer mentioned how they used to sterilize their fields using steam, decreasing the amount of diseases and pests in their soils for better production.

**Farmer 11:** We used to sterilize (inside greenhouse) using steam, using a boiler. We used to pass pipes one foot down the soil and cover, steam passes through. We used to rent the boiler from the government department, we used to pay a certain amount. The Water is heated, steam forms and passes through pipes, killing the insects. Afterwards, the crops used to flourish, as it reduces pests and there used to be less diseases.

*Kinna nisteralizzaw bl-‘isteam’. Bl-‘isteam’. Bil-‘boiler’, kinna ngħattu, kinna ngħaddu il-pajpijiet fil-ħamrija daqs pied ’l isfil u nitfgħulu l-‘isteam’. Il-‘boiler’, kien jiġi l-‘boiler’ tal-gvern kinna nikruh, per eżempju kien joħdolna tant, isahħan l-ilma u jiġi ‘steam’ u nifthulu u imbagħad, l-‘isteam’ kien joqtol l-insetti, allura imbagħad x’hin kinna nħawlu l-wiċċ kien itir eh. Ghax mard ma kienx jkun hemm.*

#### **4.2.3.2 Conventional farmers’ views on organic farming**

Speaking to conventional farmers, almost all of them were sceptical on organic farming, especially about local organic farms. Some of the reasons why they are unconvinced is the fact that given that the Maltese Islands are so small, it is rare to find a field which is enough distance away from another field which may be sprayed. The buffer zone was the most discussed issue of why they do not believe that it is possible in Malta.

Another issue which was raised is the loss of produce when one converts to organic, hindering farmers from opting to venture into organic farming. Even terraced fields may hinder farmers from considering organic farming as they discussed how the chemicals in the soil may percolate down to other fields.

**Farmer 2:** I do not know where organic farming exists. You may say it is organic, but is it 100%? Once I was at a market abroad, in Italy, one of the sellers told me that he was the only organic farmer. When I asked him why, he told me that he has the least produce. Those who have larger quantities of produce are not organic.

*Heq il-biedja organika ma nafx fejn qiegħda teżisti jien. Ghax billi tgħid ‘organic’ imma mija fil-mija? Xi trid tgħid biha organic? Darba minnhom kont qiegħed ġo suq barra minn Malta, x’hin bdejt indur ġo fih, l-Italja kint ta’ voldieri, qalli jien biss għandi l-‘organic’ minn dawn l-ghaxra. Ghidtlu għala? Qalli ghax jien għandi ftit, qalli dawk li għandhom hafna m’ħumiex ‘organic’.*

**Farmer 4:** We do not have in Malta! Organic, if you check its regulations, you cannot be organic while the others other are not. ... No one would be able to eat. For example, sulphur, it is organic since it is natural. Even copper sulphate, used as a prevention from diseases. I use them myself. I have nothing against organic, but it does not exist.

*Malta m'hawnx! Organic kieku tidhol fil-programm tagħha, organic ma jistax jkun hemm inti organic u l-ieħor mhux, u l-ieħor mhux! ... Ma jiekol ħadd. Per eżempju kubrit, dak 'organic', għax naturali. Anke l-kupru, li huwa prevenzjoni biex jilqa' l-mard. Voldiri dak nużah jiena. M'għandi xejn kontra tagħha imma ma teżistix.*

**Farmer 5:** If a farmer comes and tells me he has everything organic, I am a bit sceptical, I do not believe, but nothing is impossible. The biggest problem I can see in Malta is that we are such a small island, that even if I have not sprayed, and someone two kilometres away sprayed, there may still be traces of pesticides on my crops, do I call that organic?

*Fir-realta' jekk jiġi bidwi jgħidli għandu kollox organiku, jiena daqsxejn xettiku, ma tantx nemmen, imma, fid-dinja xejn mhu impossibli. U l-akar ħaġa li nara naqra problema għax Malta tant aħna żgħar illi jekk ma bixxejtx jien u bexx żewġ kilometri bogħod minni jista' ġew xi traċċi ta' bexx, allura dak tgħidlu organiku?*

One of the farmers stated that one of the few possibilities of having an organic farm in Malta is if the field is close to the sea, meaning that there are less fields surrounding the field.

**Farmer 6:** I do not believe there are any (organic farmers). Maybe those close to the sea, there may be some trying to grow crops, but they take nothing out of it. Close to the sea, maybe there is a chance of growing organic, and have only a small amount of produce, but you are not going to make a living out of it. You will surely not live out of organic production. They have a few products and low level of production.

*Ma nemminx li hawn xi ħadd, li għandek forsi dawn qrib il-baħar, hawn min ipprova jagħmel il-prodotti imma ma ħu xejn. Qrib il-baħar forsi għandim ċans jagħmlu dawn l-affarijiet u hekk, u forsi ħa xi prodotti, ftit miżeri, imma mhux ħa tgħix minnu żgur. L-organiku żgur mhux ser tgħix minnu. Jkellim ftit u l-produzzjoni tkun baxxa.*

Others, as mentioned in previous paragraphs stated that when they go at the Pitkali markets there will be no distinction made between organic and inorganic produce, so eventually they will be offered the same price.

**Farmer 10:** I think there are some who are sceptical. No one wants to experiment. Another thing, when I go with my organic produce to the Pitkali markets, there is no distinction. You go to the markets, for example for watermelons and there are the normal ones and the seedless. If the market is bad, they will give us the same price for both.

*Hemm min hu xettiku ngħid jien. Hadd ma jrid jesperimenta. Imbagħad oħra jien x'ħin ħa mmur bih il-pitkalija, ħa niktbilhom organic fuqu. Mhux ser jkun hemm distinzjoni. Tmur il-pitkalija, eżempju dulliegħ hemm is-'seedless' u nurmul, jekk jkun suq ħażin, jiġi l-istess prezz.*

## 4.2.4 A sustainable farming future

### 4.2.4.1 What is sustainable agriculture? A farmer's perspective

Farmers had a lot to say about a sustainable farming future. When asked what they understand by sustainable farming, most delved into aspects of the farmers' wellbeing, financial stability and also enhancement of the environment, which after all, they depend on.

**Farmer 5:** Sustainable farming is about being moderate, having a just production without using too much pesticides, and in the mean time taking the profit we deserve. I can assure you that every farmer, especially those living off agriculture, always try to change to be more sustainable. When saying sustainable, I mean environmental sustainability in production, with less costs and sustainable so that maybe enough profit is left. I can assure you that everyone tries to do it.

*Biedja sostenibbli hija li qed tkun moderat, tieħu l-produzzjoni xierqa mingħajr ħafna bexx u imbarazz, u fl-istess ħin il-bidwi ikun sosten, jieħu qliegħ li ħaqqu. Nassigurak illi kull bidwi illi speċjalment irid jaqla' l-ghixien tiegħu minn hemm, dejjem jipprova u jbidel biex jkun sostenibbli. Issa meta tgħid sostenibbli, sostenibbli għall-ambjent, fit-tkabbir, b'inqas spejjeż u sostenibbli biex forsi jibqalu dak li ħaqqu hu ukoll. Nassigurak li kulhadd jipprova jagħmel hekk.*

**Farmer 6:** Sustainable agriculture means that one grows produce which is viable and provides a living for the future and the present. It is important that one does not grow any crop, thinking that it may or may not produce. Nowadays, you cannot do that. The expenses are huge, so one has to be careful which produce one chooses to grow and how.

*Biedja sostenibbli jigifieri li wiehed ikabbar il-prodott u importanti li dak il-prodott li qiegħed jkabbar huwa viabbli u ikollu l-għixien minnu fil-futur u anke waqt li jkun qiegħed ikabbru. Importanti illi wiehed, mhux jifja' fl-għelieqi, jgħid ha nitfa' prodott u jgħid u iwa jekk jagħmel jagħmel. Illum il-gurnata ma tistax tagħmel hekk. Illum gejna li l-ispejjez huma kbar allura inti trid toqgħod attent kif wiehed jipproduci ċertu affarijiet, ċertu prodotti.*

**Farmer 7 Organic:** You have enough to maintain yourself and your family. That is the first thing, and to be able to cover your costs. Even for the environment, you must maintain the fields in a good condition, upkeep the rubble walls, paths and roadways, not leaving everything abandoned.

*Li trid taqla' x'tiekol u tgħajjex il-familja tiegħek. Dik hi l-ewwel trid taqla' x'tiekol u tkopri l-ispejjez ukoll u għall-ambjent, kif għidtlek li jkun il-post miżmum sewwa, hitan tas-sejjeħ nodfa, toroq forsi u passagġi, mhux affarijiet mitluqin u zdingati.*

**Farmer 8 Organic:** Sustainable agriculture for us at this farm, is to first take care of the environment and take care of soil, that is the most important. If we do not take care of the soil, we can't produce any more. This means that we take care of biodiversity. We try not to use pesticides which kills everything. Sustainable means that when my children and the children of my children take over, the soil would still be good to grow crops.

*Il-biedja sostenibbli għalina hija li aħna, l-prattika tagħna fuq dan farm hija li l-ewwel haġa nieħdu ħsieb l-ambjent u nieħdu ħsieb il-ħamrija, l-aktar haġa importanti. Għax jekk ma nieħdux ħsieb il-ħamrija ma jkollniex biex nkabbru aktar. Jigifieri nieħdu ħsieb il-biodiversità. Aħna nippruwaw ma nużawx bexx li joqtol kollox bl-addoċ. Sostennibbli jigifieri nistgħu nħallu, meta jkun hawn it-tfal tiegħi jew it-tfal tat-tfal, il-ħamrija tkun għadha tajba biex tkabbar il-prodott fih.*

One of the farmers interviewed, practiced hydroponics, which he stated is based on sustainable practices, reusing the water and providing enough fertilisers for the plants to be able to grow.

**Farmer 12:** Sustainable agriculture is to use a method similar to ours, hydroponics, where you are using much less water, less fertilisers as the plants take what is needed and the remaining is still kept.

*Biedja sostenibbli tfisser tkun bħas-sistema li nkabbru aħna, 'hydroponics', illi qed tuza ħafna inqas ilma, ħafna inqas fertilizzant għax il-pjanta tiegħi li għandha bżonn u ż-żejjed jibqa' għandek hux.*

#### 4.2.4.2 A farmer's perspective on the future of farming

Most of the farmers were not so optimistic about farming in Malta, especially as a full-time job. The number of full-time farmers has been on the decline, along with the number of young farmers.

**Farmer 1:** Agriculture will decline. There are a number of elderly farmers like myself, and it will decrease. No one is taking care of farming. They have to take care of the younger ones, as I am getting old. Otherwise there is no future, nothing.

*Tinqata' trid il-biedja. Il-biedja, hawn erbgħa xjuħ bħali u ħa tonqos ħafna. Ħadd mhu jibża' għaliha l-biedja. Ħa tmur lura ħafna l-biedja. Jieħdu ħsieb il-bidwi ż-żgħir għax jien issa xjiħt. Il-bqija m'hawnx futur tal-biedja... xejn.*

**Farmer 5:** The future of farming is going downhill, moving backwards. I pray to God, that something happens to our country in general, the people, the government and even farmers themselves, become aware of what we are going to lose.

*Il-futur tal-biedja f'Malta ifhimni, s'issa t-triq għan-niżla tidher, jiġifieri sejjer lura jiġri. Pero nispera f'Alla illi jiġri xi ħaġa u l-pajjiż inġenerali, poplu, gvernijiet u bdiewa nnifishom, jsiru konxji ta' x'nistgħu nitilfu!*

Farmers commented about the fact that lately a number of fields are being bought or used for recreational purposes rather than for farming as such. It could be that due to an increase in part-time farmers and a decrease in full-time farmers, farming is being seen as more of a passtime rather than a full-time job. Agricultural land, especially that owned by the government, as farmers recommend, should be preferably passed on to prospective full-time farmers, rather than be used for recreational purposes.

**Farmer 2:** I think what needs to be done is that fields are given to farmers who work the land other than giving it to someone and leaving it abandoned. There are a lot of fields which are not worked. You hand it over to a farmer who is willing to work it. Going around here, you have a lot of fields with swimming pools or BBQ areas, with a room and an oven. And as I told you before, they should not be divided into

one tumolo, one tumolo. Going down to Lapsi, you could see fields no larger than this van.

*Naħseb li jrid jagħmel ir-raba' jtiegħ vantaġġ lil min jrid jaħdem mhux jtiegħ lil min mhux bidwi u jzommu żdungat. Għax hawn ħafna raba' mhux jinħadem. Jtiegħ lill-bidwi, lil dak li jipproduci hux, mhux dak il-bidwi, illum għandek ħafna rabgħa, tista' dđur hawn jew tidħol u tibda tara ħafna swimming pools fl-għelieqi. Ħafna kmumar tal-BBQ, xi forn. Dawn ir-raba' u li għidtlek l-ewwel, mhux kull għalqa tinqasam tomna tomna. Hemm għelieqi int u nieżel Lapsi tarahom kemm kemm akbar minn dan il-vann.*

**Farmer 3:** The future of agriculture in Malta, if I take you around in fields, you could see fields with rooms in it, not store rooms, but with a BBQ, that is the future I am seeing. Maybe I am being pessimistic, but...

*Il-futur tal-biedja f'Malta jekk noħdok fl-għelieqi li għandi 'l hawn u 'l hemm, ngħidlek ittauwal 'l hawn u 'l hemm u tara għelieqi b'xi kmara ġo fihom, imma dil-kamra mhux xi 'store room' ta' kamra u tmur u ssib il-'BBQ area', dik hi l-futur li qed nara jien. Issa forsi qed nkun naqra pessimist imma...*

A decline in farmers will ultimately lead to a change in the Maltese landscape, especially in rural areas. Farmers comment on how, aesthetically one would rather see fields which are being worked by farmers, rather than fields which are abandoned. Simultaneously, abandoned fields, which are no longer used for agricultural purposes, may be more susceptible to be taken over by the construction industry, especially those close by to residential areas. Farmers are finding it even harder to buy land as it is becoming even more expensive.

**Farmer 4:** If farming was to end, Malta would become a disaster. Look at an abandoned field, all Malta would be like that. Even, as I told you, the fact that the land is divided into smaller sections, rooms are built in it for recreational purposes. But there is a problem of land for agricultural purposes. That is what is happening to the majority. How much can someone afford to pay for the land? A farmer will not afford it. Let us say you want to sell it and I want to buy it for agricultural purposes and the asking price is the same as you would sell it for construction purposes, why would I buy it? It is better if you sell it for construction purposes, if you own the land, hence the decrease in agricultural land.

*Jekk tispiċċa l-biedja jiġi Malta diżastru. Jiena ngħidlek ara biċċa mhux tinħadem u Malta tiġi kollha hekk. Anke dik li għidtlek l-ewwel, li tinqasam l-artijiet hekk, biċċiet*

*zghar qed issir kamra go fihom u jmorru jirrikrejaw ruhhom hemm. Imma ghandek il-problema ta' art ghar-raba'. L-maggoranza hekk qed jsir. Dak li jkun jkun jiflah jhallas biex jixtri dik in-naqra u bidwi ma jkunx jiflah ihallas dawk l-ispejjez biex izommha hu. Ghax ejja nghidu inti trid tbieghha, xtrajt tieghek jiena li rrid nahdem ir-raba' u int titlobni daqs kemm tiswa ghall-bini, jiena dik x'ha nixtriha naghmel? Inti jaqbillek tbieghha ghall-bini, jekk tkun tieghek allura dejjem tonqos l-art.*

**Farmer 6:** Obviously, the more we build the less space we have for agricultural purposes. The more we take away from there and there, the more industrialist society becomes, the more we pollute the environment, the more agriculture is given the back.

*Ovujament hux, il-bini aktar ma' jibnu inqas ha jkellna spazju fejn nimirhu fuq l-agrikoltura. Aktar ma nnaqqru minn hawn u minn hemm, u aktar ma tohloq ambjent industrijalist, l-ambjent ser jithammeq, allura l-biedja aktar ghandha cans taqla' go fiha.*

**Farmer 10:** For example, to acquire a piece of agricultural land it is very expensive. For example, next to my field there were two tumoli of land, one tumolo for three thousand or six thousand, it was sold for eighteen thousand euro. I would not have bought it for that sum. You cannot compete to buy it. It was bought by someone to do a BBQ area, he could afford it.

*Per ezempju biex takkwista r-raba' problema, min m'ghandux ghali infern. Ezempju magenbi kien hemm tumnajn rabgha, tomna raba' bill-500 ewro s-sieħ jigu bejn 3000 jew 6000, inbieghet 18,000 jien mhux ser immur nixtriha 18,000 voldieri. Ma tistux tikkumpeti biex tixtrihim, ghalija fhimt. Gie wiehid biex jaghmil il-BBQs, jeffordja hux.*

Encouraging young farmers is the key for guaranteeing a future for this industry in Malta. The government is helping by providing subsidies and helping farmers invest in this industry through European Union funding. The question is: Is it enough to encourage the younger generation to take on farming as a full-time job?

**Farmer 8 organic:** To become a farmer, it is a bit difficult for the younger generation, because first of all, as farmers we already have a bad reputation, it is hard work and the produce is not sold at a good price. You must love this work to become a farmer, so we have to find means to encourage the younger ones. For example, the government is helping those interested to become organic farmers by giving subsidies of around seventy thousand. You have to be committed that you become a full-time organic farmer for five years, and this is encouraging some younger ones.

*Biex tidhol fil-biedja daqsxejn iebsa għaż-żgħażaġh għax l-ewwel haġa kif qed ngħidu aħna il-bidwi diġa għandu daqsxejn fama hażina, xogħol iebes, il-prodott ma jgibx flus. Irid jkollok vera l-imħabba għal dan ix-xogħol biex tidhol fih, allura biex inħajru liż-żgħażaġh, irridu nsibu xi metodi li ninkoraġġuhom. Issa l-gvern per*

*eżempju għall-agrikoltura organika harez is-sussidju għal min irid jibda żaġżuġh, hemm xi sussidju ta' xi sebgħin elf. Irid jintrabat għal hames snin jsir 'full-time farmer', u din is-sistema qed tinkoraġġi xi żaġżuġh jidhlu fiha l-affari.*

**Farmer 10:** The government has tried to help by giving incentives, schemes for young farmers, but they are not encouraged as it is very hard work. Most of the younger ones continue with their education, they will not work in the fields. The parents themselves do not encourage their own children to continue farming, even if they are farmers themselves. ... I do not know what can be done. Maybe work with school children and teach them about agriculture.

*Il-gvern ippruva jgħin, ippruva jincentiva, skemi tal-young farmers, imma fhimt ma jithajjru għax fih it-tbatija. Illum hafna tfalijiet jitgħallmu l-iskola, mhux ha jmorru jaħdmu gol-għalqa. Voldieri l-ġenituri stess ma jhajjru lit-tful, anke jekk jkun bdiewa huma. ...Ma nafx x'ngħidlek x'jista' jsir. Jew tful mill-iskola jgħallmuhom fuq il-biedja.*

#### **4.2.4.3 Sustainable farming practices**

Through these interviews conducted with farmers, one could not help but notice that each of them mentioned various eco-friendly sustainable methods which they use in order to make conventional and organic farming more sustainable. In the following paragraphs all of these practices will be discussed.

##### **4.2.4.3.1 Use of bees**

Interviewing this particular farmer, one could notice the enthusiasm with which he speaks about bees. He truly believes that bees are highly intelligent and should be safeguarded through all possible means, as without their existence we may be in jeopardy. He uses bees for pollination inside his greenhouses. Another method he uses is to use traps hanging around his greenhouse, so that he may see which insects there are and if there is a need to use any precautions against them (Refer to Appendix F for photos).

**Farmer 2:** We use a lot of things. For example, the traps I have just shown you are used so that I know what pests there are (in the greenhouse) to use the appropriate pesticide. We use other traps like water for Tuta Absoluta. We use nets all around greenhouses to prevent insects from going in. And if I know that a certain person smokes, I won't let him in my greenhouse as I am afraid the bees would smell it. If that person stays in the greenhouse for a long time, on that day the bees won't work as bees are afraid of smoke. Bees are highly intelligent creatures. I believe they are the most intelligent! And the one we need the most! As if bees end, we would end too.

*Nużaw ħafna affurijiet. Eżempju għodni kif urejtek dawk in-nasas biex nkun naf x'hemm biex ma noqgħodx nbixxu għal xejn. Għandna dawk biex nkeċċu it-tuta għas-susa (bl-ilma), dik li qisha gażaża u hemm duk qisu 'wire' ukill. U Per eżempju gos-serer kullimkien magħluq bin-nett biex kemm jista' jkun ma jidhlux insetti. U jkun xi bniedem ipejjep ma ndaħħlux. Għax kultant nibża ħabba r-riħa li jkellu, ħabba n-naħal. Duk in-naħal dik ir-riħa tiegħu, jekk jidholluk per eżempju joqgħodlok, duk il-ħin, duk in-naħal dik il-gurnuta ma jaħdimlekx sakemm titlaq ir-riħa. Għax in-naħal jibża mid-daħħun. In-naħal hu annimul intelligenti ħafna. L-aktar naħseb annimul intelligenti hu. U l-aktar wieħed li għandna bżonn! Għax jekk tispiċċa n-naħla nispuċċaw aħna.*

**Farmer 2:** We use bees for tomatoes, strawberries, aubergines... mostly inside the greenhouse. When I go in the greenhouse...I go next to the flower, and I can see brown thin marks inside, which is the pollen marked by the bees by scratching it. This is a sign that the bees have worked. For example, when bees are not working, either getting old or are feeling the cold, I either think of getting new bees or try something to encourage it to work.

*L-aktar in-naħal, nużawh għat-tadum, għall-frawli, għall-brunġiel... għal gos-serer l-iżjed. Jien x'ħin nidhol gos-serer... immur fuq il-fjura l-għdida, nittawwalha u naruwha migduma min-naħla, tiġi per eżempju, l-fjura tkun safra u jkillha sinjuli kannella rquq, tan-naħla li ħadet il-'pollen' b'sieqha, tigrifha. Allura inti hemm tinduna, tgħid mela n-naħal ħadem. Per eżempju meta ngħid ara bit-'trouble' in-naħal mhux jaħdem, jew xjieħ jew jħiss il-bard, allura jew naħsiblu għan-naħla jew nara x'ha nivvintulu biex ngjieghlu jaħdem.*

#### 4.2.4.3.2 Use of other natural methods

Other methods mentioned by farmers include the use of flowers to detect any diseases, natural sprays used on plants as a prevention and the most common one, the manual pick up of weeds rather than using herbicides.

**Farmer 1:** We use roses so that it shows you when there are any diseases, it gets sick first.

*Biex l-ewwel ma timrad hi, x-xandrija, turik li ġej il-mard.*

**Farmer 2:** No, I never use herbicides for weeds, as I do it by manual work. We use the hoe and take it out when it is still young. To prevent doing this job twice, we plant for example marrows instead of sowing it directly in the field.

*Le! Għall-ħaxix qatt ma nbixx jiena. Dejjem naddafna jew b'idejna, ngħaddi bl-imgħażqa u nonqXu meta jkun żgħir u problema biex niffrankaw li nonqXu, flok nonqXu darbtejn nonqXu darba, per eżempju ngibu, flok il-qarabagħli niżirgħu fuq il-post, ngibu x-xitel u nħawluh.*

**Farmer 8 Organic:** For weeds, we use two methods. We take out weeds by manually picking them, or otherwise we use mulch. We put in a layer, we use cardboard, others may use plastic, to reduce weeds growing. We cover it with soil. Sometimes we also use plastic mulch, but we try to use cardboard as it does not damage the soil and increases the carbon levels in soil.

*Il-ħaxix ħażin aħna nużaw żewġ sistemi. L-ewwel ħaga l-ħaxix ħażin naqtgħuh b'idejna, jew inkella nużaw is-sistema tal-'mulch'. Nużaw 'layer', aħna nużaw il-kartun, ħaddieħor juża l-plastik, biex ma jitlax ħaxix ħażin. Ngħattu l-ħamrija. Aħna ukoll nużaw plastik imma generalment nippruvaw nużaw l-kartun għax l-ewwelnett mhux ser jagħmel ħsara lill-ħamrija, anzi jagħmillha l-gid għax jżid il-'carbon' fil-ħamrija.*

**Farmer 10:** We try not to spray crops, but if one sees certain diseases on crops, such as mold, you see the surface colour of the crops changing. Sometimes we use sprays which do not leave environmental impacts, or is at a minimum, using it as a prevention. For example, sometimes we use home products such as bicarbonate and such things... We mix it with water and spray it on the plant so it creates like a protective layer, it's like washing it. It works on certain types of mold, not all.

*Jekk jista' jkun aħna ma nbixxux, imma jekk tura ċertu infezzjonijiet fhimt, bħall-muffa, fhimt? Allura taruh jibdil il-kulur il-wiċċ. Imbagħad ġieli għandna ċertu bexx li ma fiħx impatt fuq l-ambjent, jkun minimu, bħala prevenzjoni jiġifieri. Eżempju ġieli użajna affarijiet tad-dur bħal bikarbonat u hekk... Inħalltuh mal-ilma u nbixxu bih u jagħmel qisu lega, jiġi qisik qed taħslu fhimt, u ċertu muffa tmur, mhux il-muffa killha.*

#### 4.2.4.3.3 Natural fertilisers and fungicides

One of the farmers commented on how he uses wheat, fodder or barley to return nutrients, naturally, to the soil. Rotating the fields, this farmer mows these products in the soil rather than harvesting them in order to

improve the soil and increase nutrients. This method has helped him increase production in previous years.

**Farmer 3:** We use wheat but fodder and barley are better. You return it back to the land. It really helps a lot. I love doing it before it dries up and is still green. I attach the mower to the tractor, and the smaller you shred it the better. It will leave much more nutrients.

*Nużaw il-qamħ, imma aktar milli l-qamħ, aħjar minnu kieku hemm l-felu u x-xgħir. Terġa' troddu lura lill-art. Eh, dik tiswa ħafna ... Inħobb nagħmilha dik ħafna qabel jinxf, ikun għadu aħdar. Ngħaddi bil-mower hawn għandi il-mower hawn wara 'tractor', aktar ma tqattgħu biċċiet aktar aħjar. Hekk aktar jħalli nutrijenti.*

One of the common things between conventional farmers and organic farmers is the use of sulphur and copper sulphate, which are both natural chemicals used as fungicides. These have been used for years and are still commonly used by both sectors of farmers.

**Farmer 7 Organic:** Yes, since I am an organic farmer, I use natural manure. We use cow's manure as a fertiliser, and as a pesticide we use copper sulphate and sulphur. Now we are also doing an insecticide using nettle, and we also have organic sprays and similar products.

*Iva, jiena peress li bidwi organiku, nuża d-demel. Ikollna d-demel tal-baqar nużawh bħala fertilizzant u peſtiċida nużaw kupru u kubrit u issa qed nagħmlu l-insettiċida bil-ħurrieq u jkun hawn ukoll bexx organiku, u affarijiet hekk.*

#### **4.2.4.3.4 Solarisation**

Solarisation was one of the methods mentioned by one of the farmers. Instead of sealing the field and using gas to sterilise the soil, the farmer uses a more natural method. He prepares the soil by ploughing it, giving the manure according to the size of the field and then sealing it off by covering it with plastic. Leaving it covered for the whole of Summer, the temperatures of the soil would rise up sterilizing the field naturally. For

this method to be viable, the farmer has to have enough fields to use while one of the fields is sealed off for a few months.

**Farmer 5:** In favour of the environment we use this method. For example, instead of sterilising the field using gas and other chemicals, we often do it by using solarisation. All we use is sulphur, which does not create any dangers and cover the whole field in white plastic at the end of May or mid-June. The temperature rises and we remove the plastic at the end of September. So first we cover in white plastic, then let the sun raise very high temperatures and this will eradicate insects and diseases in the soil.

*Favur l-ambjent per eżempju ġieli aħna flok taġhti, flok tisterilizza l-ħamrija bil-gass u kimika, mhux darba u tnejn nisterilizzaw il-ħamrija bi solarisation. Kull ma nużaw huwa kubrit, sulphur, dak ma jagħmilx periklu, u nagħttu bil-plastik lejn l-aħħar ta' Mejju, nofs Ġunju, biex imbagħad taġhti bil-plastik abjad, titla' sħana qawwija, u tnehħiħ la jasal Settembru. Mela l-proċedura hija li taġhti bil-plastik abjad, ix-xemx taġhmel fuqha, titla' temperatura qawwija u inti toqtol il-mard u l-insetti.*

#### 4.2.4.3.5 Mulching

Most of the farmers interviewed, use mulching. Mulching is most commonly done using plastic, but other material can be used. Plastic is used in rows, usually having holes in it in order to be able to plant the crop through it. The mulch, that is the plastic which is usually black, prevents weeds from growing around the crops, thus preventing the use of herbicides or other chemicals. Drip irrigation is usually laid underneath; thus, the mulch will help reduce evaporation and water loss. In Winter, some farmers use transparent plastic on top of the mulch, creating like sort of a small greenhouse, to help increase the temperature around their crops (Refer to Appendix F for photo).

**Farmer 5:** We reduce the negative impacts of farming on the environment by for example, instead of using herbicides, which is the spray used to prevent weeds from growing, we use mulching, or otherwise use the traditional method of picking weeds manually (*nonqxu*) which was the method used by our parents and grandparents. Otherwise I do not know (what else can be done), as even if someone is using a

computer, one is still polluting the environment, I can't see why we are attacked.

*Innaqqsu l-impatti negattivi tal-biedja fuq l-ambjent heq naħseb per eżempju Innaqqsu l-impatti negattivi tal-biedja fuq l-ambjent, heqq, naħseb per eżempju flok nużaw erbicida, dan għal min ma jafx x'inhu huwa bexx biex ma jitlax il-ħaxix, nifirxu l-‘mulching’ jew inkella naħdmu tradizzjonalment, ngħidu nonqxa aħna. Bħal ma kienu jagħmlu l-ġenituri u n-nanniet ta’ kulhadd. Il-bqija ma narax jiena, għax anki min jixgħel kompjuter, ukoll qed iħammeġ l-ambjent, ma narax għalfejn niġu attakkati aħna.*

**Farmer 5:** Mulching is plastic, in Winter we use black plastic, from October till March we lay it on to the soil using special machinery, and sow in it (as it has holes). What you sow or plant, will grow and avoid weeds from growing around it, preventing pesticide use from March till October. In Summer, we spread plastic with two colours, grey and black. Black is put at the bottom to stop weeds, and grey at the surface because of the Sun.

*‘Mulching’ huwa plastic, fix-Xitwa nifirxuh iswed, qisu għandek minn Ottubru sa Marzu, tifirxu fil-ħamrija, għandna l-makkinarju, u thawwel go fih biex inti li thawwel jew li tiżra, jiekber u l-ħaxix ma jitlax, mela inti tiffranka li tbixx għall-ħaxix. Minn Marzu sa Ottubru, fis-Sajf, nifirxu plastic jkun żewġ kuluri, naħa iswed, u naħa griż, l-iswed nagħmluh taħt halli l-ħaxix ma jitlax, u l-griż nagħmluh fuq halli ma tagħmilx ħafna x-xemx go fih.*

#### 4.2.4.3.6 Crop rotation

Crop rotation, in Maltese *newba*, has been traditionally used throughout the years in order to maintain a good level of nutrients in the soil.

Farmers rotate their produce from one field to another, including legumes and grains to help return the nutrients taken by other crops.

**Farmer 2:** You can use crop rotation in greenhouses. For example, I use it, in order to rest the soil and eradicate some diseases. For example, now I have tomatoes, next year I will not do tomatoes, but I will do marrows. In Summer I will do broad beans, legumes... Always trying to change produce, as much as I can.

*Ifhem tista’ tuża newba fis-serer. Jien per eżempju nuża imma li nagħmel per eżempju hawn nagħmel għax biex il-ħamrija inti isserraħha u teqred ċertu mard, per eżempju issa għandi t-tadam, is-sena d-dieħla dik mhux ser nagħmilha tadam, ser nagħmilha qarabagħli. Fis-sajf ġieli nagħmel il-fażola... Allura dejjem tipprova tqalleb naqra l-wiċċ kif tista’.*

**Farmer 3:** We had enough fields that we would divide them into three, in order to do crop rotation. Crop rotation means that you rest the field, so that the following year, the produce would flourish. We would

divide it into three; the first year we would grow wheat, during the second year, you would do melons (bħajra). Third year, tomatoes. Then switch again to wheat. You create a system of crop rotation from the products you have. You have various groups of produce. Potatoes and tomatoes are one group, aubergines and peppers another group, called brassica, a technical word. You have broad beans, peas and beans, called legumes. I prefer working with those.

*Kellna rabgħa biżżejjid li konna naqsmuh fi tlieta. Biex inkabbru bin-newba. In-newba jigifieri ttijha l-mistrieħ l-għalqa biex is-sena ta' wara tagħmel prodott u jkun, isseħħ hawn, jigifieri. Allura konna naqsmuha fi tlieta, mela, l-ewwel sena tizirgħu qamħ, it-tieni sena tagħmilha bħajra hawn, bil-bettiegh. U t-tielet sena tadam. Imbagħhad terga' taqleb għall-qamħ. Toħloq newba bil-prodotti li għandek. Inti għandek diversi familji ta' prodotti. Patata u tadam dawk familja għalihom, il-brunġiel u l-bżar għalih, il-brassica hawn għax dan kliem tekniku ma nifhimx ... Allura, eh imbagħhad għandek il-ful, il-piżelli u l-fażola, x'jgħidulhom il-legumi. Dawk kemm jista' jkun bihom qed naħdem.*

**Farmer 5:** Crop rotation is when you change produce from one year to another. For example, marrows this year, next year you will not do the same family of marrows, so you introduce wheat, clover, broad beans and peas. Yes, I do crop rotation. I try to do as much as possible, as it is as important as any other substance, in my opinion.

*Newba li tbiddel, crop rotation, jigifieri jekk dis-sena għandek il-qarabagħli, s-sena d-dieħla ma tagħmilx l-istess affarijiet ta' l-istess familja tal-qarabagħli, u jekk jista' jkun iddaħħal il-qamħ, silla, ful u l-piżelli. Iva nagħmel newba. Nipprova nagħmel kemm jista' jkun newba għax dik hija importanti daqs l-aqwa sustanza, jiena għalija.*

#### 4.2.4.3.7 Use of predatory insects

Recently, farmers have been using predatory insects, imported from abroad, especially against the Red Spider which is considered a pest especially by strawberry growers.

**Farmer 5:** Yes, there are a lot of farmers who use them on strawberries, against the red spider. I have used it. You buy the insects, spread it over strawberry plants using the instructions for correct quantities. You must know what you are doing, it is not like releasing a balloon with the wind. These insects eat other insects which usually one uses pesticides for, so you use insects instead of pesticides. Working in favour of the environment.

*Iva, hawn ħafna bdiewa fuq frawli, għar-'red spider'. Jiena ġieli wżajtha. Dak tixtri dud, ixxerdu fil-frawli, għandek il-kejl u ammont u kollox, kollox bil-qies u tkun taf x'inti tagħmel, mhux qisek tlaqt bużżieqa mar-riħ. Dan id-dud jkun jiekol dud ieħor li s-soltu ġeneralment inti tbixxu, allura titlaq id-dud u tiffranka l-bexx. Tkun aktar favur l-ambjent.*

**Farmer 6:** We bring insects from abroad, spread them on strawberries and so not use pesticides. We do a long period without spraying, until I notice that the insects are not working any more and sort of die. They do a certain period of time working until they die, maybe two months or three. I do not spray, and then maybe I spray at the end if necessary, but otherwise I stay away from spraying and would have used a natural product.

*Ingibu insetti minn barra inxerduhom fil-flanni tal-frawli u ma nużax bexx, nagħmel perjodu twil ma nużax bexx sakemm nibda nara illi l-insetti għajjew jieklu, qishom jmutu, jagħmlu perjodu u jmutu, forsi tgawdihom xahrejn, jew tlieta. Ma nbixx, imbagħad forsi fl-imwaħħar jkolli nuża ftit bexx jekk hemm in-necessità, għax jekk ma jkunx hemm, ngħid iffrankajtu u fl-istess hin inkunu użajt affarijiet naturali.*

This organic farmer explained how, since they do not use any chemical pesticides, nature balances itself, and they encourage predatory insects in their field in order to control the number of the others. Flowers are used to attract insects to the site.

**Farmer 8 Organic:** We use various systems with different techniques. For example, we encourage insects, we do not spray against insects, and after a number of years, after five or six years, we notice a difference. Since we do not spray against insects, we found that nature balances itself out. We have ‘bad’ insects, but we have ‘good’ ones too, predatory insects which control the others, so we do not have such a big problem. We use ladybirds, and recently the predatory nematode, the spider mite is used on strawberries. It works against the red spider mite. We use flowers to attract insects and we have various boxes full of bees around the farm to pollinate. We encourage bees to enter into our greenhouses, as we have two (greenhouses), by planting flowers inside, especially near cauliflowers and tomatoes, to increase pollination.

*Aħna nużaw ħafna sistemi b'tekniki differenti. L-insetti eżempju, ninkoraġġu kemm jista' jkun jigifieri l-insetti aħna ma nużawx bexx li joqtlu l-insetti u nsibu li wara certu snin, wara ħames snin jew sitt snin, bdejna naraw differenza, wara li ma wżajniex insetticida li toqtol kollox bdejna nsibu li n-natura sabet il-bilanċ tagħha. Jigifieri għandna insetti ħżiena imma għandna ukoll ħafna insetti tajbin li, 'predatory insects', li jikkontrollaw il-ħżiena allura ma tantx għandna problemi ta' insetti. Nużaw insetti bħan-nannakola, 'ladybirds', dan l-aħħar dahlet il-'predatory nematode', 'spider mite' ngħidulha, nitfgħuha fuq il-frawli. Hija 'spider mite', kontra 'red spider mite', dawk li nużaw. Nużaw ħafna fjuri biex nattiraw l-insetti. L-ewwel nett għandna kaxxi tan-naħal imdawwrin kullimkien, mal-'farm', biex jdakkru l-affarijiet. It-tieni haġa ninkoraġġixxu n-naħal jidhlu fis-serer, għanda żewġ serer. Nhawlu l-fjuri fis-serer biex jidhlu naħal fis-serer u mal-kaboċċi u affarijiet li għandhom bżonn jiddakkru bħat-tadam, nitfgħulhom ħafna fjuri.*

#### 4.2.4.4 Suggestions for a better farming future

Farmers had a lot to offer with regards to suggestions in order to improve their practice or even make farming more sustainable in the long run. In the following paragraphs all the suggestions mentioned by farmers will be discussed.

##### 4.2.4.4.1 Better care of valleys and rainwater catchment projects

Since farming depends a lot on the use of water for irrigation, farmers felt the need for better management of valley systems in Malta. In the past a lot of farmers used water collected in valleys to water their crops, especially those fields which are close to such valleys. Some of them stopped using this water as it was too dirty or the walls built (dams) were no longer there, and water simply ran off. Such water will eventually also percolate in the rocks, replenishing the water table.

**Farmer 2:** We have a lack of water. They never took enough care to build dams in valleys. This would have been the best solution for our current problem. For example, in this valley we used to have dams (*skontri*) but they came and removed everything. Dams are like walls, which hold water, as at Chadwick lakes. Water is trapped there. For example, in May when growing potatoes, we used to pump water (from the valley) and use it for irrigation. Nowadays rainwater is ending at the sea.

*Għax ilma għandna ftit. Imma l-aktar soluzzjoni, li għalija jien, li għandna problema, ħabba n-nuqqas tal-ilma... li qatt ma ħudu ħsieb għamli l-ilqugh għall-ilma. Per eżempju, jien hawn fil-wied niftakar kien hawn ħafna lqugh tal-ilma, kinna ngħidulhom skontri. Dawk illum ġew neħhew kollox. Hitan li jżommu l-ilma, bħal m'hemm Chadwick Lakes, fadal minnhom hemm. L-ilma joqgħod hemm, jkillek per eżempju f'Mejju il-patata konna narmaw il-pompi u kinna nsagqu minnu, mhux illum jiġi l-ilma, għamlet ix-xita u telaq kollox il-baħar.*

**Farmer 4:** If it was my decision, I would build dams (in valleys) so that it (rain water) percolates, rather than letting it get lost at sea. It would seep through the rock and everyone can use it.

*Ilma tax-xita, jiena kieku jiena il-widien kollha nagħmilhom bl-ilqugh ħalli jinxtorob mhux meta jagħmel ħafna jibqa' sejjer kollox il-baħar. Jinzel fl-art u jista' jużah kulhadd.*

**Farmer 5:** We need more water reservoirs, that is for sure. Now, whether they are done by the government or the private sector, they are needed.

*Aktar ġibjuni, dik żgur. Issa jaġħmilhom il-gvern, jaġħmilhom il-privat, huma bżonn.*

This farmer, proudly accounted how he does not use any underground water as he has built a large water reservoir and collects rainwater from on top of his greenhouses and the area near to his fields.

**Farmer 11:** Speaking on my behalf, my father has always thought of using rain water for our greenhouses by collecting it from the roofs of greenhouses and nearby. We collect water, and in fact that is what I did. I built a large water reservoir and collect rain water from other places. I built a pipeline and it brings it to my reservoir, otherwise I won't have enough by collecting water only from on top of the greenhouses. It helps. I do not have a borehole. I am a farmer who does not use boreholes and use only rainwater. Since I no longer sow plants directly on the ground, the water used for irrigation is re-collected to be used again.

*Jien ngħid għalija missieri dejjem haseb biex jsaqqi dejjem bl-ilma tax-xita fis-serra, udejjem jilqa' l-ilma ta' fuq is-serra u kull fejn jista' jilqa'. Niġbru l-ilma, u jien fil-fatt hekk għamilt għamilt ġibjun kbir u nilqa' l-ilma tax-xita u għandi post nilqa' u ngħib l-ilma 'l hawn jġifieri għamilt pipeline u ngħibu għal ġol-ġibjun tiegħi. Għax inkella ma jkollix biżżejjed minn fuq is-serer biss. Imma tgħin hux. Jien m'għandiex borehole, jien bidwi mingħajr borehole, nuża l-ilma tax-xita biss. U sintendi x'ħin insaqqi, m'għadnix inħawwel fl-art jien, l-ilma li nsaqqi nerga niġbru biex nerga' nużah.*

#### 4.2.4.4.2 Just Competition

More attention is needed by the relevant authorities to guarantee a just market. The necessary precautions should be taken so that just competition is guaranteed. This farmer's comment delves into a case, which was also mentioned by a few others, which shows that imported produce is being sold as local produce.

**Farmer 5:** Authorities need to pay more attention to what is being imported, as competition is nice only when it is done fairly. If they bring in a product which is second class and try to sell it as a Maltese

produce, or mix it up with local produce, then that competition is not just... For example, one could go and buy imported marrows and sell it as local. How can it be done? He has no right to do it, but why isn't he caught? He is not caught as our Maltese produce is not packaged and has no labels or logos.

*Nahseb illi jridu joqghodu attenti l-awtoritajiet jridu joqghodu attenti x'inhu diehel minn barra ghax il-kompetizzjoni sabiha imma meta ma tkunx gusta mhux sewwa. Jekk jgibu prodotti 'second class' u jippruwaw jbigħuhom ta' Malta, u jhalltu x-xogħol hemm hija kompetizzjoni mhux gusta. ... Per eżempju jista' jagħti l-każ illi xi hadd jmur jixtri qarabagħli ta' barra u jmur ibiegħu u jghidilhom li ta' dan hu qarabagħli ta' Malta. Għaliex jista' jagħmilha din? Bi dritt ma jistax jagħmilha, imma għaliex s'issa ma jinqabadx? Ma jinqabadx ghax aħna l-bdiewa Maltin ix-xogħol tagħna mhux \*ippakkettjat b'ta' Malta, m'ghandux tikketta, 'logo' jew 'label'.*

#### **4.2.4.4.3 Marketing**

Marketing of local produce may be the key to increase the sales of locally grown products. When buying local, it is more sustainable, as one is reducing the costs of shipping, as well as reducing the carbon footprint of that particular product, reducing travelling and thus reducing emissions. Through proper marketing of seasonal produce grown locally, a fresh product is guaranteed, encouraging consumers to look for locally grown produce.

**Farmer 6:** We have a lack of marketing for our local produce! In my opinion, when the season arrives, for example potatoes, broad beans, artichokes, strawberries, whatever it is. It is important that before the product starts, we should market it properly, advertise it, to prepare the consumers.

*Għandna nuqqas ta' marketing tal-prodott lokali! Għaliya meta jasal l-istagun, hu x'inhu, patata, ful, qaçoć, frawli, hu x'inhu, importanti illi minn qabel ma jibda' l-prodott għandna nimmarkitjawh fis-suq, tirriklamah fis-suq, importanti ħafna halli tipprepara lill-konsumatur.*

#### **4.2.4.4.4 Organic matter**

Recently, Maltese households are collecting organic matter in separate bins. One farmer suggested that such organic material should be sold or given to local farmers. This minimises the need for them to buy fertilisers from abroad.

The organic material collected is processed at Sant' Antnin Waste Treatment Plant and is being used to produce biogas, generating green energy and electricity. The remaining organic matter, compost, that can be eventually used by farmers, is being cleaned (WasteServ Malta Limited, n.d.).

**Farmer 2:** I am no expert and maybe I am mistaken but for example, this organic matter we are collecting at Sant Antnin, which we separate at home would work in favour of the environment. I would see how I would mix it up with animal manure and give it to farmers. We would save up on the nitrates we are importing from abroad. I believe this is the problem, we do not work with our natural matter, we are not taking care of our local products

*Issa per eżempju kieku waħda biex nibza għall-ambjent, naruwaha naħseb li hi tajba, issa jien mhux xi espert, forsi żbaljat ukoll. Per eżempju hawn dan id-demel li qed niġbru bħal ta' Sant'Antnin, li nagħzlu tad-djar, il-ħaxix, l-'organic' u hekk. Dak kieku jiena nara kif nagħmel, inħalltu ma' tal-bhejjem imbagħad inxerrdu u ntih lill-bdiewa. U niffrankaw dun in-nitrat li qed ngħidu li qed ngjibu minn barra. Għax din naħseb il-problema li aħna m'għadniex naħdmu bin-natural tagħna, l-oġġett tagħna mhux nibzghu għalih.*

#### 4.2.4.4.5 Relevant suggestions

Two other suggestions made by farmers include the possibility of using the produce unsold at the Pitkali markets to make other products and the possibility of reverting back to glass greenhouses rather than using plastic.

**Farmer 6:** Since there may be a large production of the same produce, it is difficult to sell all of it at Pitkali market and the rest is thrown away. Now, maybe we can start cutting it and packaging it. We need such a

system at the Pitkali markets, it needs to be transformed into something else to be sold, such as giardiniera or similar.

*Billi jkun hemm produzzjoni qawwiya ta' prodott, diffiċli biex jinbiegħ kollu l-Pitkalija u allura żżejjed li jibqa' jarmuh. Issa llum il-ġurnata qed ngħidu forsi jibda jitqatta' jew hekk, forsi jippakkjawh... hemm bżonn fuq dik is-sistema tal-pitkalija, hemm bżonn illi dan jitqatta' jew jinħadem xi affarijiet bħal giardiniera jew hekk.*

**Farmer 11:** For example, we are using plastic for greenhouses, which is bad for the environment. Before, my father had greenhouses made out of glass and wood, and now instead of modernising, we are using plastic, which is worse. We can go back to using glass and aluminium, but they are very expensive.

*Eżempju waqajna fuq is-serer tal-plastik, heq u l-plastik jagħmel naqra ambjent ħażin. Qabel missieri kien bis-serer tal-ħġieġ u tal-injam, u issa minflok waqajna għall-modern, morna aktar għall-antik bil-plastik, għax iħammeġ l-ambjent. Issa dejjem hemm dik li l-ambjent bil-plastik, nistgħu naqgħu fuq is-serer tal-ħġieġ nerġgħu, bl-aluminium u nerġgħu naqgħu fuq is-serer tal-ħġieġ, imma jiġu għoljin ħafna.*

#### 4.2.4.5 Local vs foreign produce

As expected, all the farmers are in favour of local produce over foreign produce. The most common reasons for the preference are guaranteed freshness of their produce; less transportation thus less carbon emissions and less preservatives used; and, short shelf-life of local produce, evidence of less preservatives. The local Mediterranean climate and the soils are factors which farmers consider as guaranteeing the taste and quality of local produce.

**Farmer 3:** In Malta you have an enormous advantage with regards to produce. I cut produce in the morning, and by that evening or even before, it is at the customer's home ready to be cooked. Compared to the imported produce coming in fridges, and whatever is added to increase shelf life, what is more worth it? A fresh product coming from our fields arriving to you on the same day, or you look at the wax covered and preserved products in plastic bags? ... There is that discrepancy, as we are talking about a product which is fresh and genuine that from today till tomorrow if not consumed will start to deteriorate, or else imported produce which is picture perfect and stays good for much longer. It still has problems, but there is that difference.

*Jiena naħseb li, tkellem għandek prodott hawn Malta għandna vantaġġ enormi, mela għadni kif qtajtu filgħodu u sa filgħaxija jew anke qabel, qieghed għand il-mara tad-dar lesta biex tieklu jew issajru. Hdejn li ġej minn barra u friġġis, biex jiġi attraenti twaddablu li twaddablu hemm imsomma, xi affarijiet oħra biex ma jmurlekk, x'inhu l-aktar 'worth it' li tiekol? Prodott frisk inqata' mill-għelieqi tagħna u wasal għandek fl-istess ġurnata jew toqghod thares lejn dak għax miksi bix-xemgħa u għax dak kemm hu ppreservat bl-affarijiet li waddbulu fil-borża?... Hemm dik id-differenza qawwija li aħna qed titkellem bi prodott frisk ġenwin li mil-lum sa għada, jekk ma jiġix ikkonsmat jibda' jiddeterjora ma jdumx u ta' barra hu kif inhu Alla jbierek tal-istampi kien, għadu u jdum aktar. Ikun hemm problemi ta', ukoll, imma hemm dik id-differenza hekk.*

**Farmer 5:** I will start with the local product. The local product, as a result of the sun and Maltese climate, is a healthy product and tastes good, which exceeds the foreign product. But the problem is with the packaging. Here in Malta we are still a step behind with regards to packaging. We are trying. If we have packaging which is similar to the imported products, the local product is much better than the imported, and let me tell you why. First of all, the distance. If I wake up at five o'clock in the morning to pick up strawberries, at seven I am at the Pitkali markets, and by eight or nine, let us say in the same day, by night it is on the consumer's table at home. That is called fresh! When you are bringing strawberries from a foreign country, I am not going into how long, everyone does their homework and check how long it has been travelling for kilometres and miles, and how much emissions have been produced until it arrives here.

*L-ewwel ħa nibda mill-prodott lokali. Il-prodott lokali permezz tax-xemx u l-klima ta' Malta huwa prodott bnin u fit-togħma huwa tajjeb li jgħaddi lill-prodott barrani. Pero il-problema qieghda fil-'packing'. Aħna Malta fil-'packing' għadna lura, qed nippruwaw imma għadna lura. Jekk ikollna ppakkjetjar simili għal ta' barra, il-prodott ta' Malta huwa ħafna aħjar minn ta' barra. U ngħid għaliex. L-ewwel nett id-distanzi, jekk jiena inqum fil-hamsa ta' filgħodu naqta l-frawli fis-sebgha nkun il-pitkali, u fit-tmienja jew fid-disgħa, eja ngħidu dik il-ġurnata stess sa filgħaxija tista' tispiċċa fuq il-mejda tal-konsumatur. Dak jissejjaħ frisk! Issa jekk iġġib frawli minn postijiet oħra barra minn Malta, mhux ser noqghod ngħid kemm, kulhadd jagħmel il-'homework' tiegħu kemm ikun vjaġġa mili u kilometri, u kemm nkunu ħlejna emmissjonijiet biex wasal hawn dan ukoll.*

**Farmer 6:** For me the local product is much healthier, it is cut and within a few hours it would have arrived at the consumers. Maybe there are still farmers that do not present their produce as should be, in uniformity, those who throw in everything in their boxes, but we have improved a lot.

*Jiena għalija prodott lokali huwa prodott bnin, prodott li jinqata' fi ftit siegħat jasal għand il-konsumatur. Huwa forsi, għad hawn bdiewa, ħa nitkellem ċar li ma jipprezentawx il-prodott b'uniformita, illi kulhadd forsi hawn min għadu naqra waħda l-antika u jwaddab kollox, pero, illum irrangaw ħafna ta' jiġifieri.*

Ultimately, what farmers produce is all dependent on the demand from the market. Consumers are the key influencers into what crops farmers seek to produce and opting for local produce is the ultimate key for warranting a secure future for local farmers.

**Farmer 5:** I have absolute trust in consumers and that those who want a good product will look for Maltese produce. If there no longer are consumers who search for local produce, the few farmers left would have been long gone.

*Jiena għandi fiduċja assoluta fil-konsumatur, min hu konsumatur u jrid it-tajjeb, ifittex ta' Malta. Li kieku ma baqax il-konsumatur ifittex ta' Malta, kieku l-ftit bdiewa li fadal, ilhom li żarmaw!*

When asked what farmers think consumers prefer, whether it is local produce or foreign produce, most commented that recently there was a slight increase in demand for local produce. On the other hand, one of the farmers stated that the demand is rather equal. One of the reasons why he thinks so is the fact that an increasing number of consumers are buying all their needs, at one go, at supermarkets. Most large supermarkets, stock a limited number of local produce, and when asking the farmers why they think some will not stock more on local produce, the reason was explained.

**Farmer 10:** It is equal. There are those consumers who prefer local, but nowadays most go into a supermarket and buy everything from there, preserve, meat, everything, without knowing what they are buying. Fast paced lifestyle... Everyone must work, and you cannot blame anyone. So, one could go and buy ready-made products.

*Equal fhimt. Hawn min jippreferi t'hawn, imma llum hemm hafna jmurru go supermarket kbir u jixtru killix, preserve, laħam, u jibqa' għaddej, u ma jafx x'inhu jixtri. Il-ħajja mgħaġġla. Kulhadd jaħdem, u ma tagħti tort lil hadd. Voldieri dak li jkun jaqbad u jmur jixtri l-lest.*

**Farmer 2:** When I was approached, I was told that when working with supermarkets you are obliged to give him produce throughout the whole year. We cannot because we cannot work the whole year and

we work according to the seasons. So then they bring from abroad. Another thing with supermarkets is that they bring in a whole container and distribute it between four shops, so he has bought in bulk so it is cheaper.

*Għax jien nahseb imbagħad is-supermarket, ħa ngħidlek għax ġieli ġew tas-supermarket. Imma supermarket trid tintrabat miegħu li ttiġ is-sena kollha. Imma aħna ma nistgħux naħdmu s-sena kollha għax aħna bl-istaguni. Imma barra, huma jgħibu minn barra. U ħaġa oħra li għandu supermarket, imur per eżempju jimpliek 'container'. Għandek dawn is-supermarkets il-kbur, ġib 'container' u qassmu bejn erba' ħwienet li għandu, mela hu xtara bil-lott allura jixtruh irħas.*

#### **4.2.4.6 Labelling, packaging and grading**

Competing with a foreign market, farmers feel that it is a must to keep up-to-date with the standards. Grading of produce, proper packaging and presentation, along with labelling, are mostly felt as a need to help local produce thrive in the market.

##### **4.2.4.6.1 Labelling and Traceability**

Proper labelling would help consumers know where the product is coming from. Knowing by which farmer it has been grown may put their mind more at ease. Maybe, it would also be a good idea to add on a short history of the farmer, with information on what he/she strives for. On the other hand, a number of farmers feel that they do not have the adequate finance to be able to label and package the produce themselves.

**Farmer 2:** One would know from whom he is buying (with labels) but then you would have to package it. If for example, we have to do packaging, the farmers cannot afford to do more expenses. You are adding on more work and expenses.

*Ikun jaf mingħand min qed jixtri imma nahseb trid tippakkjah ukoll, imma. Jekk tiġi per eżempju biex tippakkja, il-bidwi m'għadux jiflaħ għal dawk l-ispejjeż. Għax inti ħa żżidlu xogħol u spejjeż.*

As with local organic produce, on the contrary to produce from conventional farmers, they are obliged to label their product to mark that it is organically grown.

**Farmer 8 Organic:** Yes, it is obligatory to have labels on organic products. It is in your own interest to label it. It is by law.

*Iva, bilfors jrid jkollok 'labels' tal-'organic'. Prodott organiku fl-interess tiegħek li tagħmillu 'label'. Bil-liġi.*

#### 4.2.4.6.2 Grading and Packaging

When it comes to grading, although it is not officially done, most of the farmers practice grading by separating their produce into different crates according to size. It is not obligatory, but they feel that it helps with the presentation of their produce. As for packaging, since almost all the imported produce comes readily packaged, farmers feel that in order to compete, local produce should also be packaged to help with its presentation.

**Farmer 4:** Grading means that you are choosing the produce. Grading, is to a certain extent, being done, even though one would not say he is grading. You put the big ones in a box and the smaller ones in another.

*Il-'grading', jiġifieri prodott magħżul. Il-'grading' kważi kważi qed isir, avolja ma tgħidx li qed tagħmel 'grading', il-kbir għalih u żgħir għalih.*

**Farmer 6:** Grading is important. We talk about grading at Pitkali markets, but so far we have not applied it a hundred percent. However, nowadays, we have gradually started grading. You put the same size in the same box, with different sizes, so that is grading.

*'Grading' huwa importanti mela le. Il-grading huwa illi, ilna ngħidu fuqha anke fil-pitkalija, imma s'issa għadna ma wasalniex, mija fil-mija. Għalkemm illum il-gurnata aħna bdejna 'grading' hux. Jew tqiegħdu kollu l-istess daqs, daqsijiet differenti allura 'grading' differenti.*

**Farmer 5:** Packaging is one of the problems we have, as it is attractive to the eye. Another thing farmers must nowadays keep in mind is that we are no longer living in a society like we used to live, like our parents and grandparents, where the housewife had more time to cook.

*Il-packaging huwa waħda mill-problema u anke għax jattira l-għajn. U oħra, l-bdiewa jridu jitgħallmu li qiegħdin ngħixu f'soċjetà u mhux bħal ma kienu l-ġenituri u n-nanniet tagħna, li l-mara d-dar għandha ċans.*

**Farmer 10:** It would help a lot. There is a sense of presentation. If we package it, someone wanting a salad could just grab one packet. Us as farmers, we try to do what we can, but if for example there is a cooperative who does such work, helping with grading could work. Here it did not work (in Gozo). The machinery for grading was bought by the Gozitano, but it was never used, and we do not know what happened to it. We were members in the Gozitano cooperative.

*Tgħin hafna dik. Sewwa dik għax hemm sens ta' 'presentation'. Jekk tippakkjah, dak li jkun jrid salad qabad pakkett. Heq aħna l-bdiewa għall-argument nippruvaw nagħmlu daqsxejn għas-sewwa imma kieku jkun hemm per eżempju koperattiva, u jiggredjauh. Hawn ma ħadmitx. Inxtrat il-magna, il-Gozitano, giet u ma ntuzat qatt, u ma nafux x'sar minnha. Konna membri fil-Gozitano, il-koperattiva.*

On the other hand, some of the farmers argued against packaging in the midst of the current plastic pollution crises. Alternatively, one could opt for biodegradable material or other eco-friendly packaging options, which may be recollected and reused.

**Farmer 6:** Packaging is very common nowadays. But now we have another thing, if we start using packaging, we are going to increase waste and pollute the environment. As farmers, I am grateful for the crate system we have locally, as it doesn't exist anywhere else in Europe.. Our crates are reused, washed and no waste is created, reducing pollution to the environment.

*Dak affarijiet ta' 'packaging', daħal hafna, pero għandek oħra. Issa jew ħa naqgħu fuq il-'packaging' u ser inħammeg l-ambjent, ara kemm thammeg. Aħna min-naħa tagħna bħala agrikultura niringrazzja dis-sistema li għanda tal-kaxxi għax imkien fl-Ewropa m'għandhom din is-sistema tagħna. Aħna għandna l-kaxxi tagħna li jinħaslu, dejjem iduru, u ma nħarbtux u ma nħammgux l-ambjent.*

**Farmer 11:** I do not agree with packaging. First of all, you are going to create plastic waste, and plastic is bad. The more packaging you add, the more damage is done to something else.

*Ma naqbilx magħha li tippakkja. L-ewwel nett ser toħloq hafna plastik, jigifieri, ħa toħloq hafna plastik u dak il-plastik ħażin. Aktar ma żżid il-packaging aktar ħa toħloq ħsara fuq haġa oħra.*

## **4.2.5 Education for Sustainable Development and farming**

### **4.2.5.1 Courses offered to farmers**

Most of the farmers acknowledged the fact that various courses are provided. Using the principles of ESD during such training courses, would help farmers embrace the principles of sustainable farming practices, along with their current good practices. Engaging farmers in decision making, will also help them in embracing such decisions and implementing them within their line of work. A sustainable farming future may guarantee the continuation of this primary industry, seeking means of improving it, making it more profitable, seeking means of reducing the impact on the environment and guaranteeing the well-being of farmers.

**Farmer 3:** The only righteous way is that you build trust from whom you are buying the produce, know from where they are brought, given credit that he is a responsible farmer. So, you may tell me that there are irresponsible farmers too. It is not that they are not responsible, but maybe they need more education regarding certain issues.

*L-unika triq tajba li tista' taqbad fuqha li itni trabbi fiduċja ma' fejn tixtri, minn għand min qed jgħibu u dan jkollu ċertu kreditu li hu bidwi tal-affari tiegħu. Issa tgħidli mela allura jfisser li hawn xi bdiewa mhux tal-affari tagħhom. Mhux għax jkunu mhux tal-affari tagħhom imma jkunu naqra waħda, jridu tagħlim fuq ċertu affarijiet.*

### **4.2.5.2 Appreciating and empowering farmers**

Farmers feel that often, within society in general, they are looked down at. They feel their work is not appreciated enough. Sustainable Development is not only about promoting the care of the environment, but also helping in the well-being and social aspects, in the case of

farmers. Empowering farmers is a need. To feel appreciated and trusted in your line of work will encourage one to work even harder.

**Farmer 3:** The thing I like most about farming, is the need to carry a sense of responsibility, to produce your crops in the most nutritional means and cultivate it, as at the end we are producing food for our consumers.

*L-aktar li jogħġobni mill-biedja ukoll jiġifieri li, minħabbi li inti trid tkun responsabbli, terfa' ċertu responsabbilta'. Kemm biex twassal prodott u kemm biex tikkultivah bl-aktar mogħod nutrittiv, jiġifieri inti wara kollox qed titkellem jiġifieri, qed tipproduċi ikel għall-konsumatur.*

**Farmer 5:** We must empower farmers so they become proud that they are producing food. We are working with food, the best thing! One thing I can tell you, is that as they say, you need a farmer three or four times per day.

*Il-bdiewa jridu jgibuhom illu jhossuhom kburi li inti qed tkabbar x'nieklu, u mal-ikel, qed nilgħabu mal-ikel, mal-aħjar haġa! Waħda milli nista' ngħidlek bħal ma gieli jgħidu, għandek bżonn bidwi tliet darbiet jew erbgħa darbiet kuljum.*

**Farmer 6:** We have to be careful, as they say agriculture is not important, but agriculture is of utmost importance to our country! Certain people may not appreciate as they are served, but since you have a local Maltese product, a healthy product and a very good one, in my opinion, if you do not take care of them and help them, one day in the future it is going to be a shame as then you cannot bring them back. I have been in agriculture for forty-two years, and my experience has taught me well. You start with experience, sometimes things may go bad, but then you learn by experience, that is what you learn from.

*Irridu noqgħodu attenti li l-agrikultura, ara kemm jgħidu mhux daqshekk bżonnjuża, l-agrikultura, l-biedja hija bżonnjuża immens għall-pajjiż! Immens. Certu nies ma japprezzawx għax jgħidulek u iwa jien moqdi, imma la darba inti għandek prodott Malti, prodott bnin u prodott veru tajjeb, għaliya, jekk ma tibzux għalih u tgħinhom, għada pitt għada tkun hasra għax imbagħad ma ggibhomx lura, u jien hekk ingħid. Jien ilni tnejn u erbgħin sena fl-agrikultura u ma tgħallimtx mil-lum għall-għada. Dejjem tibda bl-esperjenza, u daqqa dik gietek hażin, u bl-esperjenza titgħallem, hi tgħallmek kollox.*

#### 4.2.5.3 Encouraging Dialogue

The need for more dialogue between the government, different stakeholders and farmers themselves was mentioned by a number of

farmers. They feel the need to be consulted and voice their opinions on decisions taken in the name of farmers.

ESD is built on giving a voice to all relevant stakeholders and giving a voice to the sectors of society which may not always be heard. Keeping in mind the sustainable development of the agricultural sector, a true dialogue, encouraging farmers to voice their opinions and find solutions which they feel they can embrace, and which are not imposed on them, will encourage the adoption of such sustainable principles.

**Farmer 2:** I think that all farmers are depicted under a bad image, and farmers have become voiceless and powerless. Farmers have a huge problem, as they never had one cooperative to have one whole vision, and the number of farmers are few.

*Naħseb li l-bidwi killu kultant qed taħt stampa ħażina għax il-bidwi bniedem gie bla lehen, m'għandux saħħa. Il-bidwi għandu problema kbira, qatt ma kellu koperattiva li jkollu għajta sħiħa u bdiewa li hawn ftit.*

**Farmer 4:** I really wish that there would be a sincere dialogue (between the government and farmers), as for me personally they all respect me as I am sincere and it has nothing to do with politics. Sometimes you must go against the will of some, but something has to be done.

*Jiena nixiteq li jkun hemm djalogu sinċier li jippruvawh jagħmluh għax jiena voldiri, kollha jirrispettawni immens għax jiena sinċier, u ma noqgħodx ngħid ħabba partiti. Xi kultant jkollok twegġa' lil xi hadd biex tithadded, imma hemm bżonn li jsir xi haġa.*

**Farmer 11:** The threat from the government is that they ignore us. When there is funding from the European Union, they need to apply for it. I believe that is the biggest threat, that they leave us uninformed and so we cannot advance.

*It-theddida hi li l-gvernijiet ma jagħtux każna daqshekk. Li jkun hemm fondi mill-Ewropa u l-gvern jrid japplikha għaliha. Naħseb dik l-aktar theddida li jħallik injorant, ma tawvanzax imbagħad inti daqshekk.*

#### 4.2.5.4 Working with schools

Another relevant issue raised by one of the farmers to guarantee a better future for farmers, was the need to work with school children. This would enable them to get to know more about the farmer's work, appreciating

their work and understanding where their food comes from. Seeing the produce grow, one would become aware of the whole process involved, knowing how it is produced and finally ending at home on their plates.

**Farmer 5:** An initiative that had started involved school children visiting fields, not necessarily to become farmers, but to know where their food is coming from. Most of the kids and adults, do not know how to distinguish between Maltese produce from that brought from abroad, they are not aware where it is coming from. If we start by teaching children, telling them this is coming from there or there, and the other is coming from abroad. It has travelled for long, and sometimes we get criticised for working against the environment.

*U waħda illi bdew ħa jagħmluha, ibda mit-tfal tal-iskola, iduru fl-għelieqi, mhux biex jsiru bdiewa, jekk jridu jsiru bdiewa jsiru, imma biex jkunu jafu minn fejn ġej l-ikel. Għax ħafna mit-tfal u anke kbar illum, qas jagħrfu ta' Malta minn ta' barra, ma jafux minn fejn hu ġej. Jekk nibdew nagħllmu t-tfal ngħidulhom din ġejja mit-tali post u tat-tali post, u dik l-oħra ġejja mit-tali post minn barra. Ilha tivvjagġa, ara lilna jgħidulna, kultant niġu kkritikati li aħna naħdmu kontra l-ambjent.*

#### **4.2.5.5 Promoting Hydroponics and Aquaponics through Education for Sustainable Development**

Hydroponics is not so much in trend with local farmers. Promoting such sustainable practices through ESD may help other farmers embrace such new concepts. Sometimes what farmers need is to see other farmers who have successfully embraced such practices, in this case hydroponics. Hydroponics and aquaponics may be the solution to Malta's lack of natural water resources and the decreasing amount of arable land. Encouraging new farmers to practice such sustainable farming practices, through ESD may help guarantee a better farming future in Malta.

One of the farmers interviewed, who practices hydroponics was a regular farmer, planting and sowing his crops in fields just like any other farmer until he came across the idea of growing his crops using hydroponics (Refer to Appendix F for photos). This system is self-sufficient and uses

much less water than conventional farming. He specializes on a number of crops, mostly which have a short-life cycle. Nutrients and fertilisers, according to the crop, are passed through the water system.

**Farmer 12:** This system works by providing all the fertiliser needed to plant the crops which are otherwise found in the soil. You must provide all the fertilisers in the water. We mix it with water, and according to the uptake by plants, you add accordingly and regularly. The advantage of growing salads is that it is grown in water and there are fewer diseases (since it has a short life span). We collect rainwater from on top of our greenhouses, and have a large water reservoir, and add to it. We do use a little water from the boreholes, in Summer, when the one in the reservoir ends.

*Din is-sistema taħdem billi inti trid tagħti lill-pjanta li għandek trid tagħti 'fertiliser' li inti kieku ssib fil-ħamrija, flok toħodhom mill-ħamrija, toħodhom mill-ilma. Inħalltuh mal-ilma u skont kemm jieħu 'fertiliser' inti trid iżżidu. Jinħadem regolari. Li għandek vantaġġ peress li huma 'salads' dejjem qed ġol-ilma u ma jimradx jew hekk. L-ilma aħna nużaw tax-xita niġbru l-ilma tax-xita minn fuq is-serer kollha, għandi ġibjun kbir hawn hekk, u dejjem iddur u żżidu. Intellgħu fit ilma mill-'boreholes', fis-sajf, meta jkun spicċa tax-xita.*

#### **4.2.5.6 Adequate access to Laboratories**

Having adequate access to the necessary resources at a national level is a need which is felt by a number of farmers. Sustainability may be better integrated into everyday farming practices if the necessary resources are provided and made accessible to farmers in general. Knowing whether you are making any mistakes in your practice, by testing for excessive amounts of pesticide and fertiliser use, is necessary to practice sustainable long-term farming. The use of laboratories and promotion of good farming measures through ESD are desired.

One farmer delved into the need of having a locally equipped laboratory where farmers can, personally take samples of their soil or produce to be tested. This way, as this farmer discussed, farmers will know what

fertilisers their soil needs and whether the produce has any residues of pesticides. Currently, sample of produce which are tested for pesticide residues are sent abroad.

**Farmer 5:** On the other hand, I believe that there should be a laboratory, so that we may test our soils regularly so that we know what is needed. Be assured that no farmer puts in substances without care, but if we have a laboratory to test our soil we would be sure of what the soil needs. It would be fair for all.

*Issa mill-banda l-oħra jiena nemmen illi jrid jkun hawn laboratorju ħalli nagħmlu t-testijiet għall-ħamrija regolari ħalli naraw kemm għandna nwaddbu. Ibqa' ċerta li l-bdiewa ħadd ma jhobb jwaddab bl-addoċċ, imma li kieku jkellna fejna tagħmel test tal-ħamrija ħalli jgħidlek eżatt kemm trid twaddab, nahseb illi jkun 'fair' ma' kulħadd.*

#### **4.2.5.7 Promote the Conversion to Organic Farming**

Sustainable farming is a way of farming which works hand-in-hand with nature, respecting the natural processes taking place and embracing the natural ecosystems and habitats. ESD helps in promoting such ecologically friendly principles, helping to find a balance between the protection of the environment, the well-being of the farmers and economic aspects, such as increased profits. The demand for organic produce is on the increase, and the need for promoting organic farming or at least some more organic practices to be embraced by conventional farmers, may be targeted through ESD.

In the following paragraphs, the conversion from conventional farming to organic farming was discussed, with the two organic farmers interviewed.

*Question: What is the process to become an organic farmer?*

**Farmer 7 Organic:** You have at least two years of conversion, so that the soil is cleansed of all chemical residues. You become organic after

two years. They come to do tests, take samples of the soil and produce, and if all is well you are given a certificate.

*Tagħmel mill-inqas sentejn 'conversion' jghidulha, biex jitnaddaf l-kimika li kien hemm ġol-art, sentejn. Imbagħad tiġi 'organic' wara sentejn. Jiġu jittestjaw, jieħdu 'samples' tal-ħamrija u tal-prodott, u wara jekk jsibu kollox sewwa jtuk iċ-ċertifikat.*

**Farmer 8 Organic:** First thing to do is to stop using any synthetic chemicals to spray. The difference between organic pesticides and conventional is the synthetic element. What I call the 'bad' pesticides are made up of chemical which do not exist in nature and are made in a laboratory or similar, so they are not found in nature. So, this is the synthetic chemical spray. We still use chemicals, but chemicals which are found in nature. Such as sulphur, copper sulphate, lime, some oils, that is what is generally used. Some soaps, for example we use soap mixed with oil, called white oil and we spray with it, to stay on leaves. Now with the new European Union laws we have more organic pesticides/herbicides on the market that we can buy.

*L-ewwel haġa li trid tagħmel taqta' kull tip ta' bexx sintetiku. Differenza bejn bexx 'organic' u bexx 'conventional', huwa l-bexx sintetiku, l-bexx ħazin ngħidlu jien, huwa magħmul minn kimiki li ma jeżistux fin-natura. Magħmul ġo laboratorju jew hekk, jiġifieri ma jeżistix fin-natura. Dak huwa l-bexx kimiku sintetiku. Ahna xorta nużaw kimiki imma nużaw kimiki li jinsabu fin-natura, nużaw kif għidtlek il-kubrit, il-kupru, il-ġir, nużaw xi żjut, dawk huma ġeneralment li nużaw ahna. Xi sapun, li nħalltu ma' xulxin eżempju żejt ma' sapun, li ngħidulu 'white oil' u nbixxu bih. Biex joqgħod fuq il-weraq, u issa ħabba liġijiet tal-Ewropa qed nsibu aktar bexx organiku lest li nistgħu nixtruh.*

*Question: Must you leave the field barren for a certain period?*

**Farmer 8 Organic:** No, you can still work it. There has to be a period of time from the first day you register to convert to organic farming, the conversion period, which in Malta takes three years. So, you have three years in conversion where you cannot spray, and start the conversion slowly, from conventional farming to organic farming. After those three years, you are fully organic. You do not need to leave the field barren as long as you do not use spray.

*Le, tista' taħdimha mal-ewwel, għax inti tgħaddi perjodu mill-ewwel ġurnata li tirreġistra, li taqleb organic tibda' organic, tibda 'conversion period', li hawn Malta ddum 3 snin. Jiġifieri għandek 3 snin 'in-conversion' li ma tistax tbixx u taqleb bil-mod il-mod, minn 'conventional' għall-'organic' u wara 3 snin tiġi biċ-ċertifikat li tiġi 'fully organic'. Ma tridx thalliha vojta. Basta ma tbixx.*

*Question: Do you know the distance that should be left from one field to another?*

**Farmer 8 Organic:** I do not know exactly. That is called the buffer zone. We are fortunate enough that we have a large buffer zone as we have a lot of fields here.

*Ma nafx eżatt. Dik jgħidulha l-‘buffer zone’. Aħna għandna fortuna kbira li għandna ‘buffer zone’ kbira ħafna għax għandna ħafna raba’ hawn.*

*Question: Does production decrease?*

**Farmer 8 Organic:** Production, how shall I say it? Yes, for sure, it decreases a bit. I am aware that there will be a certain amount of loss, not on every product, but certain products yes, I am aware that there will be losses as we do not take certain prevention against insects, snails, sparrows, and others. So, we always have losses. But not a loss greater than someone else’s. Generally, so far, at the Pitkali markets it is useless selling organic produce as they will not pay differently, whether it is organic or not.

*Il-produzzjoni, kif ngħidu? Jonqos iwa żgur, jonqos daqsxejn, aħna naf li ħa jkollna ċertu ammont ta’ loss, mhux fuq kull prodott, imma ċertu prodotti iwa nafu li ser nitilfu daqsxejn għax ma niehdux dawk il-passi kontra l-insetti, bebbux, u l-għasafar tal-bejt u hekk, jġifieri dejjem ser jkollna xi loss. Imma mhux loss ikbar minn xi hadd ieħor. Generalment s’issa l-pitkalija għalxejn tbiegħ l-‘organic’ għax il-pitkalija mhux ħa jhallsuk xi flus differenti jekk hux ‘organic’ jew mhux ‘organic’.*

**Farmer 8 organic:** I would like to tell you that by organic, after a certain amount of time, nature begins to revive by itself. We do not need to aid with pesticides. With regards to insects, we found a balance, they ask me how come we do not have white fly in our greenhouses. Some farmers use pesticides and still have white fly as it has become resistant. I try to explain how nature balances itself out and we have other insects which are predators of white fly. We have spiders, chameleons in greenhouses, we have everything. At the beginning, it is hard. Generally, the first and the second year of conversion, there is a lot of disappointment until nature balances itself and they lose a bit of produce.

*Nixtieq ngħidlek li proċedura tal-‘organic’, wara ċertu żmien li taħdem ‘organic’, in-natura tibda tieġu r-ruħ minnha nnifisha. M’hemmx għalfejn ngħinuha aħna bil-bexx u hekk, kif qed ngħidlek fuq l-insetti, aħna sibna bilanċ, per eżempju jiġu jgħiduli kif m’għandekx ‘white fly’ fis-serra. Dawn bdiewa li jbexxu u xorta għandhom white fly għax saret reżistenti għall-bexx. Nipprova nispejgħom li aħna issa n-natura tagħna bbilanċjat u għandna insetti oħra li jieklu white fly. Għandna brimb, kamaleonte fis-serer, għandna minn kollox jġifieri. Imma fil-bidu tkun daqsxejn iebsa. Generalment l-ewwel u tieni sena tal-conversion, jkun hemm ħafna diżappunt għax sakemm jaqilbu u n-natura għadha ma sabitx bilanċ, jtilfu daqsxejn il-prodott.*

#### **4.2.6 Synopsis of Qualitative Data Results**

- Most of the challenges mentioned by the interviewed farmers were the long hours of work, having to deal with weather conditions and the level of commitment needed, having no days off.
- Farmers feel that it is very difficult to compete with the amount of produce which is being imported, having a detriment on the price being offered for their local produce.
- Farmers feel the impact of new diseases and pests coming from abroad, having no other options but to use pesticides and herbicides to control the situation, whenever possible.
- Farmers feel that there needs to be more traceability at the Pitkali markets and embracing modern practices, such as labelling, grading and better presentation of local produce.
- Farmers discussed how farming helps maintain the local landscape and rural environment.
- Farmers are aware of the impacts of the use of pesticides and fertilisers and the high nitrate levels found in groundwater, while stating that the problem is not only caused by farmers.
- Some are still sceptical of using treated sewage water to minimise the use of groundwater, feeling the need of better water catchment projects.
- Most are sceptical of the practice of organic farming in Malta, mostly due to having small land parcels close to each other.

- Farmers are aware of what sustainable farming practices are and how to embrace sustainable measures within their practices.

### **4.3 Conclusion**

Through the analysis of both the quantitative and qualitative data collected from full-time arable farmers in Malta, a clearer picture of the farming situation in Malta was achieved. The quantitative data collected through the questionnaire distributed among farmers, helped in paving the issues which needed to be discussed with farmers through in-depth interviews.

The results which were represented in this chapter will be discussed in the subsequent chapter, triangulating the data from both the quantitative and the qualitative analysis of data.

# 5

## Discussion of Findings

## **5 Discussion of Findings**

This chapter will represent the findings from both the quantitative and the qualitative data which were collected for the purpose of this study. This will be done by using triangulation and merging all the data together to gain a clearer picture of what the overall findings were.

The main categories which will be discussed in this chapter include:

- The farmers' perceptions on sustainable agricultural practice;
- The perceptions on the use of pesticides and fertilisers;
- The perceptions on ground water and use of New Water;
- Issues related to conventional farming;
- current sustainable farming practices implemented by conventional farmers;
- Their perceptions on the future of farming;
- The link between ESD and farming.

All of these themes were selected following a thorough analysis of both the quantitative and the qualitative data collected for the purpose of this study.

### **5.1 Farmers' perceptions on sustainable agricultural practices**

Since prehistoric times, agriculture has been a staple necessity for the survival of mankind. Providing food, agriculture has evolved tremendously throughout the years. From subsistence agriculture, to

technological revolutions which helped in increasing quantities, maybe even so without considering the repercussions (Mason, 2003). One of the main aims behind this research was to seek the farmers' perceptions on sustainable agricultural practices. This study mainly focuses on whether the farmers are familiar with such practices and whether they will be willing to implement such practices, if not already doing so.

Evidence gathered from the quantitative data collected from questionnaires shows that the majority of farmers stated that they agree (46.4%) or strongly agree (44.3%) with the statement that they understand what sustainable farming practices are. Farmers also stated that they agreed (40.5%) or strongly agreed (25.6%) with the statement that they understand what unsustainable farming practices are.

Data collected from interviews shows evidence that farmers know that sustainability is not only about taking care of the environment. The farmers also mentioned the importance of being moderate in the use of pesticides, sustaining profitability in the long run, guaranteeing the livelihood of the farmers themselves. Farmers included comments such as: *“Sustainable farming is about being moderate, having a just production without using too much pesticides, and in the mean time taking the profit the farmer deserves”* (Farmer 5); and, *“You have enough to maintain yourself and your family. That is the first thing, and to be able to cover your costs. Even for the environment, you must maintain the fields in a good condition”* (Farmer 7 Organic).

Farmers showed awareness of the three pillars of sustainable development; mainly the environmental, economic and social pillars, holistically incorporating all three of them, giving equal importance to each, “seeking to maximise the goals across all three spheres at the same time and the possibility of mutually supportive gains that can be made through sustainable development actions” (Elliott, 2013, p.21).

Sustainability, as discussed by farmers during the interview is about maintaining nutrients in the soil, upkeeping rubble walls, using more efficient methods for irrigation of fields, along with other methods. The ideal sustainable agricultural practices would be the adoption of methods such as hydroponics, aquaponics, organic farming or permaculture, keeping sustainability in mind.

In a study conducted locally by Mizzi (2012), the research sought to compare the practices of a conventional agricultural farm with another farm implementing permaculture, both in Marsaskala, Malta. This research concluded that permaculture farm, Dar Frate Jacoba, was agriculturally more sustainable than the conventional farm investigated. Further investigation is needed to seek the viability of implementing more permaculture farms on the Islands and whether farmers are willing to implement such practices or not.

While conducting the present study, most of the conventional farmers showed scepticism on organic farming practice, especially organic farming in Malta. There was a discrepancy between the findings from the quantitative data and the qualitative data. While from the questionnaire,

36.3% agreed and 11.3% strongly agreed that organic farming should be widely practiced on the Maltese Islands, 26.2% chose to remain neutral, meaning that they were not willing to either agree or disagree with the given statement. A total of 25% chose to disagree or strongly disagree.

While interviewing conventional farmers, they commented that organic farming is very hard to implement and practice in Malta, mainly due to the fact of having small land parcels close to each other, making it very difficult to avoid contamination from neighbouring fields. Another issue hindering farmers from opting to convert from conventional to organic farmers is the risk of loss of quantities in produce, leading to a loss in profits, a risk many are not willing to take.

Comments from interviews such as: “*We do not have in Malta! Organic, if you check its regulations, you cannot be organic while the others are not. ... No one would be able to eat*” (Farmer 4); “*The biggest problem I can see in Malta, we are such a small island, that even if I have not sprayed, and someone two kilometres away sprayed, there may still be traces of pesticides on my crops, do I call that organic?*” (Farmer 5); depict the skepticism of conventional farmers on organic farming in Malta, mainly due to certain limitation, such as the closeness of fields.

Even the NAP (2018a) discusses these issues related to the practice of organic farming in Malta, acknowledging the need of more extension services with expertise on such organic farming practices, to promote and educate on such sustainable farming practices (p.119).

## **5.2 Farmers' perceptions on the use of pesticides and fertilisers**

One of the most debated issues related to conventional farming practices is the use of pesticides, herbicides, insecticides, artificial fertilisers and other such man-made, synthetic chemicals used by farmers. Recently, locally we have seen the new National Action Plan for the Sustainable Use of Pesticides: 2019-2023 (MCCAA, 2019), helping to implement legislations related to the use of such chemicals on a National level.

From the quantitative data collected, it emerged that the great majority of farmers agree (42.9%) or strongly agree (51.8%) with the regularisation of the use of pesticides to guarantee, not only the well-being of the environment, but also of the consumers. Interviewed farmers also conversed about their obligation to attend training courses on the application and storage of such chemicals, to guarantee, not only their own safety, but also of those consuming their produce.

Data collected through the questionnaires for the purpose of this study shows that the majority of farmers agree (36.9%) or strongly agree (28.0%) that they are aware of the negative impacts pesticides have on the environment and local habitats. Complimentary to these results, farmers also agreed (47.9%) or strongly agreed (20.4%) with the statement that artificial fertilisers can have a negative impact on the environment.

Farmers shed light on the fact that recently they are being portrayed under a bad light, all being blamed of high levels of use of pesticides and

artificial fertilisers. Over half of the participants in the survey strongly agreed (53.0%) or agreed (29.8%) that they are being portrayed negatively. Interviews portrayed the views of other farmers who stated that the majority of farmers are responsible enough and do not risk the overuse of such chemicals. The majority lamented about the fact that such chemicals are very expensive to buy, so no farmer is willing to throw away his money by overusing them.

Articles published on local newspapers such as “13% of fruit and veg had excessive pesticides” (Martin, 2017, February, 8<sup>th</sup>), “Excessive pesticide levels land 15 farmers in court” (Martin, 2018, May 7<sup>th</sup>), “11% of fruit and vegetables exceeded pesticide limits” (Fiorella, 2018, August 2<sup>nd</sup>), “Maltese fruit and veg top EU pesticides list” (Martin, 2018, July 31<sup>st</sup>), and other such articles highlight the situation of excessive pesticides used by a number of farmers whose produce has been collected from the Pitkali markets and tested. Recent changes in the testing methods conducted by the MCCA, resulted in a drastic drop, from 20% (in 2017) to 3% of local produce containing excessive amount of pesticides, as published in the article “Overuse of pesticides less alarming than thought” (Martin, 2019, July 10<sup>th</sup>). The effects of such articles in the newspapers was evident in farmer’s comments such as: *“People make bad publicity because they think we are not responsible for the food we are producing. When the first article was published in a local newspaper, it immediately had an effect on us”* (Farmer 3); and, *“They are trying to make bad publicity because of the pesticides. It may be true that there are*

*farmers who abuse, but just because two or three farmers are caught, you cannot generalise” (Farmer 6).*

On the contrary, Malta was amongst the first countries within the EU to ban Chlorpyrifos, issued in the article “Malta imposes immediate ban on pesticide flagged by European Food Safety Authority” (Hudson, 2019, August 13<sup>th</sup>).

During interviews, farmers delved on the fact that due to the increasing amounts of pests and diseases which have been recently threatening their crops, it is very hard for them to totally do away with the use of pesticides and artificial fertilisers, as otherwise they will lose their yields resulting in great loss. Evidence of this are such comments: “A lot of diseases have come from abroad, such as that of tomatoes, and trees, all of that came from abroad. One is forced to buy pesticides” (Farmer 1); and, “It is impossible to work without using pesticides! Can a doctor work with natural remedies and not give us any medicine? He could and he tries to as much as possible and so do the farmers!” (Farmer 5). Complimenting the statements from interviewed farmers, farmers who participated in the quantitative data collection, strongly disagreed (31.5%) or disagreed (42.3%) with the statement that they can do away with using pesticides and artificial fertilisers.

Cortis (2016) conducted a study on Northern Malta farmers’ perceptions on pesticide use. This study concluded that the majority of farmers consider that the use of these pesticides is an essential tool to control invasive pests and limit the damage on their crops. Farmers also showed

awareness of the risks linked to such use of chemicals. This was similar to what the farmers in this particular study had to say. Through proper exposure and training on more sustainable means of controlling pests and diseases, farmers may slowly start to change their mindset.

### **5.3 Farmers' perceptions on use of ground water, nitrate levels and the use of New Water**

Another debated topic related to the practice of agriculture in Malta is the extraction of groundwater from either the perched or the mean sea level aquifer for irrigation purposes. The State of the Environment Report (ERA, 2018) considers the agriculture and the domestic sectors within the Maltese Islands as the two major sectors which place a demand on local groundwater.

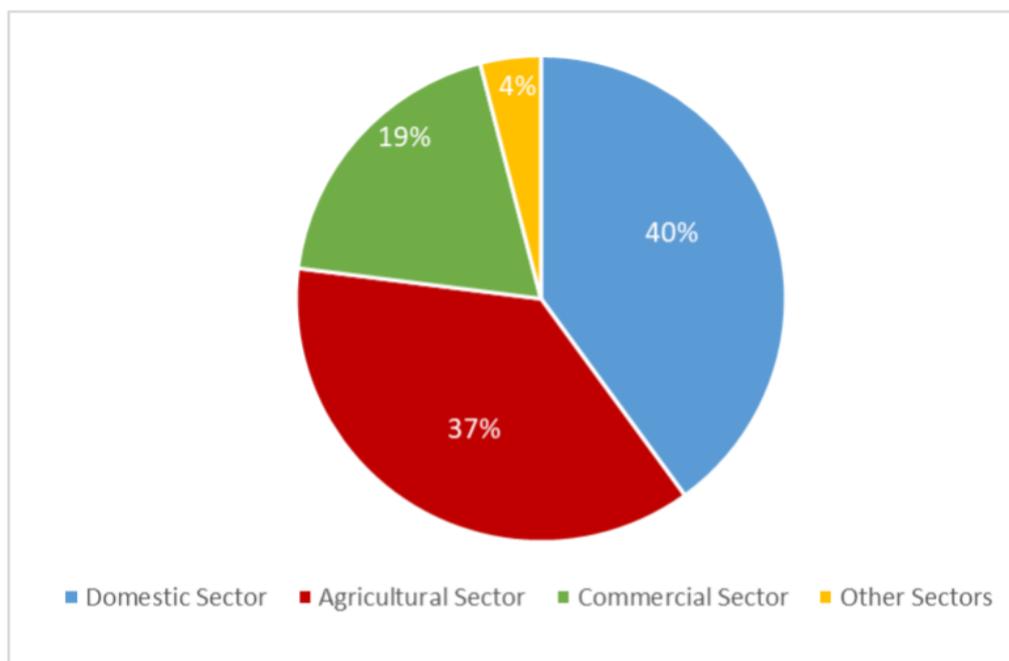


Figure 5.1 National demand for water per sector. Source ERA, 2018 p. 34

One must consider the fact that the only natural water resource in the Maltese Islands is groundwater. Farmers showed awareness of this fact through the results obtained through quantitative data collection. 47% of the participants strongly agreed, while 43.5% agreed with the statement that water is a limited resource in the Maltese Islands. From qualitative interviews, farmers also pointed out the fact that the increase in impermeable surfaces across the island has also contributed to a decrease in groundwater: *“Buildings and roads are both a threat. These large concrete roads. As water is not percolating through the rocks, it runs off. When we talk about table water, there are many who say that farmers are using the table water. But before, rain water had permeable surfaces to pass through”* (Farmer 2).

ERA (2018) states that most of the tested groundwater bodies in Malta have high nitrate levels which exceed the limit set by the EU Nitrates Directive, higher than 50mg/L. While the mean sea level aquifer is showing stable levels, there is an upward trend in the perched aquifer. This report added on that chemical contaminations resulting from agricultural chemicals used, such as pesticides, are not of concern in these water reservoirs.

When asked about the effects of nitrates on water, from quantitative data, it emerged that the great majority of farmers are aware of the time frame set by the Nitrates Action Program for Malta (2011), with 46.4% agreeing and another 42.9% strongly agreeing with the statement. Correspondingly, 44.0% agreed and another 25.0% strongly agreed with

the statement that they are also aware of the effects of excessive use of manure on the quality of groundwater.

From the interview data collected, it emerged that a number of farmers believe that it is not only the agricultural sector which is contributing to an increase in the groundwater's nitrate levels, naming the leakage from the drainage system across the islands: *“Due to farming, there could be some places which had an impact but the problem, most of it, is caused by leaking government drainage system. The drainage system is all damaged. I know because I used to work in construction and we knew what was there”* (Farmer 10).

Aiming to target the issue of groundwater extraction by the agricultural sector, the Water Services Corporation has been working on treating Sewage Water and turning it into water which is safe for crop irrigation, also known as New Water. The issue of use of New Water was delved in the qualitative part of this study. This gives way for the possibility of investigating this issue on a quantitative scale, throughout the Islands. Farmers commented that the use of New Water will surely help ease the problem of groundwater extraction, especially in the dry season, adding on that this water needs to be evenly distributed across the farming community: *“I think that yes, it is a solution for water shortage. The thing is that we do not have access to it all around Malta”* (Farmer 5).

From this study it resulted that, some of the farmers are dubious of using such water, mainly because of the water quality which had been produced at Sant Antnin sewage treatment plant, which is soon to be

replaced by the Ta' Barkat system. *“In the Northern parts they began using it and said that it is good. In the South, we are still a step behind, as Sant Antnin no longer works. Now we have one at Xagħjra (Ta' Barkat) and this year it is supposed to start functioning. Before, in the beginning, it used to be good, but those taking care were no longer cautious, and they were putting in too much chlorine, damaging the crops”* (Farmer 12).

A study conducted by Cauchi (2015) entitled “The Use of Treated Sewage Effluent For the Irrigation of Agriculture” sought to find out the attitudes and perceptions of farmers using the Tač-ċumnija wastewater treatment plant. Complimentary to the findings of this study, there are mixed perceptions and attitudes from farmers, some fearing that by using such water, their reputation of good quality produce will deteriorate, especially those growing water based products, such as watermelons, strawberries and tomatoes. A similar study by Grech (2016) focused on the perceptions on Gozitan farmers with regards to using treated sewage effluent for irrigation purposes. Grech’s study concluded that 78% of the participants were willing to use this water, given that it would cost them less than if they extract groundwater. These farmers also pointed out the issue of groundwater salinisation, due to overextraction from the mean sea level aquifer, thus this New Water would be a better alternative.

As suggested by these studies, the general public’s opinion on the use of such water should also be targeted, as afterall, consumers are those who ultimately determine the choices made by farmers. Farmers were concerned that their produce will diminish in its popularity because of

this use of such water. It is also evident that more distribution points are needed to encourage farmers to use this alternative water resource.

## **5.4 Issues related to conventional farming**

The qualitative interviews gave farmers the opportunity to open up and discuss the most prominent difficulties they have to face. One of the most prominent topics discussed by all farmers participating in the qualitative part of this study, is the issue of having irregular long hours of work, working on Sundays and public holidays to prepare their produce to be taken to the Pitkali markets.

Another issue farmers deal with is the changing weather patterns, which is also leading to different pest invasions and freak storms. One farmer acknowledged this issue: *“Even because of the fact that we are having harsher Summers, rising temperatures because of global warming are making it more difficult to grow our produce, all due to the excessive heat”* (Farmer 3).

Galdies, Said, Camilleri & Caruana (2015) conducted a study amongst Gozitan farmers to seek climate change trends, beliefs and concerns towards adaptation strategies. Linked to the prolonged warmer climate we are experiencing on the Islands, farmers commented on the increase of pest invasions on their crops. Similar to the findings of this study, the results also showed that Gozitan farmers perceived an increased amount of severe weather conditions, such as prolonged periods of drought, heavy rainfall and strong winds.

Farmers indicated how farming has become 'easier' with the use of machinery and other technologies and that unlike in previous decades, farmers nowadays must compete with foreign produce coming from the European Union market and beyond. This has prompted farmers to increase their produce and seek means of guaranteeing both quality and, above all, quantity, however, not always through the most sustainable means of production. Two of the farmers remarked: "*In the past years, we were not better off in the sense that nowadays it is easier to work the fields, but we were better off because there was no foreign produce coming in*" (Farmer 1); "*The importation of produce from abroad affected us directly, it is the reason behind today's farming situation*" (Farmer 5). The quantitative data collected corresponds to such statements. When farmers were asked about whether they agree that the importation of fruits and vegetables from the European Union has impacted them negatively, 76.8% strongly agreed while another 16.7% agreed that it had a negative impact on them.

Along with an increase in imported produce, there was also an increase in the number of pests and diseases which are now impacting local produce: "*Different species of insects have entered Malta from abroad, along with the imported produce. Nowadays we have a huge problem with tomatoes, palm trees, fig trees, we have loads of issues*" (Farmer 6).

Another issue raised by farmers is the size of the fields. This issue was also conferred by organic farmers who were interviewed, hinting that this might raise issues for potential organic farmers as other fields used by

conventional farmers might be too close by: *“Over time, when the land is inherited and is divided, it is one of the biggest problems we have. What farmers have to do is that they have to agree with one another and decide to turn their fields into organic fields as a whole group”* (Farmer 8 Organic).

The Pitkali markets is one of the most prominent issues farmers spoke about, being the place where they take their produce to be auctioned by a middle man. Through the interviews carried out with the farmers it was evident that most agreed that a reform is needed with regards to various aspects, such as traceability of produce, grading, labelling, packaging, online access to prices offered, operating hours, along with other issues. Organic farmers also prompted that their produce is sold no differently than the other produce, so they prefer not to take their produce over there and sell it directly to their customers.

## **5.5 Sustainable farming practices currently used by farmers**

The quantitative data revealed that 48.8% agreed while another 28.0% strongly agreed that they already use more natural methods to minimise use of artificial pesticides and fertilisers. This was further backed up from qualitative data collected, with farmers mentioning various methods which they currently use. Some are traditional methods, passed on over generations, such as crop rotation, with farmers participating in the quantitative interviews also agreeing (47.6%) or strongly agreeing (31.5%) that they practice crop-rotation.

From the quantitative data collected, when farmers were asked whether they agree that there are other solutions to control diseases, pests and weeds, the results showed that the farmers have mixed opinions. 25.0% disagreed, 22.0% chose to remain neutral, while 34.5% agreed. This shows that while there is a good number of farmers who believe that there are solutions, there is still a quarter of the farmers who disagree, giving the impression that maybe pesticides and herbicides are the solution. More sustainable methods of controlling weeds and insects will be discussed in the following paragraphs.

Data gathered through interviews revealed that most of the farmers, especially those who own greenhouses, acknowledge the importance of maintaining bees in the environment as they help pollination. One of the farmers insisted that: *“I believe it is the most intelligent! And the one we need the most! If bees end, we would end too”* (Farmer 2).

Complementing such statements, a number of farmers also added how they use flowers to detect any diseases approaching the crops and also to attract insects for pollination. When it comes to weeds, the majority of farmers prefer to use manual labour to pick out any weeds/wild plants, around their crops rather than passing over with chemicals. First of all, they insisted that it is less costly, although more time consuming, and secondly, they insisted that if they are taking produce to the market, they cannot use such chemicals and then sell their produce within a few hours.

Mulching, whether done by the use of plastic or cardboard, also helps to eliminate weeds from growing around the crops, taking up their water and nutrients from the soil. This is backed up by comments including “*We reduce the negative impacts of farming on the environment, for example, instead of using herbicides, which is the spray used to prevent weeds from growing, we use mulching, or otherwise use the traditional method of picking weeds manually*” (Farmer 5).

Other sustainable natural methods mentioned by farmers included the use of solarisation to eliminate weeds and pests from the soil, and the use of predatory insects to eliminate other pests. This was specifically mentioned for the use of helping eliminate red spider from strawberry fields.

One of the most important natural resources farmers rely on is soil. As evident, farmers believe that the upkeep of their soils is one of the factors that may guarantee a sustainable farming future. Statistics collected from the questionnaires shows that the great majority of farmers strongly agree (51.2%) or agree (42.9%) that they try to reduce soil erosion by maintaining rubble walls and consider weather elements, such as wind, before tilling their fields. This was further backed up by statements given during interviews: “*Rubble walls help reduce soil erosion due to rainfall and also helps the field maintain itself at one level*” (Farmer 1).

## 5.6 Farmer's perceptions of the future of farming

With the number of arable agricultural land on the decrease, 63.1% of the farmers participating in the quantitative data collection strongly disagreed, while another 20.8% disagreed with the statement that the sale of agricultural land for developers is not a threat to the industry.

Most farmers conversed about the decline of the farming population over the years, which will ultimately lead to a decrease in agricultural activity over the Islands, leading to a changing Maltese landscape. Farmers also lamented about the fact that nowadays, agricultural fields are being sought after for recreational purposes, leading to a decrease in agricultural land for potential farmers. The increase in prices for fields offered on the market also deters any young farmers who want to own their own land. One of the farmers stated that: *“The future of agriculture in Malta, if I take you around in fields, you could see fields with rooms in them, not store rooms, but with a BBQ, that is the future I am seeing”* (Farmer 3).

The key to sustaining the agricultural industry within the Maltese islands stands in the hands of the younger generation who may be willing to take on farming as a full-time job. The issue here is that farmers themselves may not even be willing to encourage their own children to continue in their line of work, many because of the irregular hours and income. Referring to the results obtained from quantitative data, when asked whether the younger generation needs to be encouraged to take on

farming as a full-time job, the results showed a variety of opinions. This shows that not all farmers believe that farming is an ideal job, in fact, from the interviews conducted, some of the farmers commented that they do not even encourage their own children to continue in this line of work. Others, however, stated that even if they have all the resources available, such as fields and machinery, the younger generation prefer to work more fixed hours with a well-paying salary, rather than having unlimited hours and irregular income.

Farmers had various suggestions to help improve the farming future in Malta, such as: taking better care of valleys and increase rainwater catchment projects to help reduce the pressure on groundwater extraction; government's and agencies' support for just competition practices; improved marketing strategies; and the collection of household organic matter to be supplied to farmers.

## **5.7 Education for Sustainable Development and farming**

ESD is not only about educating about the care of the environment, but it also entails issues related to social and economic well-being, in this case, that of farmers.

ESD is the tool through which sustainable farming practices may be promoted. Farmers believe that agricultural courses should be highly advertised in order to encourage the younger generations. Evidence of this are the results obtained from the questionnaire, with 39.9% of

participants strongly agreeing and another 38.7% agreeing. Educating future farmers on sustainable means of practicing farming is essential to maintain long-term sustainability of this industry.

ESD may even be used to educate and encourage farmers to supply what is being demanded by the market and seek means of meeting the trends set by consumers. During the quantitative data collection, when farmers were asked whether consumers prefer organic over inorganic produce, the results were quite varied, with the majority of 33.9% choosing to remain neutral, while another 32.1% agreed with the statement. Although, as discussed in previous paragraphs, some of the farmers are sceptical about organic farming practices in Malta, ESD helps in promoting more sustainable measures, on the bases of organic farming, hydroponics, aquaponics and permaculture. Even if the smallest of sustainable measures are adopted by farmers, in the long-run, it will lead to a better, sustainable farming future.

Grima's (2018) ethnographic study with two organic farmers in Malta clearly conveys the practices of organic farming, taking on a more traditional stance, going back to how farming was done before artificial pesticides and herbicides were introduced on the market. Organic farmers saw themselves as returning back to their roots, abiding to nature's rules and respecting the ecosystems. ESD may provide a platform through which organic and conventional farmers converse on different practices and common practices, encouraging and empowering one another to practice sustainable farming.

Sustainable Development is based on supporting local communities, helping reduce the costs and carbon footprint related to transportation of goods. Buying local and supporting local farmers and the local economy will benefit not only the farmers but also the environment in seeking sustainability. On the same aspect, out of those participating in quantitative data, 36.3% agreed while another 27.4% strongly agreed that consumers still prefer local produce over foreign produce. Proper marketing is key, with the questionnaires revealing that 81.5% of the participating farmers strongly agree that consumers should be encouraged to buy local produce.

ESD is also about empowering people and making them feel appreciated and needed within society. Most farmers believe that the public is not aware of the hard work full-time farming entails, with 33.3% of the participants of the questionnaire strongly disagreeing and another 33.9% disagreeing with the statement that the public is aware of the hard work. Complimentary to this, once again 42.9% of the farmers strongly disagree, while 38.7% disagree that farmers are well respected within society. One such comment which backs up this result of the quantitative data states: *“We have to be careful, as they say agriculture is not important, but agriculture is of utmost importance to our country! Certain people may not appreciate it, but since you have a local Maltese product, a healthy product and a very good one, in my opinion, if you do not take care of them and help them, one day in the future it is going to be a shame as then you cannot bring them back”* (Farmer 6).

Appreciation also comes through working with the younger generations. Schools may be the platform through which farmers and the public engage together, encouraging dialogue and building up trust. School gardens and other such projects help students appreciate the work it entails in growing such crops.

## **5.8 Conclusion**

In this chapter, the main findings of this study were outlined in view of both the quantitative and the qualitative data collection methods used. Using triangulation, both sources of data were used to further prove the different findings, linking such findings to similar studies. In the following chapter, recommendations and suggestions for further studies will be outlined.

6

# Conclusion

## **6 Conclusion**

Farming has been an integral part of the human being's history. Since prehistoric times, agriculture has been essential for society's survival by providing food. Farming has also helped shape the first human settlements, usually close to water courses and fertile soils to be able to grow crops and raise animals.

Over the years, the agricultural industry has evolved tremendously, witnessing advance in crop management systems, advanced machinery and new technologies, new adapted plant species, etc. Along with these improvements came along the increase of this primary industry's impact on the surrounding environment. Moving away from our ancestors' agricultural practices in agriculture, meant having an increase in quantity of crops and animals with the use of, possibly, unsustainable means of practice, such as with the use of artificial chemicals and the practice of monoculture.

### **6.1 Filling in the gap in knowledge**

This study sought to convey the perceptions of full-time arable farmers on sustainable development, in view of sustainable farming practices. There is a gap in knowledge in this sector of agriculture, whereas most of the previous local studies focused on one area, such as water or pesticides. The aim of this study was to gain an overall view of farmers' perceptions on various aspects with regard agricultural sustainability on the Islands.

This study also gave the platform for farmers to voice their own opinions on various controversial topics, such as the use of pesticides and the high level of nitrates found in groundwater. Farmers also discussed past practices, some of which they still make use of, passed on from one generation of farmers to next. The farmers' attitudes and perceptions on the implementation of more sustainable agricultural practises were also targeted.

## **6.2 Main findings**

Using both inductive and deductive methods, this study opted to provide a clearer picture of the local farmers' attitudes and perceptions. It is evident that farmers are familiar with the concepts of sustainability, not necessary the word 'Sustainability' itself, but rather the concepts which form an integral part of sustainable agricultural practices. Through interviews, farmers integrated the social, economic and environmental aspects of their practice.

From this study, one may also conclude that farmers do practice some sustainable measures, which were usually passed from previous generations, such as crop-rotation, use of natural fertilisers and herbicides, the importance of upkeeping rubble walls, maintaining their soils' nutrients, etc.

Meanwhile, it was also evident that the majority of farmers feel that they cannot totally do away with using artificial chemicals, such as pesticides, pointing out the fact that lately they have been witnessing an increase in

invasive pests and diseases damaging their crops. While the interviewees agreed that the use of pesticides should be regulated, there are still a number of local farmers whose produce were found to exceed the regulated amount of pesticides to be used. This shows that there is still a lot of work to be done, as even though the majority of farmers themselves agree with regularisation of the use of such chemicals, individual cases are still damaging the reputation of the whole agricultural sector. This further justifies the need for farmers to embrace sustainable principles and work collectively. Sharing of good practices and ideas between conventional, organic and permaculture farmers, through ESD principles may help bridge the gap between these different farming communities.

In view of Malta's natural water resource, they do acknowledge that it is a scarce resource, pointing out the fact that in recent years most farmers are using more efficient water irrigation methods, such as drip-irrigation, which reduces water loss. They added on that farmers are not the only ones to blame. With an increasing number of buildings and impermeable surfaces, less surface areas are left for water to percolate through. New Water, having been lately introduced in new areas around the Islands, has great potential of helping reduce ground water extraction. Some of the farmers are still uncertain of using it, fearing that it will be of a detriment to the quality and taste of their produce. More distribution points are also needed. The future of the farming industry in Malta, according to the farmers is in a dire state, due to the decrease in the number of younger full-time farmers.

The mind map (Figure 6.1) represents the main findings of this study, which were outlined in detail in the Data Analysis chapter.

## **6.3 Recommendations**

Including all the possible stakeholders in this sector is integral to guarantee a whole systematic approach, be it through government agencies, individuals within the private sectors, environmental NGOs, farmers' organisations, the education sector, policy makers, consumers of agricultural products, Pitkali markets, etc. To achieve the goals of sustainable agriculture, a holistic approach needs to be taken by all the different stakeholders.

### **Government Agencies and Policy Makers**

- Encourage farmers to adopt more sustainable strategies by providing training courses catered for their needs.
- Subsidies should be used to encourage the adoption of such sustainable agricultural practices.
- Work on more water catchment projects and make such water directly available for farmers to use.
- Work on having a local laboratory for the testing of soils, water and crops, obtaining results within a few days.
- Use campaigns on the media to promote the sale of local, agricultural seasonal produce.
- Create leaflets/brochures with recipes using seasonal local produce and stress on the importance of supporting local farmers.
- Help subsidies a labelling, packaging and grading system of local produce.
- Help by using biodegradable packaging.

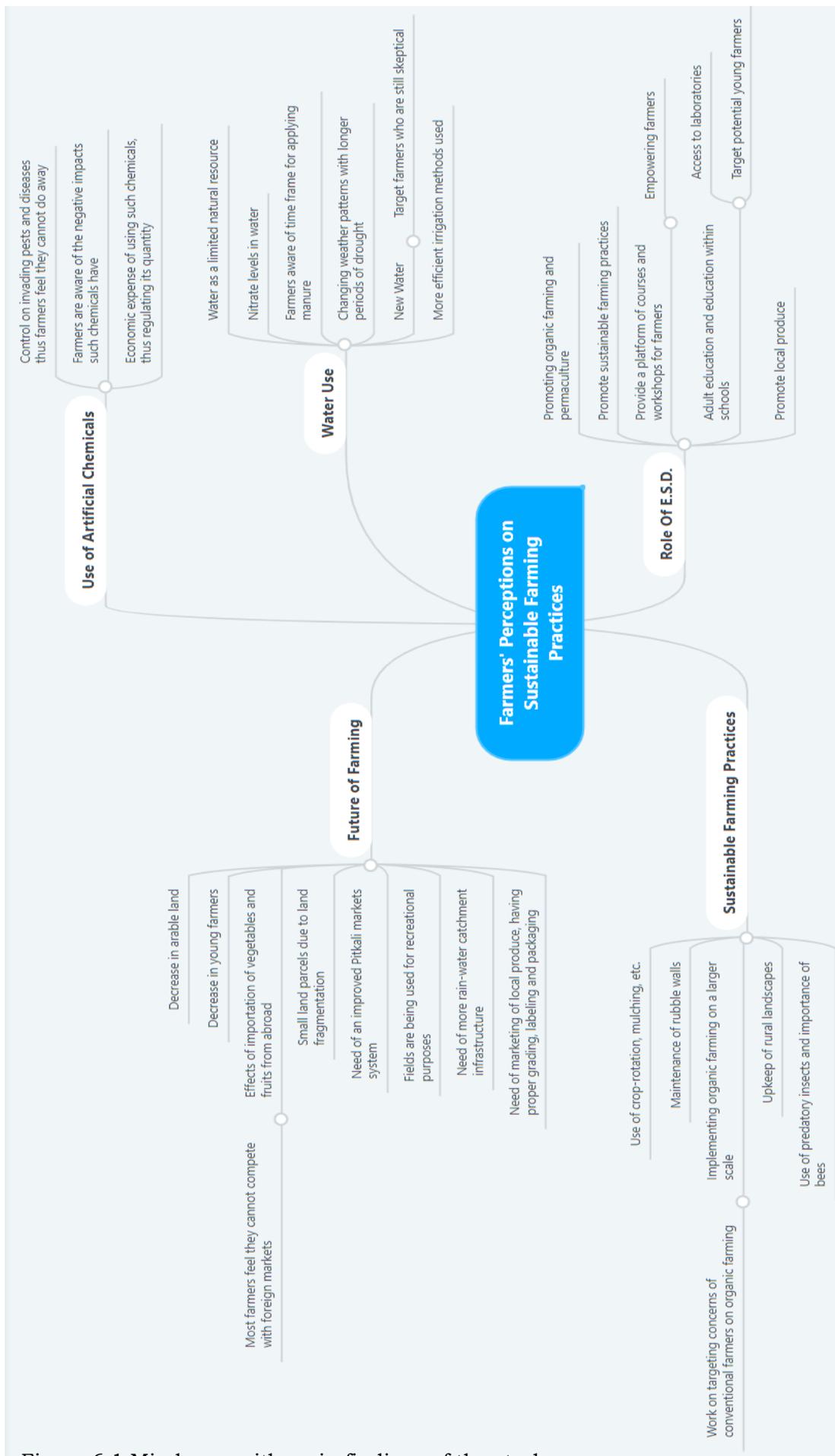


Figure 6.1 Mind map with main findings of the study.

- Publish short footage on local media, depicting the work of local farmers and how produce is grown, to raise awareness on the importance of farmers within our society.
- Work more on promoting organic practices on a larger scale on the Islands, for example by having designated areas for organic practices.
- Organise more frequent consultation meetings and encourage all farmers to attend such meetings.
- Organise more training courses on the proper and safe use of artificial chemicals, providing farmers with feasible alternatives.
- Help farmers apply for EU funds and help them fill up the necessary paper work, etc.
- Provide the right opportunities and encourage younger farmers to become farmers themselves.

### **Pitkali markets**

- Work more on traceability of produce.
- Create an online system through which farmers can access their own accounts and have same-day access on how much their produce was sold for.
- Work on a proper grading system and improve the packaging system of local produce.
- Work on labelling of produce, helping consumers trace their produce to a farmer, building up trust.

### **Private Sector: Private companies, Tourism industry**

- Work with local farmers to provide frozen products using local produce.
- Consider the possibility of using products which are otherwise thrown away at the Pitkali markets to produce packaged or canned products, reducing food waste.
- Supermarkets work more on offering local produce, having advertisement banners to promote the sale of local, fresh produce.

- Work on reducing the gap between the price given to farmers and the price of produce on the market.
- Work with the tourism industry to provide more opportunities for Agri-Tourism and Eco-Tourism within rural areas, promoting the conservation of such areas.

### **Environmental NGOs**

- Provide workshops for farmers to help promote more sustainable agricultural practices, such as by adopting, at least some, of the ideas behind organic and permaculture farming.
- Organise campaigns on promoting local produce, stressing out the benefits of buying local produce over imported produce.
- Provide a platform through which individual farmers can demonstrate and talk about his work with other members of society, such as consumers.
- Work on advertising local seasonal produce.
- Target different age groups through educational campaigns.
- Campaigns to promote the reduction of food waste.

### **Farmer's Organisations**

- Work more directly with government agencies and environmental NGOs.
- Encourage its members to attend courses and workshops.
- Organise workshops themselves to help promote more sustainable agricultural practices.
- Organise consultation meeting for farmers to seek means of targeting the problems within the agricultural sector, listening to the farmers' needs and collectively seek means of improving the situation.

### **Farmers Themselves**

- Be more open to incorporate new practices, some of which may replace unsustainable practices.

- Try to reduce, as much as possible the use of artificial chemicals and fertilisers, trying on new methods and approaches, used in organic and permaculture farming.
- Embrace new sustainable methods and work in changing other farmers' mindsets to also incorporate such methods.
- Work collectively towards improving the agricultural sector, being more open-minded on sharing sustainable ideas and practices with other farmers.
- Work as groups rather than as individuals, helping them have a stronger voice and empower one another, helping them bring about the much needed change.
- Community empowerment will help bring about the behavioural change which is needed to incorporate new sustainable practices.
- Be more open to work with NGOs and other organisations, participating in studies and workshops.

### **Education Sector**

- Promote the implementation of more ESD strategies by organising national cross-curricular activities which target sustainability.
- Promote agricultural courses within the Secondary and Tertiary level, such as Agribusiness as an option in Senior secondary schools and courses offered at MCAST within the Institute of Applied Sciences – Centre of Agriculture, Aquatics and Animal Sciences, helping promote younger generations to practice farming as a full-time job.
- Work more on educational programmes, such as EkoSkola to promote sustainable practices and even work on projects promoting school gardens where students can grow their own crops, such as the “We Eat Responsibly!” program.
- Provide a platform through which farmers are more open to school visits, showing students how they work and foster appreciation of locally grown produce, understanding the whole process of growing crops.

## **6.4 Areas for possible further studies**

Agriculture, being on the decline in the Maltese Islands should be studied even more, in order to seek means of guaranteeing a sustainable future. Such studies, recommended below, would help widen the perspective and gain a deeper insight on both sustainable and unsustainable farming practices on the Islands.

- Comparative studies between different regions on aspects such as use of pesticides, use of New Water, sustainable farming practices, etc;
- Case Studies on organic farms in Malta;
- Case Studies on permaculture farms in Malta;
- Comparative studies between organic and permaculture farms;
- Exploratory studies on how to best conduct farmers' training courses on sustainable practices;
- Use of focus groups to help engage consumers with farmers;
- Use of focus groups to help engage, organic, permaculture and conventional farmers, sharing sustainable farming measures practiced on their farms.

## **6.5 Limitations and Difficulties**

This study sought the views of 168 farmers who participated in the quantitative survey and 12 farmers who participated in the interviews. Although the sample is a representative sample of the registered full-time arable farmers as at 2018, obtained from JobsPlus, there were some limitations to this study. The opinions of part-time farmers were not sought and no pastoral farmers were included in the research, only those who either practiced arable farming or a mix of both.

When conducting and transcribing the interviews the native Maltese language was used. Most of the farmers spoke in dialect, and the transcriptions were also written down in dialect to help keep its character and authenticity. Translating the quotes used into English, was not always easy as some words used by the farmers, especially technical words in Maltese, were not easily translatable.

Collecting data was quite challenging, as farmers tend to be suspicious in their nature. The fact that the researcher, comes from a farming family herself and lives in a rural village, helped a lot. Knowing that the researcher was familiar to their methods, and has experiences, to a certain extent of the work entailed in the farming industry, farmers were more open and trusting. Some even added that they usually would avoid participating in such research, fearing that they will be judged, or that the data would be used against them. Coming from the farmers themselves, farmers are not so keen on sharing their practices with other farmers, as they are usually portrayed as competitors. Guaranteeing full confidentiality to the participants was of utmost importance to put their minds at ease.

One must mention that the farmers were very helpful in using the snowballing effect and referring the researcher to other farmers, talking to them before-hand. Farmers were not so easy to find in lots, with the researcher having to go to different localities around Malta and conducting the interviews face-to-face. One must also consider that the language used when communicating with the farmers had to be informal.

## **6.5 Conclusion**

ESD plays a crucial role in helping farmers adopt an open mindset, helping them integrate more sustainable farming strategies in their fields, guaranteeing not only better care of the environment but also, helping them improve their social and economic status. It was felt that farmers need empowerment, to help them feel acknowledged within society. Adult education which has ESD principles at its bases, when done well, using the right communication skills, language and atmosphere, will help yield more sustainable farming practices.

This research study has helped in shaping a clearer picture of the farming situation on the Maltese Islands. It has contributed ideas for policy makers to help target the difficulties faced by farmers and work on promoting more sustainable agricultural measures within the conventional farming community. The researcher hopes that this study will help improve, not only the agricultural sector, but also help bring about a move towards more sustainable practices and towards changing the mindsets of individual farmers who may still be sceptical about implementing such strategies. ESD principles may be the key to empower farmers, encouraging them to work collectively as one whole group and sharing their own sustainable practices within the community.

## References

- Alonge, A. J., & Martin, R. A. (1995). Assessment of the adoption of sustainable agriculture practices: Implications for agricultural education. *Journal of Agricultural Education*, 36 (3), 34-42. doi:10.5032/jae.1995.03034
- Ary, D., Jacobs, L. C., Razavieh, A., & Sorensen, C. (2006). *Introduction to Research in Education* (7th ed.). Belmont, USA: Thomson Wadsworth.
- Ary, D., Jacobs, L.C., Sorensen, C., & Razavieh, A. (2010). *Introduction to Research in Education* (8th ed.). Belmont, USA: Wadsworth, Cengage Learning.
- Azzopardi, A. (2002). *A New Geography of the Maltese Islands*. (2<sup>nd</sup> ed.). Valletta, Malta: St. Aloysius' College, Progress Press Co. Ltd.
- Bagheri, A. (2010). Potato farmers' perceptions of sustainable agriculture: the case of Ardabil province of Iran. *Procedia Social and Behavioural Sciences*, 5, 1977-1981. doi:10.1016/j.sbspro.2010.07.399
- Bell, J. (2005). *Doing your Research Project: A guide for first-time researchers in education, health and social science*. (4th ed.). Berkshire, England: Open Univeristy Press.
- Blaxter, L., Hughes, C., & Tight , M. (2001). *How to research* (2nd ed.). Buckingham, United Kingdom: Open University Press.
- Bowen, A., & Pallister, J. (2002). *Understanding GCSE Geography* (2<sup>nd</sup> ed.). Oxford, Great Britain: Heinemann Educational Publishers.
- Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. London, United Kingdom: SAGE publications.

- Brain, R., & Thomas, B. (2013). *Permaculture*. Department of Environment & Society. Utah State University. Extension Sustainability. Retrieved from [https://www.researchgate.net/publication/282575424\\_Permaculture](https://www.researchgate.net/publication/282575424_Permaculture)
- Carson, R. (1962). *Silent Spring*. London, England: Penguin Books in association with Hamish Hamilton.
- Caruana, C. (2015) in W. Leal Filho et al. (eds.) Civic Action for Sustainable Futures: What Role for Adult Environmental Education? *Intergrative Approaches to Sustainable Development at University Level*, World Sustainability Series. Pp. 663-674. doi:10.1007/978-3-319-10690-8\_45 Retrieved from <https://www.um.edu.mt/library/oar/handle/123456789/41926>
- Caruana, C. & Pace, P. (2018) in W. Leal Filho et al. (eds.). Local Agenda 21 Processes and Their Implications for SDGs. *Handbook of Lifelong Learning for Sustainable Development.*, World Sustainability Series, pp.293-305. doi:10.1007/978-3-319-63534-7\_20. Retrieved from <https://www.um.edu.mt/library/oar/handle/123456789/42230>
- Cauchi, C. (2015). *The Use of Treated Sewage Effluent for the Irrigation of Agriculture: An analysis about the attitudes and perceptions, of potential users of Tač-Ċumnija wastewater treatment plant*. (Faculty of Arts in part fulfilment of the requirements for the Degree of Bachelor of Arts (Honours) in Geography, Thesis). University of Malta.
- Clover, D. E. (2002). *Environmental Adult Education*. Retrieved from <http://journals.sagepub.com/doi/abs/10.1177/104515950201300201>
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). Oxon, United Kingdom: Routledge.

- Cortis, E. (2016). *Pesticide Use: Perceptions of Farmers in Northern Malta*. (Institute of Earth Systems of the University of Malta for the degree of Bachelor of Science (Hons) in Earth Systems, Thesis). University of Malta.
- Creswell, J. W. (2015). *A Concise Introduction to Mixed Methods Research*. London, United Kingdom: SAGE Publications Ltd.
- Creswell, J. W., & Plano Clark, V.L. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). London, United Kingdom: SAGE Publications.
- Doyle, L., Brady, A., & Byrne G. (2016). An overview of mixed methods research-revisited. *Journal of Research in Nursing*, 21 (8), 623-635. doi: 10.1177/1744987116674257
- Elliott, J.A. (2013). *An Introduction to Sustainable Development*. (4<sup>th</sup> ed.). Oxon, United Kingdom: Routledge.
- Engel, K. E., & Engel, P. H. (2012). Building resilient communities: where disaster management and facilitating innovation meet. In A. E. Wals, & P. B. Corcoran (Eds.), *Learning for Sustainability in times of accelerating change* (pp. 133-147). Wageningen, Netherlands: Wageningen Academic Publishers.
- ERA. (2011, March). *The Water Catchment Management Plan for the Maltese Islands*. Malta Environment and Planning Authority. Retrieved from [https://era.org.mt/en/Documents/1st%20WCMP\\_final.pdf](https://era.org.mt/en/Documents/1st%20WCMP_final.pdf)
- ERA. (n.d.) *The 2<sup>nd</sup> Water Catchment Management Plan for the Malta Catchment District 2015-2021*. Sustainable Energy and Water Conservation Unit. Environment and Resources Authority. Retrieved from [https://era.org.mt/en/Documents/2nd\\_Water\\_Catchment\\_Management\\_Plan-Malta\\_Water\\_in\\_Maltese\\_Islands.pdf](https://era.org.mt/en/Documents/2nd_Water_Catchment_Management_Plan-Malta_Water_in_Maltese_Islands.pdf)

- ERA. (2018). *State of the Environment Report 2018: Summary Report*. Retrieved from [https://era.org.mt/en/Documents/ERA%20-%20STATE%20OF%20THE%20ENV%20REPORT\\_V2.pdf](https://era.org.mt/en/Documents/ERA%20-%20STATE%20OF%20THE%20ENV%20REPORT_V2.pdf)
- EU. (2007). *Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) NO 2092/91*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32007R0834>
- EU. (2010). *The EU Nitrates Directive*. Retrieved from <http://ec.europa.eu/environment/pubs/pdf/factsheets/nitrates.pdf>
- EU. (2016, March). *CAP in your country: Malta*. Retrieved from [http://ec.europa.eu/agriculture/sites/agriculture/files/cap-in-your-country/pdf/mt\\_en.pdf](http://ec.europa.eu/agriculture/sites/agriculture/files/cap-in-your-country/pdf/mt_en.pdf)
- Eurostat. (2019). *Organic farming statistics*. Retrieved from [https://ec.europa.eu/eurostat/statistics-explained/index.php/Organic\\_farming\\_statistics#Total\\_organic\\_area](https://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics#Total_organic_area)
- FAO. (2014). *Building a common vision for sustainable food and agriculture: Principles and Approaches*. Rome, Italy: United Nations. Retrieved from <http://www.fao.org/3/a-i3940e.pdf>
- FAO. (2016a). *Food and Agriculture: Key to achieving the 2030 Agenda for Sustainable Development*. Food and Agricultural Organization of the United Nations. Retrieved from <http://www.fao.org/3/a-i5499e.pdf>
- FAO. (2016b). *Forests and climate change*. United Nations. Retrieved from <http://www.fao.org/3/a-i6374e.pdf>
- FAO. (2017). *Food and Agriculture: Driving action across the 2030 Agenda for Sustainable Development*. Food and Agriculture Organization of the United Nations. Sustainable Development Goals. Retrieved from <http://www.fao.org/3/a-i7454e.pdf>

- FAO. (2019). *Sustainable Development Goals: Sustainable Agriculture*. Retrieved from <http://www.fao.org/sustainable-development-goals/overview/fao-and-the-post-2015-development-agenda/sustainable-agriculture/en/>
- Fiorella, P. (2018, August 2). 11% of fruit and vegetables exceeded pesticide limits. *TVM News*. Retrieved from <https://www.tvm.com.mt/en/news/11-of-fruit-and-vegetables-exceeded-pesticide-limits/>
- Foley, J. (2014). A five-step plan to feed the world. *National Geographic*, 225 (5), 26-57.
- Folger, C. (2014). The Next Green Revolution. *National Geographic*, 226 (4), 32-55.
- Freitas, M. R., Matias, S. V., Macedo, R. L., Freitas, M. P., & Venturin, N. (2015). Nonformal environmental education: A case study with farmers in a town of the South Minas Gerais state, Brazil. *Chinese Journal of Population Resources and Environment*, 14(4), 324-331. doi:10.1080/10042857.2015.1078491
- Gadotti, M. (2009). Eco-pedagogy: extending the educational theory of Paulo Freire to sustainability. In P. B. Corcoran, & P. M. Osano (Eds.), *Young people, education and sustainable development: Exploring principles, perspectives, and praxis* (pp. 107-112). Wageningen, Netherlands: Wageningen Academic Publishers.
- Galdies , C., Said, A., Camilleri, L., & Caruana , M. (2016). Climate change trends in Malta and related beliefs, concerns and attitudes toward adaptation among Gozitan farmers. *European Journal of Agronomy: A gobal agronomy journal*, 74, 18-28. doi:<http://dx.doi.org/10.1016.j.eja.2015.11.011>
- Gay, L.R., Mills, G.E., & Airasia, P. (2009). *Educational Research. Competencies for Analysis and Applications* (9th ed.). London, United Kingdom: Pearson Education Ltd.

- GIZ. (2015). *What is sustainable agriculture?* Bonn and Eschborn, Germany : GIZ .
- Gold, M. V. (1999, Sept). *Sustainable Agriculture: Definitions and Terms*. Alternative Farming Systems. USDA. Retrieved from <https://books.google.com.mt/books?id=zwAUAAAAYAAJ&printsec=frontcover&dq=Sustainable+Agriculture:+Definitions+and+Terms+WithMary+V.+Gold&hl=en&sa=X&ved=0ahUKEwjci7j92pzmAhXRYcAKHaHKBvgQ6AEIOzAC#v=onepage&q&f=false>
- Grech, L. (2016). *Assessing Gozitan Farmers' Perceptions of Using Treated Sewage Effluent for Irrigation*. (Institute of Earth Systems of the University of Malta for the degree of Bachelor of Science (Hons) in Earth Systems, Dissertation). University of Malta.
- Grima, S. (2018). *An Ethnographic Perspective on Organic Farming in Malta*. ( B.A. (Hons.) Anthropological Sciences, Thesis). University of Malta.
- Grover, S., & Gruver, J. (2017). 'Slow to change': Farmers' perceptions of place-based barriers to sustainable agriculture. *Renewable Agriculture and Food Systems*, 32 (6); 511-523. doi:10.1017/S1742170516000442
- Harris, D. R., & Fuller, D. Q. (2014). Agriculture: Definition and Overview. In C. Smith (Ed.). *Encyclopaedia of Global Archaeology* (pp.104-113). New York, USA: Springer.
- Holmgren, D. (2013). *Essence of Permaculture. A summary of permaculture concepts and principles taken from 'Permaculture Principles & Pathways Beyond Sustainability'*. Retrieved from [https://files.holmgren.com.au/downloads/Essence\\_of\\_Pc\\_EN.pdf?\\_ga=2.90579865.260078247.1573055391-1845031271.1573055391](https://files.holmgren.com.au/downloads/Essence_of_Pc_EN.pdf?_ga=2.90579865.260078247.1573055391-1845031271.1573055391)

- Hudson, D. (2019, August 13). Malta imposes immediate ban on pesticide flagged by European Food Safety Authority. *MaltaToday*. Retrieved from [https://www.maltatoday.com.mt/news/national/96862/malta\\_imposes\\_immediate\\_ban\\_on\\_pesticide\\_flagged\\_by\\_european\\_food\\_safety\\_authority#.XdLtdVdKhPY](https://www.maltatoday.com.mt/news/national/96862/malta_imposes_immediate_ban_on_pesticide_flagged_by_european_food_safety_authority#.XdLtdVdKhPY)
- International Standard Classification of Occupations: ISCO-08. International Labour Organization (2012). *Volume 1: Structure, Group Definitions and Correspondance Tables*. Geneva. Retrieved from [https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms\\_172572.pdf](https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_172572.pdf)
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A research paradigm whose time has come. *Educational Research*, 33(7), 14-26.
- Kagan, N. (Ed.). (2006). *Concise history of the world: An illustrated time line*. Washington, U.S.A: National Geographic Society.
- Kolbert, E. (2011). Enter the age of man. *National Geographic*, 219 (3), 60-85.
- Kunzig, R. (2014). Carnivore's Dilemma. *National Geographic*, 226 (5), 108-135.
- Lehman, H., Clark, A., & Weise, S. F. (1993). Clarifying the Definition of Sustainable Agriculture. *Journal of Agricultural and Environmental Ethics*, 6 (2), 127-143.
- Leifeld, J. (2012). How sustainable is organic farming? *Agriculture, Ecosystems and Environment*, 150, 121-122. doi:10.1016/j.agee.2012.01.020
- Lichtman, M. (2006). *Qualitative Research in Education: A User's Guide*. London, United Kingdom: Sage Publications.

- Lincoln, Y.S., Lynham, S.A., & Guba, E.G. (2011). In Denzin, N.K. & Lincoln, Y.S. (Eds.). *The SAGE handbook of Qualitative Research*. London, United Kingdom: SAGE Publications Ltd.
- Local Subsidiary Legislation 427.93. (2018). *Organic Production and Labelling of Organic Products Regulations*. 12<sup>th</sup> January 2018. Retrieved from <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=12785&l=1>
- Martin, I. (2017, February 8). 13% of fruit and veg had excessive pesticides. *Times of Malta*. Retrieved from <http://www.timesofmalta.com/articles/view/20170208/local/13-of-fruit-and-veg-had-excessive-pesticides.638967>
- Martin, I. (2018, May 7). Excessive pesticide levels land 15 farmers in court. *Times of Malta*. Retrieved from <https://timesofmalta.com/articles/view/15-farmers-in-court-over-excessive-pesticide-levels.678447>
- Martin, I. (2018, July 31). Maltese fruit and veg top EU pesticides list. *Times of Malta*. Retrieved from <https://timesofmalta.com/articles/view/maltese-fruit-and-veg-top-eu-pesticides-list.685527>
- Martin, I. (2019, July 10). Overuse of pesticides 'less alarming than thought': Tweaked testing methods bring with them a sigh of relief. *Times of Malta*. Retrieved from <https://timesofmalta.com/articles/view/overuse-of-pesticides-less-alarming-than-thought.720637>
- Mason, J. (2003). *Sustainable Agriculture*. (2<sup>nd</sup> ed.). Victoria, Australia: Landlinks.
- Mazoyer, M., & Roudart, L. (2006). *A History of World Agriculture: From the Neolithic Age to the Current Crisis*. New York, USA: Monthly Review Press.

- MCCAA (2019). *Malta's National Action Plan for the Sustainable Use of Pesticides 2019-2023*. Retrieved from <https://mccaa.org.mt/media/3667/nap-for-the-sustainable-use-of-pesticides-2019-2023-for-malta.pdf>
- McKnight, T. L., & Hess, D. (2008). *Physical Geography: A landscape appreciation* (9<sup>th</sup> ed.). Upper Saddle River, NJ: Pearson Education.
- Mengshoel, A. M. (2012). Mixed methods research- So far easier said than done? *Manual Therapy*, 17, 373-375. doi:10.1016/j.math.2012.02.006
- MEPA. (2012). *The Environment Report Indicators 2010-2011*. Floriana, Malta: Malta Environment & Planning Authority.
- Merill. (n.d.). Retrieved from <http://merill.com.mt/tomna>
- Merriam, S. B. (2009). *Qualitative Research: A guide to design and implementation*. San Francisco, California: John Wiley & Sons.
- Mifsud, M. C. (2014). *Environmental Science: A Maltese Perspective*. Luqa, Malta: Miller Distributors Ltd.
- Ministry for Rural Affairs and the Environment. (n.d.). *Malta fact file: Agriculture, food, fisheries*. Retrieved from <http://cap.europe.bg/upload/docs/2012-05/loadfile.ashx.pdf>
- Mizzi, D. (2012). *Permaculture and Conventional Agriculture: A Comparative Analysis*. (Bachelor of Arts Degree in Geography, Honours, Thesis). University of Malta.
- MOAM. (2018). *Mission of MOAM*. Retrieved from <http://moammalta.com/mission>
- NAP. (2018a). *Agricultural Policy for the Maltese Islands: 2018-2028*. Parliamentary Secretary for Agriculture, Fisheries and Animal Rights. Retrieved from [https://agriculture.gov.mt/en/agricultural\\_directorate/Documents/nationalAgriculturalPolicy/napFinal.pdf](https://agriculture.gov.mt/en/agricultural_directorate/Documents/nationalAgriculturalPolicy/napFinal.pdf)

- NAP. (2018b). *National Agricultural Policy for the Maltese Islands: 2018-2028 Public Consultation Paper*. Parliamentary Secretary for Agriculture, Fisheries and Animal Rights. Retrieved from [https://meae.gov.mt/en/Public\\_Consultations/MSDEC/Documents/An%20Overview%20of%20National%20Agricultural%20Policy%20for%20the%20Maltese%20Islands%202018%20%E2%80%93%202028.pdf](https://meae.gov.mt/en/Public_Consultations/MSDEC/Documents/An%20Overview%20of%20National%20Agricultural%20Policy%20for%20the%20Maltese%20Islands%202018%20%E2%80%93%202028.pdf)
- National Geographic. (2019). *Agriculture*. Retrieved from <https://www.nationalgeographic.org/encyclopedia/agriculture/educator/>
- Neuman, W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches* (6th ed.). Boston, USA: Pearson International Edition.
- Newby, P. (2014). *Research Methods for Education* (2nd ed.). Oxon, United Kingdom: Routledge.
- Nitrates Action Programme. (2011). *Nitrates Action Programme Malta*. Malta: Government of Malta. Retrieved from <https://agriculture.gov.mt/en/agric/Documents/Nitrates%20Action%20Programme.pdf>
- NSO. (2012). *Census of Agriculture 2010*. Valletta, Malta: National Statistics Office.
- NSO. (2016). *Agriculture and Fisheries 2014*. Valletta, Malta: National Statistics Office. Retrieved from [https://nso.gov.mt/en/publicatons/Publications\\_by\\_Unit/Documents/B3\\_Environment\\_Energy\\_Transport\\_Agriculture\\_Statistics/Agriculture\\_and\\_Fisheries\\_2014.pdf](https://nso.gov.mt/en/publicatons/Publications_by_Unit/Documents/B3_Environment_Energy_Transport_Agriculture_Statistics/Agriculture_and_Fisheries_2014.pdf)
- NSO. (2017). *Regional Statistics Malta: 2017 Edition*. Valletta, Malta: National Statistics Office. Retrieved from [https://nso.gov.mt/en/publicatons/Publications\\_by\\_Unit/Documents/02\\_Regional\\_Statistics\\_\(Gozo\\_Office\)/Regional%20Statistics%20MALTA%202017%20Edition.pdf](https://nso.gov.mt/en/publicatons/Publications_by_Unit/Documents/02_Regional_Statistics_(Gozo_Office)/Regional%20Statistics%20MALTA%202017%20Edition.pdf)

- NSO. (2019). *World Food Day 2019*. National Statistics Office. Retrieved from <https://www.facebook.com/nsomalta/photos/a.534468443313001/2469193869840439/?type=3&theater>
- Onwuegbuzie, A. J., & Collins, K. M. (2007). A Typology of Mixed Methods Sampling Designs in Social Science Research. *The Qualitative Report*, 12(2), 281-316.
- Pace, P. (2007). Empowering citizens through education for sustainable development. In P.G. Xuereb (Ed.), *Business ethics and religious values in the European Union and Malta – for a moral level playing field. Civil Society Project Report 2007* (pp.209-220). Malta: The European Documentation & Research Centre, University of Malta.
- Palmer, J. A. (1998). *Environmental education in the 21<sup>st</sup> century: Theory, practice, progress and promise*. London, England: Routledge.
- Park, C. (2001). *The Environment: Principles and Applications* (2<sup>nd</sup> ed.). London, United Kingdom: Taylor & Francis Group.
- Permaculture Malta. (2016). Retrieved from <http://permaculturemalta.org/bahrija-oasis/>
- Pinter, L. (2007). A strategic approach to influencing agricultural policy and practice through measurement. In F. J. Hani, L. Pinter, & H. R. Herren (Eds.), *Sustainable Agriculture: From Common Principles to Common Practice* (pp. 19-24). Manitoba, Canada: International Institute for Sustainable Development and Swiss College of Agriculture.
- Rainelli, P. (1989). Intensive animal husbandry and management of animal manure. In Organisation for Economic Co-Operation and Development. *Agricultural and Environmental Policies: Opportunities for integration*. Paris, France: OCDE.

- Rauscher, L., & Greenfield, B. H. (2009). Advancements in Contemporary Physical Therapy Research: Use of Mixed Methods Design. *Physical Therapy*, 89 (1), 91-100.
- Richards, D. (1985). *An illustrated history of modern Europe: 1789-1984* (7<sup>th</sup> ed.). Essex, England: Longman Group Ltd.
- Royte, E. (2016). Waste not, want not. *National Geographic*, 229 (3), 30-55.
- Scherer, L.A., Verburg, P.H., & Schulp, C.J.E. (2018). Opportunities for sustainable intensification in European Agriculture. *Global Environmental Change*, 48, 43-55. doi: <https://doi.org/10.1016/j.gloenvcha.2017.11.009>
- Siebert, C. (2011). Food Ark. *National Geographic*, 220 (1), 108-131.
- Silverman, D. (2014). *Interpreting Qualitative Data*. London, United Kingdom: SAGE Publications Ltd.
- Somerville, C., Cohen, M., Pantanella, E., Stankus, A., & Lovatelli, A. (2014). Small-scale aquaponic food production: Integrated fish and plant farming. *FAO, Fisheries and Aquaculture Technical Paper*. 589. Food and Agricultural Organization of the United Nations, Rome, Italy. Retrieved from <http://www.fao.org/3/a-i4021e.pdf>
- Stapp, W.B, et al. (1969). The concept of environmental education. *The Journal of Environmental Education*, 1 (1), 33-36. Washington, DC: Heldref Publications.
- Strahler, A., & Strahler, A. (2005). *Physical Geography: Science and system of the human environment* (3<sup>rd</sup> ed.). Hoboken, N.J.: John Wiley & Sons, Inc.
- Strauss, A., & Corbin, J. (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (3<sup>rd</sup> ed.). London, United Kingdom: Sage Publications, Inc.

- Tashakkori, A., & Teddlie, C. (2010). Putting the human back in “Human Research Methodology”: The Researcher in Mixed Methods Research. *Journal of Mixed Methods Research*, 4 (4). 271-277. doi: 10.1177/1558689810382532.
- Tathdil, F.F., Boz, I., & Tatlidil H. (2008). Farmers’ perception of sustainable agriculture and its determinants: A case study in Kahramanmaraş province of Turkey. *Environment, Development and Sustainability*, 11, 1091–1106. doi:10.1007/s10668-008-9168-x
- UN. (1972). *Report of the United Nations conference on the human environment*. Geneva, Switzerland: UN Publication.
- UN. (2002). *Report of the world summit on sustainable development. Johannesburg, South Africa, 26 August – 4 September 2002*. New York: United Nations.
- UN. (2015a). *Transforming our world: the 2030 Agenda for Sustainable Development; General Assembly*. United Nations. Retrieved from [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)
- UN. (2015b). *The Millenium Development Goals Report 2015*. New York. Retrieved from [https://www.un.org/millenniumgoals/2015\\_MDG\\_Report/pdf/MDG%202015%20rev%20\(July%201\).pdf](https://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf)
- UN. (2016). *Sustainable development goals: 17 goals to transform our world; The sustainable development agenda*. United Nations. Retrieved from <http://www.un.org/sustainabledevelopment/development-agenda/>
- UNCED. (1992). *The United Nations conference on environment & development: a guide to Agenda 21*. Geneva, Switzerland: UN Publications office.

- UNESCO. (1975). *The Belgrade charter: A global framework for environmental education*. Paris, France: UNESCO/UNEP. Retrieved from <http://unesdoc.unesco.org/images/0001/000177/017772eb.pdf>
- UNESCO. (1997). 6a Adult environmental education: awareness and environmental action. In UNESCO, *A series of 29 booklets documenting workshops held at the Fifth International Conference on Adult Education* (pp. 273-286). Hamburg, Germany: UNESCO Institute for Education. Retrieved from <http://unesdoc.unesco.org/images/0011/001159/115957eo.pdf>
- UNESCO. (2017). *UNESCO Global Action Programme on Education for Sustainable Development: Information folder*. Retrieved from <https://pdfs.semanticscholar.org/a78f/b29890a996b14c68e4855403c688c42c4d3d.pdf>
- UNESCO-UNEP. (1977). *The Tbilisi declaration: Intergovernmental conference on environmental education, October 14-26, 1977*. Paris, France: UNESCO. Retrieved from <http://resources.spaces3.com/a30712b7-da01-43c2-9ff0-b66e85b8c428.pdf>
- UNISA. (2015). *Principles and Theories of Adult Education Tutorial Letter 501/3/2015*. Department of Adult Basic Education and Youth Development, UNISA. Retrieved from <http://unesdoc.unesco.org/images/0024/002451/245104E.pdf>
- Uri, N. D. (1999). *Agriculture and the Environment*. New York, USA: Nova Science Publishers, Inc.
- Vella, R. M. (2015). *Gozitan farmers: Sustainable agricultural practices with regards to soil erosion* (Bachelor of Science (Hons.) in Earth Systems, Thesis). University of Malta.
- Vella, S. (2010). *Sustainable Agricultural management and landscaping through agroforestry and permaculture. Case study: Northern Malta*

(Degree of Master of Science in Sustainable Environmental Resource Management/Master of Science in Integrated Science & Technology, Thesis). University of Malta- James Madison University.

Viault, B. S. (1990). *Modern European History*. New York, USA: McGraw-Hill, Inc.

Ward, F. A. (2014). Economic Impacts on irrigated agriculture of water conservation programs in drought. In *Journal of Hydrology*, 508, 114-127. doi: <http://dx.doi.org/10.1016/j.jhydrol.2013.10.024>

WasteServ Malta Limited. (n.d.). *Organic Waste Collection... the start of a new chapter in Malta's waste collection*. Retrieved from <https://www.wasteservmalta.com/organic>

Waugh, D. (2002). *Geography: An integrated approach* (3<sup>rd</sup> ed.). Cheltenham, United Kingdom: Nelson Thornes.

WCED. (1987). *Report of the world commission on environment and development: Our common future*. World Commission on Environment and Development. Oxford, England: Oxford University Press.

Whitehead, D., & Schneider, Z. (2013). Mixed- methods research, Chapter 14. In Schneider, Z., Whitehead, D., LoBiondo-Wood, G., & Haber, J. (Eds.), *Nursing & Midwifery Research: Methods and appraisal for evidence-based practice* (4<sup>th</sup> ed. pp. 263-284). Sydney, Australia: Elsevier. Retrieved from [https://www.researchgate.net/publication/255950311\\_Mixed-methods\\_research](https://www.researchgate.net/publication/255950311_Mixed-methods_research)

WSC. (n.d.) *New Water*. Water Services Corporation. Retrieved from <http://www.wsc.com.mt/information/new-water/>

# Appendix A – Information Letter English and Maltese

## INFORMATION LETTER FOR PARTICIPANTS

### **Maltese full-time, arable farmers' perceptions on sustainable development.**

My name is Jessica Zahra and currently I am following a course which will lead to a Masters degree, specialising in Education for Sustainable Development, at the University of Malta, under the supervision of Dr. M. Mifsud.

In my research I am going to investigate full-time arable farmers in the Maltese Islands. The main aims of this research are:

- to gather farmer's knowledge on agricultural practices,
- analyse farmers' opinions and attitudes in view of sustainable development,
- seek farmers' opinion on how the agricultural industry can be improved.

I would like to invite you to take part in my study. If you agree to participate this will involve filling in a questionnaire. The information that is going to be gathered during the questionnaire is totally anonymous and no names will be written on the questionnaire. I guarantee that you will remain completely anonymous. You may omit some questions or choose not to return it to me. The questionnaires will be handed as a hard copy, and collected by me. If you would like, I can also come to read and fill in the questionnaire on your behalf. The questionnaire will take around 10 minutes to complete.

Filling in this questionnaire, will be taken as a consent to participate in this survey.

Should you be interested in helping me further with my research, I would also like to interview a total of 10 farmers, to further delve into detail and seek in depth information on the local farming issues. If you agree to be interviewed, the interview will take around an hour and, with your consent, will be audio recorded. The interview will be carried out at a time and a place which is convenient for you. If you would like to participate in this interview, please complete the attached consent form. To hand in the consent form, please contact me and we will arrange a place and time to be collected.

You have every right to withdraw from the interview at any time during the research period, without incurring any negative consequences. If this happens, any information gathered from you will be immediately destroyed. Audio recorded data will be anonymised and stored safely on a password protected hard drive.

If you have any further questions or would like to clarify any details, please do not hesitate to contact me on (*email*) or (*mobile number*). If you wish to contact my supervisor, please do so by sending an email.

Yours sincerely,

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Ms. Jessica Zahra

*Student Researcher*

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Dr. Mark. C. Mifsud

*Supervisor*

## ITTRA TA' INFORMAZZJONI GHALL-PARTEĊIPANTI

### Il-Perċezzjoni tal-bdiewa Maltin *full-time*, fuq l-Iżvilupp Sostenibbli.

Jiena Jessica Zahra u bħalissa qed insegwi kors li jwassal għall-grad ta' *Masters* bi speċjalizzazzjoni fl-Edukazzjoni għal Żvilupp Sostenibbli, fl-Università ta' Malta taħt it-tmexxija ta' Dr M. Mifsud.

Fir-riċerka tiegħi se ninvestiga l-bdiewa Maltin li jaħdmu fuq bażi *full-time*. L-għanijiet prinċipali ta' din ir-riċerka huma:

- li niġbor kemm jista' jkun informazzjoni dwar prattiċi ta' biedja differenti,
- li nanalizza l-opinjoni u l-attitudni tal-bdiewa fil-Gżejjer Maltin rigward prattiċi ta' biedja aktar sostenibbli,
- li niġbor l-opinjoni tal-bdiewa fuq x'inhom l-aħjar strateġija biex insaħħu din l-industrija.

Jiena nixtieq nistieden biex tipparteċipa f'dan l-istudju. Jekk tiddeċiedi li tipparteċipa, inti għentiment mitlub li timla kwestjonarju. L-informazzjoni li ser tingabar mill-kwestjonarju hija kollha anonima u l-ebda isem mhu ser jinkiteb fuq il-kwestjonarju. Jiena niggarantixxi li inti ser tibqa' anonimu. Inti tista' taqbeż xi mistoqsijiet jew ma tirritornahx. Il-kwestjonarju ser jinghata fuq karta, u jingabar minni stess. Jekk tkun trid, jien nista' niġi naqralek il-mistoqsijiet u nimliehom. Il-kwestjonarju jdum madwar 10 minuti biex ikun lest.

Billi timla l-kwestjonarju, dan ser ikun il-kunsens tiegħek li tiegħu sehem f'dan l-istudju.

Jekk tkun interessat li tgħinni aktar fir-riċerka tiegħi, jien nixtieq li nintervista madwar 10 bdiewa, biex b'hekk inkun nista' nidhol aktar fid-dettall fuq problemi u żviluppi f'din l-industrija. Jekk taqbel li tiġi intervistat, l-intervista ser tiegħu madwar siegħa, u bil-kunsens tiegħek, din ser tiġi rrekordjata. L-intervista tista' ssir f'post u hin li huwa konvenjenti għalik. Jekk tixtieq li tipparteċipa f'din l-intervista, jekk jogħġbok imla l-formola tal-kunsens mehmuża ma' din il-karta. Biex niġbor din il-formola, nitolbok tikkuntattjani u niftiehm u biex niġi niġbor il-karta.

Inti għandek kull dritt li tirtira minn din ir-riċerka fi kwalunkwe hin matul il-perjodu tar-riċerka, mingħajr ma jkollok ebda konsegwenza negattiva. Jekk jiġri hekk, l-informazzjoni miġbura mingħandek tiġi meqruda immedjatement. Dak li ser ikun irrekordjat, ser ikun anonim u miżmum go *hard drive* sigura bil-*password*.

Jekk għandek aktar mistoqsijiet jew trid tiċċara xi punti, jekk jogħġbok ikkuntattjani fuq (*imejl*) jew (*numru ta' telefon*). Jekk tixtieq li tikkuntattja lis-*Supervisor* tiegħi, jekk jogħġbok ibgħat ittra elettronika.

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Is-Sinjura Jessica Zahra

*Studenta Riċerkatriċi*

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Dr Mark C. Mifsud

*Is-Supervisor*

# Appendix B- Questionnaire English and Maltese

## Questionnaire

Maltese full-time, arable farmers' perceptions on sustainable development.

1. Gender

Male		Female	
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2. Age group

18-23		24-29		30-35	
36-41		42-47		48-53	
54-59		60-65		65+	

3. Level of Education

Primary		Secondary		Tertiary	
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4. Farmer's home location \_\_\_\_\_

5. Locality of fields \_\_\_\_\_

6. How long have you been working as a full-time farmer? \_\_\_\_\_

7. Tick the correct column

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
• I understand what sustainable farming practices are. (Sustainable means that farmers safeguard the environment whilst guaranteeing a good livelihood and quality produce).					
• I understand what unsustainable farming practices are. (Unsustainable means that making a good profit and producing fruits/vegetables, comes at the cost of the environment).					
• I am aware that water is a limited resource in the Maltese Islands.					
• I am aware of the negative impacts pesticides leave on our environment and local habitats.					
• I am aware that artificial fertilisers can have a negative impact on the environment					
• I am aware of the time frame when I should spread manure on fields.					
• I am aware of the effects of excessive use of manure on the quality of underground water.					
• I believe that the sale of agricultural land to land developers is not a threat to the farming industry in Malta					
• All farmers should regulate the use of pesticides to guarantee well-being of the natural environment and consumers.					
• There is a bad image of local produce containing excessive amounts of pesticides and fertilisers.					
• Organic farming should be widely practiced on the Maltese islands.					
• Consumers prefer organic produce over inorganic.					
• Consumers prefer local produce over foreign produce.					

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
• Local produce is of a much better quality than foreign imported produce.					
• Consumers should be encouraged to buy local produce.					
• The importation of fruits and vegetables from the European Union has impacted us negatively					
• Foreign competition has encouraged local farmers to invest more in this industry					
• I already use more natural methods to minimize the use of artificial pesticides and fertilisers.					
• I use crop-rotation (newba) as a means of sustaining nutrients in soil over a long period of time.					
• I believe that farmers can do away with pesticides and artificial fertilisers.					
• I believe there are other solutions to control diseases, pests and weeds in the fields.					
• I believe that commercial farming has led to unsustainable farming within the last years.					
• I try to reduce soil erosion by maintaining rubble walls and consider weather conditions before ploughing fields.					
• I have considered changing my job because of the working conditions.					
• The younger generation needs to be encouraged to take on farming as a full-time job.					
• Agricultural courses should be highly advertised to encourage the younger generations to take on farming.					
• The general public are well aware of all the hard work farming entails.					
• I believe that farmers are well respected within our society.					

Other comments and thoughts:

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Thank you for your time!

## Kwestjonarju

### II-perċezzjoni tal-bdiewa *full-time* Maltin fuq l-iżvilupp sostenibbli

1. Sess

Raġel		Mara	
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2. Età

18-23		24-29		30-35	
36-41		42-47		48-53	
54-59		60-65		65+	

3. Livell ta' edukazzjoni

Primarja		Sekondarja		Terzjarja	
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4. Lokalità fejn tgħix \_\_\_\_\_

5. Lokalità tal-għelieqi \_\_\_\_\_

6. Kemm ilek taħdem bħala bidwi *full-time*? \_\_\_\_\_

7. Aghżel il-kolonna t-tajba.

	Ma naqbel xejn	Ma naqbilx	Newtrali	Naqbel	Naqbel ħafna
• Jien nifhem x'inhuma l-prattiċi ta' biedja sostenibbli (Biedja sostenibbli tfisser li l-bdiewa jħarsu l-ambjent filwaqt li jggarantixxu livell ta' għajxien aħjar u prodott ta' kwalità tajba.)					
• Jien nifhem x'inhuma l-prattiċi ta' biedja insostenibbli. (Insostenibbli tfisser li l-importanza tingħata lill-profit u l-produzzjoni għad-detrimment tal-ambjent.)					
• Jien konxju li l-ilma fil-Gżejjer Maltin huwa riżorsa limitata.					
• Jien konxju tal-impatti ħżiena fuq l-ambjent u l-abitat lokali minħabba l-użu tal-pestiċidi.					
• Jien konxju li l-fertilizzant artifiċjali jista' jhalli impatt ħażin fuq l-ambjent.					
• Jien konxju miż-żmien li fih irrid nifrex id-demel fl-għelieqi.					
• Jien konxju mill-effetti li l-użu eċċessiv ta' demel iħalli fuq l-ilma tal-pjan.					
• Jien nemmen li l-bejgħ ta' art agrikola lil żviluppaturi tal-art mhijiex ta' theddida għall-industrija tal-biedja f' Malta.					
• Il-bdiewa kollha għandhom jirregolaw l-użu tal-pestiċidi biex niggarantixxu l-ħarsien tal-ambjent u tal-konsumatur.					
• Hemm stampa ħażina fuq il-prodott lokali li fih ammonti eċċessivi ta' pestiċidi u fertilizzanti oħra.					
• Il-biedja organika għandha tibda tiġi pprattikata aktar madwar il-Gżejjer Maltin.					
• Il-konsumaturi jippreferu prodott organiku milli dak li mhux.					
• Il-konsumaturi jippreferu prodott lokali milli dak ta' barra.					

	Ma naqbel xejn	Ma naqbilx	Newtrali	Naqbel	Naqbel ħafna
• Il-prodott lokali huwa ta' kwalità ħafna aħjar minn dak li jiġi impurtat.					
• Il-konsumaturi għandhom jiġu mħeġġa jixtru prodott agrikolu lokali.					
• L-importazzjoni ta' frott u ħaxix mill-Unjoni Ewropea kellha impatt negattiv fuqna.					
• Il-kompetizzjoni minn barra ħeġġet lill-bdiewa lokali biex jinvestu f'din l-industrija.					
• Jien ikkunsidrajt li nibdel dan ix-xogħol minħabba l-kundizzjonijiet tax-xogħol.					
• Jiena diġà nuża metodi naturali biex innaqqas l-użu tal-pestiċidi u fertilizzanti artifiċjali.					
• Jiena nuża n-newba biex inżomm in-nutrijenti meħtieġa fil-ħamrija fuq perjodu twil ta' żmien.					
• Jiena nemmen li l-bdiewa jistgħu jjeqfu jagħmlu użu minn pestiċidi u fertilizzanti artifiċjali.					
• Jiena nemmen li hemm metodi oħra kif tista' tikkontrolla l-mard, insetti u ħaxix ħażin.					
• Jiena nemmen li l-biedja kummerċjali wasslet biex ikun hawn biedja insostenibbli fl-aħħar snin.					
• Jiena nipprova nnaqqas it-telf tal-ħamrija billi nieħu ħsieb il-ħitan tas-sejjeħ u nikkonsidra l-elementi tat-temp qabel naħrat l-għalqa.					
• Il-ġenerazzjonijiet iżgħar għandhom jiġu mħeġġa jidhlu fil-biedja bħala xogħol <i>full-time</i> .					
• Korsijiet tal-agrikoltura għandhom jiġu rreklamati biex il-ġenerazzjonijiet iżgħar jiġu aktar imħeġġa.					
• Il-pubbliku huwa konxju tax-xogħol iebes marbut mal-biedja.					
• Jiena nemmen li l-bdiewa huma rrispettati fis-soċjetà tagħna.					

Kummenti u ħsibijiet oħra:

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Grazzi tal-ħin tiegħek!

# Appendix C – Consent Forms English and Maltese

## CONSENT FORM FOR PARTICIPATION IN INTERVIEW

### Maltese full-time, arable farmers' perceptions on sustainable development.

I have read the information provided about the above mentioned study and have had the opportunity to ask questions.

I agree to take part in an audio recorded interview for the purpose of this study.

I understand that:

- My participation is voluntary and that I may withdraw from the study at any time without incurring any negative consequences.
- All the information I provide will be anonymised and I will not be identified in the study nor will the locality I come from be included.
- The audio recorded data will be anonymised immediately and will be safely stored on a password protected hard drive.
- Ms. Jessica Zahra will select 10 interview participants and I might not be selected.

I agree to provide the following information to enable Ms. Zahra to select interview participants according to age and locality.

Age group:

18-23		24-29		30-35	
36-41		42-47		48-53	
54-59		60-65		65+	

Locality where I live: \_\_\_\_\_

I agree to take part in the study under the above conditions and acknowledge that my participation in this interview is entirely voluntary.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Contact number

\_\_\_\_\_  
Ms. Jessica Zahra  
*Student Researcher*

\_\_\_\_\_  
Dr. Mark. C. Mifsud  
*Supervisor*

## FORMOLA TA' KUNSENS GHALL-PARTEĊIPAZZJONI FL-INTERVISTA

### Il-Perċezzjoni tal-bdiewa Maltin *full-time*, fuq l-Iżvilupp Sostenibbli.

Jiena qrajt l-informazzjoni kollha pprovduta dwar dan l-istudju u kelli l-opportunità li nistaqsi mistoqsijiet.

Jiena naqbel li niehu sehem fl-intervista li ser tiġi rrekordjata, għall-fini ta' dan l-istudju.

Jiena nifhem li:

- Il-parteċipazzjoni tiegħi hija waħda volontarja u jiena nista' noħroġ minn dan l-istudju mingħajr ma jkollli l-ebda konsegwenzi negattivi.
- Kull informazzjoni li ser nagħti ser tkun anonima, u jien ma nistax niġi identifikat, la mill-isem u lanqas mil-lokalità.
- Fl-intervista rrekordjata, il-vuċi ser tinbidel biex b'hekk hadd ma jingħaraf mil-lehen, u ser tkun miżmuma go *hard drive* sigura bil-*password*.
- Is-sinjura Jessica Zahra ser tagħzel 10 parteċipanti għall-intervista u jiena nista' ma niġix magħżul/a.

Jiena naqbel li nipprovi din l-informazzjoni biex b'hekk is-sinjura Zahra tkun tista' tagħzel il-parteċipanti skont l-età u l-lokalità.

Età:

18-23		24-29		30-35	
36-41		42-47		48-53	
54-59		60-65		65+	

Lokalità fejn ngħix: \_\_\_\_\_

Jiena naqbel li niehu sehem f'dan l-istudju taht il-kundizzjonijiet imsemmija hawn fuq u nifhem li l-parteċipazzjoni tiegħi hija volontarja.

\_\_\_\_\_  
Isem

\_\_\_\_\_  
Firma

\_\_\_\_\_  
Data

\_\_\_\_\_  
Numru ta' kuntatt

\_\_\_\_\_  
Is-Sinjura Jessica Zahra

\_\_\_\_\_  
Dr Mark C. Mifsud

*Studenta Riċerkatriċi*

*Is-Supervisor*

# **Appendix D - Interview Questions in English and Maltese**

## **Interview**

### **Maltese full-time, arable farmers' perceptions on sustainable development.**

1. For how long have you been working as a farmer?
2. What encouraged you to become a farmer?
3. What does your work consist of?
4. Do you believe that farming has an impact on the environment? In what ways? Both positive and negative.
5. How can we reduce the negative impacts on the environment due to commercial farming?
6. Do you know of any traditional farming practices which were used in the past and are no longer used nowadays?
7. Do you do any eco-friendly measures to use as much natural methods as possible instead of using pesticides and artificial fertilisers?
8. Do you believe that new water (sewage treatment plants) is the solution for Malta's water shortage?
9. How can farmers safeguard water and reduce its loss?
10. Are you willing to change your practices to become more sustainable? How?
11. What do you think of local produce as compared to imported produce?
12. What are the threats to the farming industry nowadays?
13. What do you think is the future of farming in Malta?

Thank you for your time!

## Intervista

### II-Percezzjoni tal-bdiewa *full-time* Maltin fuq l-iżvilupp sostenibbli.

1. Kemm ilek taħdem bħala bidwi?
2. X'ħajrek biex issir bidwi?
3. Kif tispjegali x-xogħol tiegħek?
4. Temmen li l-biedja għandha impatt fuq l-ambjent? B'liema mod? Kemm pożittiv u negattiv.
5. Kif nistgħu nnaqqsu l-impatti negattivi tal-biedja kummerċjali fuq l-ambjent?
6. Taf b'xi metodi ta' biedja tradizzjonali li kienu jintużaw fil-passat u li nqatgħu illum –il ġurnata?
7. Tipprattika biedja favur l-ambjent billi tuża xi metodi naturali biex tnaqqas l-użu ta pestiċidi u fertilizzanti artifiċjali?
8. Taħseb li l-ilma mnaddaf tad-drenagg' hija s-soluzzjoni għannuqqas tal-ilma f'Malta?
9. Kif jistgħu l-bdiewa jnaqqsu l-ħela tal-ilma u jibz'għu aktar għalih?
10. Inti lest li tiddel il-prattiċi tiegħek biex tipprattika biedja aktar sostenibbli (tħares aktar l-ambjent)? Kif?
11. X'taħseb mill-prodott lokali mqabbel ma' prodott impurtat?
12. X'inhil t-theddida għall-industrija tal-biedja illum –il ġurnata?
13. X'taħseb li huwa l-futur tal-biedja f'Malta?

Grazzi tal-ħin tiegħek.

# **Appendix E - Abstract accepted in peer reviewed conference**

## **Moving towards sustainable agriculture through higher education.**

Jessica Zahra

Mark Mifsud

### Abstract

Farming is an integral part of sustainability. The agricultural products farmers grow help to maintain an ever increasing world population. Nonetheless, over the past years, farmers may have adopted some unsustainable practices, which helped increase their yield and guaranteed better income. But at what cost?

This paper presents a local analysis of farming and sustainability in Malta by gathering farmers' knowledge of their agricultural practices through their life experiences. Additionally, through university outreach it tries to understand farmers' perceptions on sustainable development and to seek the most viable means of moving towards more sustainable agricultural practices. A special emphasis is given to explore the farmers' attitudes in view of sustainable development, whether they are willing to implement sustainable strategies and the role of universities in achieving this.

Through the research findings, a number of recommendations are suggested to aid farming practices become more sustainable. The results from this research and the university outreach activities will also help policy makers in the agricultural sector to seek the best means to collaborate with farmers and to give them the opportunity to voice their opinions and to help in the designing of a training programme for farmers.

This paper will be useful to anyone interested in how university research can be successfully applied to increase the sustainability of farming across communities.

## **Accepted abstract 53 - Moving towards sustainable agriculture through higher education**

Dear Colleague,

Thank you for your abstract submitted to WSSD-U-2020, which seems fine. Please make sure the aspects of university, sustainability and society are outlined in the paper, as well as any specific elements which may be of interest to an international audience and which could be replicated.

If you have any questions, please let us know.

Many thanks.

Regards,

Walter Leal & Mihaela Sima

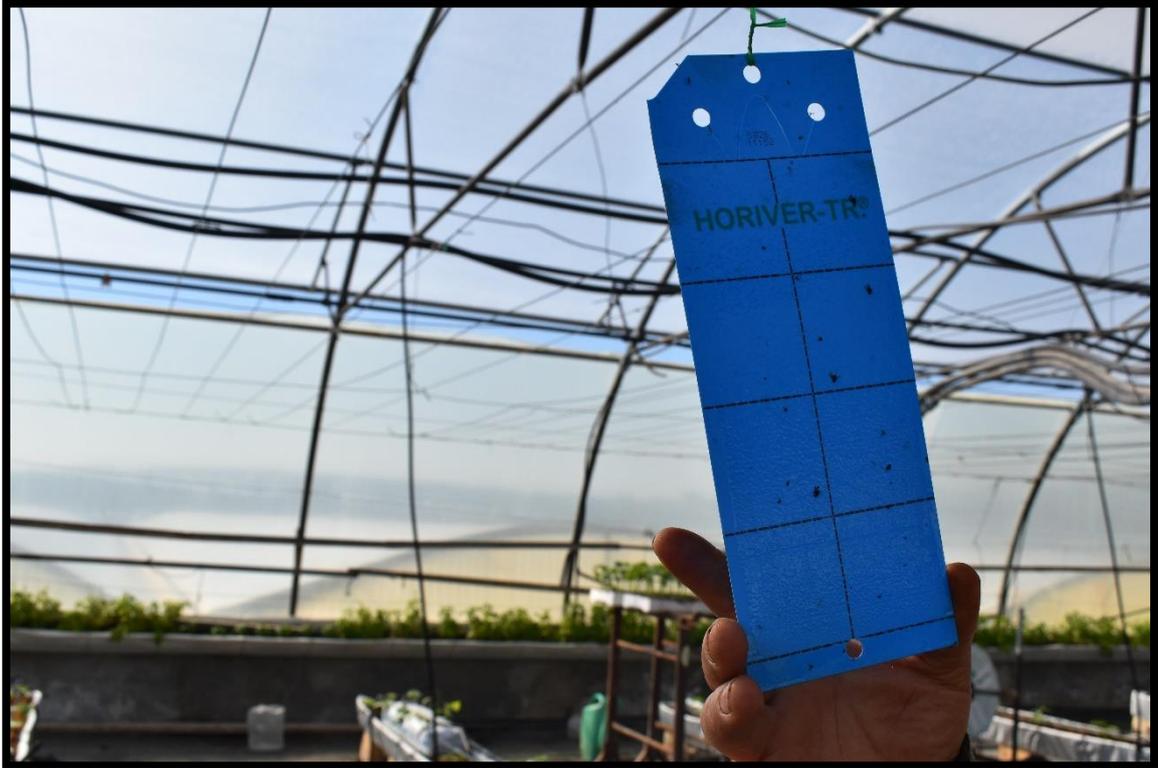
## Appendix F: Photos taken



The use of imported bees in a greenhouse for tomato production.



An example of an insect trap used inside a greenhouse.



Another example of an insect trap used inside a greenhouse. It helps farmers identify which pests need to be targeted.



A greenhouse used for the production of merrows.



The use of plastic mulch and small 'greenhouse' structures used for the production of strawberries.



A recently ploughed field in preparation for sowing.



The use of sulphur by both organic and conventional farmers.



The use of sprinkler irrigation especially in the production of potatoes.



A hydroponics system used for the production of lettuce.



Lettuce and herbs grown through a hydroponics system.