

**Managing Agricultural Challenges in Malta with Permaculture: A Sustainable
Solution**

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Abstract

This study aims to explore the integration of permaculture principles within the Maltese agricultural sector, opposed by the current challenges of soil degradation, water scarcity and an aging agricultural population. It aims to weigh in how permaculture can provide practical strategies to foster a resilient and sustainable future for Maltese agriculture, providing advice for policy makers. The research revolves around three main challenges: water scarcity, soil degradation and the consequences due to an aging agricultural community.

A qualitative research methodology approach is applied, using thematic analysis of existing literature and policies, such as Malta's CAP Strategic Plan and National Funding Schemes, to gather information. Such approach allows for a critical assessment of how permaculture principles align with national policies and the potential for their implementation. Overall results show that permaculture offers significant potential to address Malta's agricultural challenges, including improving soil health, optimizing water use and promoting biodiversity. In particular, the analysis suggests that permaculture aligns well with Malta's environmental sustainability goals. However, there are economic and social barriers to its widespread adoption, such as the transition cost for small farmers and the need for stronger political support.

The study concludes that the integration of permaculture into Malta's agricultural policies can significantly improve the sustainability of the sector. However, it highlights the need for targeted government incentives and more research to adapt permaculture practices to Malta's socio-economic conditions. The implications suggest that while permaculture is promising, successful implementation will require a coordinated political effort and continued support for local farmers.

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Chapter 1- Introduction

Section 1.1: Introduction

Malta's agriculture industry faces many difficulties that seriously hinder environmental resilience and sustainable development. Poor soil quality, scarce water supplies, and an ageing farmer population obscured from education and experience are amongst the major problems in Malta (Galdies & Vella, 2019; Holmgren, 2012). The questions here arise: how are we to address these complex concerns to sustain a resilient and sustainable agricultural future in Malta? Various authors prefer to flirt with the idea of permaculture, arguing for the self-sufficiency of consumers within the agricultural sphere. (Rodriguez et al. 2009; Holmgren, 2012)

Nonetheless, Permaculture is further than self-sufficiency as it heartens a comprehensive framework that weights on ecosystem services, biodiversity conservation, and resource efficiency, making it a practical alternative to traditional agricultural approaches (Hirschfeld & Van Acker, 2021). Malta's agriculture sector has the potential to counter environmental disruptions and build a sustainable future by integrating permaculture techniques. The advantages of permaculture, such as enhanced soil health, water conservation, and increased ecosystem resilience, are becoming more broadly accredited despite the tough environmental conditions in Malta, which include dry climates, a shortage of land, and an ageing farming population (Hirschfeld & Van Acker, 2021).

This mounting interest underlines the importance of exploring and determining the practical use of permaculture in Malta's agricultural sector. Innovative land management and agriculture approaches, such as permaculture, can invigorate Malta's abandoned agricultural fields, leading the way for a more sustainable and ecologically responsible food system.

This dissertation attempts to deliver policymakers, practitioners, and stakeholders with beneficial insights and recommendations for the future of Malta's farming sector by examining the challenges and opportunities in the island's agricultural sector.

Exploring the challenges of soil deterioration, water scarcity, and an ageing farming population in Malta, underwrites to the greater discourse on environmental resilience and sustainable agriculture. Henceforth, the study offers a wide-ranging retort to the sector's existing problems whilst guaranteeing a balance between a sustainable future and a smooth transition that leaves no one behind.

Section 1.2: Motivation

The drive for highlighting the challenges and mitigation efforts in Malta's agriculture industry stems from a blend of personal curiosity and the realisation of a serious social need. The author's motivation sprang from the recent protests across the EU-27 by farmers, who protested against the European policymakers in Brussels for failing to bond the same level of standards and principles of the Green Deal in their current Free Trade Agreements. (Dupraz,2020; CNN,2024; Times of Malta,2024). Consequently, not only corroding the competitiveness of European farmers vis-a-vis foreign farmers, but also disheartening in certain occasions for European farmers to lower their expenses to such levels. It is to the author's understanding, that the European Union (EU) unfortunately depends heavily on Free Trade Agreements, which drives the desire towards witnessing permaculture, particularly its core principle of self-sufficiency, be integrated more and more within the sector to avoid similar strains.

Furthermore, such demonstrations flag a wider concern in the agriculture sector, which includes biodiversity loss and climate change. To address the farming community's concerns and shape long-term solutions for agriculture's future, one must first understand the root causes and impacts of these demonstrations. This, therefore, has also caused in a demand for various types of innovative agricultural management approaches, inspiring the exploration into permaculture's potential as a remedy to

Malta's agricultural problems. Furthermore, the relevance of tackling environmental degradation and fostering sustainable food systems on a global scale strengthens the significance of this study endeavour. Consequently, this study not only makes an intellectual contribution, but also reflects a personal commitment to advancing sustainable agriculture and ecological resilience in Malta and beyond.

Section 1.3: Scope of Study

Throughout the course of writing this thesis, the author always retained the intention of exploring possible integration of permaculture principles to Malta's agricultural sector. Such exploration would address the key challenges in the Maltese scenario; the limitation in water resources, an aging farmer population as well as the poor conditions of soil in Malta. With the use of a comprehensive desk-based research, this study intends to commit to an analysis of existing literature, policy frameworks and practical applications. Eventually it intends to offer insights and recommendations for forthcoming readers to develop a sustainable and resilient agriculture environment in Malta. The findings of the analysis of this study intend to serve as an important foundation for future researchers on permaculture in Malta, with the focus of countering the aforementioned challenges.

Section 1.4: Research Question

Granting that there is an increasing concern and understanding of the challenges of Malta's agricultural sector, a gap in literature re-surfaces when it comes to exploiting permaculture principles as a solution. To this effect, throughout the dissertation the main research question, questions the integration of permaculture and its principles within Malta's agricultural sector for the potentiality of a more sustainable and resilient industry.

The dissertation shall respond to the following research question: "How would the integration of permaculture principles into Maltese agricultural policies and practices improve environmental sustainability, resource efficiency and socio-economic

sustainability in the face of local challenges?” Hence, the dissertation aims to deliver a range of policy recommendations that would be based of the analysis. In the author’s pursuit to responding this research question, the thesis shall inadvertently be touching with three conventional challenges, to ensure a concentrated effort in the analysis. These are limited water resource, the aging population of farmers as well as the degradation of soil quality.

Section 1.5: Methodology

The Methodological approach of this study is considered to be qualitative in nature. The researcher considers this study to mirror the viewpoints of Astalin’s definition of qualitative research as it is deemed flexible in emerging a holistic account that enlightens the researcher’s understanding of a phenomenon, as described in the previous section within the research question. Furthermore, the qualitative approach this dissertation receipts, outlines the work of Merriam & Tisdell (2015) who encircle around many qualitative subjects. However, this dissertation requires a Case Study supported by the data collection tool of thematical analysis by desk-based research. Such approach is considered by Merriam and Tisdell (2015) as a structured framework of research as it is established through an analysis of literature that classifies the key themes or concepts pertinent to the research question which puts focus on Malta’s agricultural sector.

Essentially, the same authors label desk-based research as a tool that comprises the assortment and analysis of prevailing data within documents from several sources such as academic articles, reports, polices and case studies. Such method allows the researcher to appreciate the subject without the inevitability of analysing primary data collection. Primary data in this case is a challenging tentative given that permaculture as seen within this dissertation, is an emerging concept within the local agricultural scenario. Therefore, by offering a synthesis of information from various documents, the study could unveil any patterns, trends or gaps in the current understanding of the research question.

Section 1.6: Significance of Study

In itself this study is significant as it conveys the potential to rightly fill in the gap of existing literature concerning the usage of permaculture principles as a sustainable solution to the challenges facing Malta's Agricultural Sector. The researcher is of the belief that few studies have rightly explored how permaculture may tackle the challenges of soil degradation, water scarcity and aging farmer population. Various similar studies abroad such as Hirschfeld & Van Acker's (2021) and Didarali & Gambiza's (2019) have indeed demonstrated the ecological social and economic benefits of permaculture when developing resilient ecosystems.

However, this study extends these findings to the specific case of Malta, underscoring the potential of permaculture as a solution to mitigate environmental vulnerabilities and thus, support agriculture. An additional contribution of this study is the wider comprehension, found in the studies of Boix-Fayos & de Vente (2023) and Vela Almeida et al.(2023), on how alternative agricultural practices could address global challenges as described within the European Green Deal and the Farm to Fork Strategy. The concluding recommendations found within the study benefit policymakers, practitioners and stakeholders in the Maltese Agricultural sector as well the global efforts in preserving sustainable environments.

Section 1.6 Thesis Outline

This thesis is designed into five chapters, each exploring different facets of the research topic. The subsequent is a thorough overview of the chapters:

Chapter One acquaints the research problem by describing the main challenges fronting Malta's agricultural sector, including soil degradation, water scarcity, and an aging farming population. This chapter founds the significance of permaculture as a viable solution to these issues and voices the study's purposes and research question, thereby arranging the groundwork for the following chapters.

Chapter Two offers a comprehensive literature review, guiding on the principles of permaculture, the challenges agriculture, and relevant policy frameworks, such as the

Common Agricultural Policy (CAP) and the European Green Deal. This chapter critically assesses existing research, classifies gaps in the literature, and highlights the need of investigating the potential of permaculture within the Maltese context.

Chapter Three shares the research methodology, engaging a qualitative approach complemented by desk-based research. It explains on the foundation for opting this methodology, details the data collection method, and validates the use of secondary data for thematic analysis. Additionally, this chapter defines the analytical techniques used to respond the research questions effectively.

Chapter Four exhibits the findings resulting from the thematic analysis, organized around key themes such as sustainability, resource efficiency, and policy integration. This chapter debates the potential of permaculture to mitigate Malta's agricultural challenges and assesses the alignment of permaculture practices with both national and EU policies.

Chapter Five settles the research by shortening the key findings and presenting recommendations for policymakers. It also recognises the limitations of the dissertation and suggests areas for future research, accenting the wider implications of permaculture for advancing sustainable agriculture in Malta.

Chapter 2- Literature Review

Section 2.1: Introduction

“The time is ripe to forge a new consensus on food and farming among farmers, rural communities and all other actors on the EU agri-food chain.” These were the words that echoed in the European Parliament in Ursula Von Der Leyen's State of the Union speech in 2023. Whereas innovation in the sector remains of imperative, what is being done to tackle the existing challenges that the industry is met with? This literature review revolves around three challenges of Malta's agricultural sector and the potential solutions by integrating permaculture principles and applicable policy frameworks. The resilience and sustainability of agriculture in Malta can be better understood when examining the literature on soil degradation, water scarcity and aging farmer

population. (Galdies & Vella, 2019). Indeed, research displays that one of the key issues in Europe has been soil degradation, heightened by its salinity and compaction levels, which impact productivity further when met with water scarcity problems (Short, 1997; Hallett, 2017). Additionally, the reluctance of younger generations to get involved in farming due to further opportunities in other sectors, further obscures the future of agriculture in Malta (Agius, 1992; Schoenherr, 2022).

Permaculture principles, inspired by Russell Smith's influential book "Tree Crops: A Permanent Agriculture," offer a sustainable approach prioritizing perennial plants, soil stabilization, and food production (Smith, 1929). Further developing Smith's work, Holmgren's principles provide a comprehensive framework for creating resilient agricultural systems through agroecological design, enhancing ecological balance, reducing reliance on external inputs, and supporting local biodiversity (Holmgren, 2012; Reiff & Bach, 2018).

Nonetheless briefing on the European Green Deal, its related strategies, such as the Farm to Fork strategy, Biodiversity strategy, and Soil strategy 2030, is key to evaluate their ability to promote sustainable farming practices in Malta (Boix-Fayos & de Vente, 2023; Vela Almeida et al., 2023).

Reiff & Bach (2018) have sustained that Holmgren's (2012) permaculture principles direct researchers towards a comprehensive framework that forms various agricultural strategies which enhance ecological stability and diminishes dependence on external inputs to biodiversity.

This literature review will thus explore the impacts of the European Green Deal and similar strategies through the lenses of authors such as Boix-Fayos & de Vente (2023) and Vela Almeida et al (2023).

It is through the blend of these fresh perspectives, that this review intends to deliver an understanding of the current state of Malta's agricultural sector, the possibility of merging permaculture principles and the role of policy frameworks shaping its future.

Section 2.2: Challenges faced by Malta's Agricultural Sector.

Section 2.2.1: Soil Degradation

The following lines pinpoint the challenge of soil degradation in Maltese agriculture, highlighting studies by Sultana (2017) and Zdruli and Trisorio Liuzzi (2004) to reveal the nature of such challenges that deter sustainable agriculture. The various forms of soil degradation as articulated within this research, depicts various consequences for agricultural production in Malta. This chapter therefore values the right soil management measures to expand the wellbeing of Maltese agriculture, touching on a range of factors such as soil compatibility, salinity and acidity levels, and temperature varieties amongst others.

The quality of soil in Malta and Gozo over the last decade as defined by Sultana (2017) is quite degraded, with only half of the areas showing high soil fertility. This imbalance, as also discussed by Trisorio Liuzzi (2004), reduces agricultural productivity by disturbing root growth and water infiltration. It is added that, urbanization and land use issues further aggravate this degradation. The topology of land area was another factor of concern that negatively affects agricultural productivity. Sultana (2017) rightly reported a decrease in soil salinity in many areas, probably due to local training programmes such as the Nitrate Action Programme. However, Zdruli and Trisorio Liuzzi (2004) are of the belief that persistent salt problems, especially in deep soils, subdued plant growth. Nonetheless, Sultana (2017) noted, an increase in soil organic carbon in more than half of the sites, which improved soil quality and fertility. This study is consistent with Zdruli and Trisorio Liuzzi (2004) who stressed on the preservation preserving soil biodiversity through activities such as terrace planting and dry-stone maintenance.

Despite all this, Sultana (2017) noted changes in pH and soil moisture. A significant section of the evaluated areas registered increased acidity and increased soil moisture on more than half of the evaluated areas. Zdruli and Trisorio Liuzzi (2004) emphasize that due to the semi-arid climate of Malta, promoting soil conservation practices that maintain adequate soil moisture levels is essential. Another standpoint provided by Zdruli and Trisorio Liuzzi (2004) shows that soil erosion in a country happens when agricultural harvests decline or when there is natural phenomenon such as floods or landslides. Restoring back certain environments due to these factors is said to be costly for farmers.

Therefore, the urgent need for integrated soil management practices is a prevalent notion in both studies. Such practices should consider combining soil compaction, salinity, pH changes and moisture fluctuations with modern soil management and soil improvement techniques. As described later on, Permaculture principles that promote soil health and ecosystem harmony can offer these practical solutions. In essence, Practices such as crop rotation, organic amendments and the use of salt-tolerant plant species can improve soil structure and productivity.

Soil degradation was also explored by Agius (2012), who considered carbon dioxide variations in Maltese soils over a 15-year period, and Vella (2010) who explored sustainable agricultural management in northern Malta. These studies also provide relevant data, but this time on the long-term changes in soil health and the potential benefits of incorporating sustainable practices into agriculture. The results of both studies point to an urgent need for integrated soil management procedures.

Section 2.2.2: Water Scarcity

The over spoken problem of water scarcity in Malta is another interesting avenue to explore through the lenses of Hartfiel (2020), Spiteri et al. (2015) and Papadimitriou et al. (2019). Malta, a water-intensive European state, is confronted by both the quantity and quality of its water resources. Whilst historically dependent on natural resources and rainwater, the growing population, industrialisation and growth in tourism sector are now exceeding their demands, demanding new and sustainable solutions to safeguard water accessibility both domestically and in agriculture. Malta's water scarcity is an alarming issue and great importance is given to the country's water resources. As one of the most water-challenged states in Europe, Malta's challenges range from worries about water scarcity to water resources such as groundwater being depleted due to over-extraction and or infusion with saltwater (Hartfiel, 2020; Papadimitriou et al., 2019). Historically, Malta has relied on natural resources and rainwater for harvesting. However, population growth relies groundwater, leading to pollution and the need to use sea water filtration facilities such as the reverse osmosis (Hartfiel, 2020).

Other factors which strain water resources in Malta are the low annual rainfall and population density. In essence, groundwater extraction surpasses 11 million cubic meters per year, making the remaining water discouraging to use, particularly in agriculture, given the high salinity and nitrate levels found within (Spiteri et al., 2015;; Viola et al.,2014; Aparicio et al.,2019; Papadimitriou et al., 2019 Hartfiel, 2020;)

Despite the efforts in reducing water wastage and improving some infrastructures, the costs on high energy and the reliance on imported resources pose economic challenges (Hartfiel, 2020). To resolve these problems, researchers argue that there should be an expansion in water treatment facilities as well as a coordinated infrastructure to collect rainwater. Indeed, there exist technologies and facilities for the treatment of wastewater for agricultural use, however despite this water quality improvement resources are limited to the whole population(Hartfiel, 2020; Spiteri et al., 2015).

Consequently, infrastructure investments and policy incentives are required to encourage alternative uses (Hartfiel, 2020). Sustainable water production may be increased by increasing investments in renewable energy resources such as wind and solar energy as it reduces the dependence on imported resources (Hartfiel, 2020; Papadimitriou et al., 2019). This comes also with the propagation of public awareness on water scarcity and implementing long-term affective water management practices, including the monitoring of groundwater from illegal extractions and promoting water conservation practices (Hartfiel, 2020; Spiteri et al., 2015).

The socio-economic position of farmers in the face of water scarcity problems, pits them heavily reliant on limited and often nitrate-contaminated groundwater. Statistically, the island lacks surface water such as lakes or rivers and its renewable water resources are among the lowest in the European Union, at one hundred eighty-eight cubic meters per inhabitant, far below the European Union average of four to five thousand cubic meters (Eurostat, 2024). Reverse Osmosis facilities are crucial but energy-intensive and population limited. Once again stated, addressing these challenges requires strict regulation of groundwater extraction, investment in wastewater treatment and reuse, and the promotion of sustainable agricultural practices to ensure water availability and quality for future generations (Eurostat, 2024).

In conclusion, to tackle the challenges water scarcity brings along, researchers agree that Malta requires a holistic and innovative approach, combining technological advancements, policy measures that disregard one-size fits all policy approached and address the Member States' sensitivities, and public awareness. By addressing both quantity and quality issues, Malta can move towards sustainable water management, ensuring the resilience of its agricultural sector and overall sustainability (Hartfiel, 2020; Spiteri et al., 2015; Papadimitriou et al., 2019).

Section 2.2.3: Aging Farmer Population

Another prevalent challenge the Maltese agriculture is facing according to research conducted by Agius (1992) and Schoenherr (2022), is that the population of farmers within the sector is ever ageing. This review therefore provides an overview of this issue and its consequences on agriculture. By addressing the shortage of full-time farmers, economic constraints, market restrictions and labour issues, this section highlights the urgent need for realistic measures and innovative solutions to expand Maltese agriculture and attract generations of young farmers.

Firstly, Agius (1992) provides a historical perspective on the decline of the agricultural workforce in Malta by explaining the transition from full-time to part-time farming. The shift has been due to various social, economic and psychological factors. Young people are becoming more and more interested in non-agricultural work opportunities that offer better wages with better work conditions instead that of manual labour. Therefore, farming is often regarded and portrayed as a tedious occupation, which continues to discourage youths. Agius (1992) also argue that this shift is ever increasing given that there have been considerate technological agricultural machinery advancements and thus, have reduced labour poverty and enabled low-invested farmers to manage the land more efficiently. Although this mechanization increased productivity, it also reduced the number of full-time workers as fewer workers were needed to maintain agricultural operations.

Schoenherr (2022) on the other hand, explained that high costs and low access to land are a major drawback to youths wanting to invest in agriculture. Within the author's blog, Cane Vella, a young Maltese farmer, describes the difficulty of obtaining

property without family land given the low wages and lack of funding for farming. This situation repelling agriculture opportunities to the young, and thus, an aging population is putting a strain on agriculture. Vella continues that the current system requires urgent reform to sustain the Maltese agricultural sector, as these the systemic problems faced by young farmers would lead farmers to start farming businesses only with a significant financial support or a family legacy.

In his blog Vella also brought to attention, the huge price difference between organic and commercial vegetables and fruits, which averts consumers from buying organic products. This economic disparity deters farmers to adopt sustainable practices, as the general public cannot afford organic farming. The lack of clear labelling in supermarkets heightens the problem and makes it impossible for consumers to identify and support local products. Lack of such market awareness hampers efforts to promote local agriculture and sustainable farming practices.

The shortage of agricultural workers is another major drawback presented by Schoenherr (2022). Vella says the current support systems are flawed and would rather incentivise agricultural equipment rather than meeting the real needs of farmers in manual labour. This detach would therefore indicate a problem with the system in agricultural support that needs to be addressed. Effective support systems should focus on providing the resources and infrastructure needed to meet the specific needs of farmers rather than offering blanket solutions.

Both Agius (1992) and Schoenherr (2022) highlight the need for comprehensive policy reforms to address such issues. Non- Governmental Organisations such as Friends of the Earth Malta, as defined by Schoenherr (2022), support projects such as Vella's Biome Munch and highlight the need for public policy and public support to address these issues. In essence, ensuring access to land, fair prices and adequate labour support are essential to sustaining agriculture in Malta and encouraging youth participation in farming. By addressing these critical issues, Malta can work towards a strong and sustainable agricultural sector.

In conclusion, it can be said that the ageing of the farming population in Malta is a complex problem that requires a multi-faceted approach. Considering the views of Agius (1992) and Schoenherr (2022), it is clear that addressing social attitudes, economic barriers, market constraints and labour issues are essential to revitalize

Maltese agriculture. Comprehensive policy reforms, policy support mechanisms and increased public awareness are important steps towards a sustainable and stable agricultural sector in Malta.

Section 2.3: Permaculture Principles

The idea of holding 'permanent agriculture', long associated with crop practices, is attributed to Russell Smith in his famous book *Tree Crops: A Permanent Agriculture*. (Smith 1929). Technically speaking, the term 'permaculture' emerged later on in the mid-1970s when Mollison and Holmgren applied Smith's approach of using trees to stabilise the landscape, increasing trees that produce food, and bolstering food supply strategies. At first glance, "virtual farming" was a concept of sustainable agriculture, but as permaculture developed, it spread to other areas of human life, and practitioners saw it as a sustainable practice (Mollison 1988). Holmgren's principles (2012) provide a powerful holistic framework for designing sustainable agricultural systems.

Each of these concepts is analysed scientifically in depth in Reiff and Bach's 2018 study, "Scientific Evidence Supporting the Principles of Permaculture: An Annotated Collection," in which both surveyed permaculture experts. Here is a synthesis of these principles in the eyes of Reiff and Bach (2018).

1. **Observe and Interact:** Permaculture prioritises the principle to observe and interact with the subject in order to expand in-depth knowledge not only theoretically but also the practicality regarding the given environment. Observing the nature of a particular environment and how it works and reacts involves gathering information through periods of time. This method also involves a process of learning to observe and making the most appropriate decisions, leading to the strategic planning of sustainable practices that best suit the characteristics of that environment. This is the process by which agricultural practitioners try to grow the suitable environmentally friendly and sustainable crops within their land.

2. **Capture and store energy:** Their second principle focuses on the energy conservation from various natural sources such as sun, water, wind, living biomass and waste within an environment for as long as possible to be used when necessary. The main resources comprise of fertile soils, perennial agro-ecosystems and water.

Moreover, implementing techniques like organic farming would expand water storage within the soil, crop yields and soil fertility. Rainwater harvesting and planting trees or shrubs are another to energy conservation, environmental conveniences and climate change mitigation.

3. **Productivity:** An agricultural system should produce enough to provide people with food, energy and resources. This principle also requires a good understanding of production, taking into account economic, environmental and social dimensions. Methods such as analytics measure the performance of agricultural ecosystems. To this regard they suggest the work of Nations & Nigh, (1980) who explored traditional systems such as those of the Lacandon Maya demonstrate sustainability and efficiency by balancing production and resource use.

4. **Use ideas of autonomy and acceptance:** Permaculture also prioritises to create a self-sustaining and self-regulating system. Optimistic thoughts accelerate progress, while pessimistic thoughts and beliefs prevent heighten indecision. Therefore, one must accept environmental barriers and counter them by coming up with mechanisms such as pest resistance, pollution, and nutrient availability to help maintain security and cope with these external stressors.

5. **Use and Value of Renewable Resources:** The use of nitrogen-fixing plants and animal manure instead of chemical fertilizers is an example of this. These practices increase soil fertility, moisture, durability and reduce environmental impacts from manufactured substances.

6. **Waste generation:** In natural systems, there is no waste as all productivity is used in some way. This principle intends to present the routine where one views waste as a resource and not a disposal. Animal manure, usually obtained from industrial agricultural waste, can increase soil fertility and reduce environmental problems when used correctly. Another valuable resource, human feces, can be effectively used as fertilizer to preserve certain nutrients.

7. **Design from Patterns to Detail:** This principle views natural ecosystems as models for sustainable land practices. Environmental land areas and how they are produced in agriculture are important for correct space planning and the applicability of permaculture. Examples include the use of 'unwanted' grasses in cropping environments or the amalgamation of perennial crops with animals in humid regions.

This method makes the agricultural ecosystem more suitable for the local environment.

8. Integrate instead of separate: This principle advocates the interaction between different organisms with one another so as to elevate the possibility of developing of agricultural ecosystems. This integration would normally involve using chickens control pests in the field and thus promoting resilience of for the environment to grow sustainably. Reiff and Bach (2018) present their various studies to show that integrating crops and organisms improves biogeochemical sequences, habitats, and overall agricultural environments.

9. Use small and slow solutions: Small agricultural areas tend to be more productive and stable in nature. Reiff and Bach (2018) present research that shows this opposing link between agriculture and productivity, with smaller farm units producing more per unit of land. A slow-growing system is said to conserve ecosystem practices and resilience given the attention given on such area. Long-term practices may be monitored better, and for example such the use of manure or compost for fertilization, improve soil quality and resistance to drought through a period of time.

10. Using and valuing diversity: Diversity is crucial in familiarising with environmental change. Biodiversity supports a various ecosystem practice, including productivity, nutrient cycling, and pest control. Agricultural diversity improves soil quality, carbon sequestration, and climate change. For example, increased pollution has a positive impact on crop yields as more carbon dioxide is being transferred into oxygen.

11. Use boundaries and margins of value: Boundaries between environments are normally varied and productive, so as to segregate agricultural land from an industrial one. Planning according to the region capitalises on these effects and expands ecosystem practices like pollution and pest control. Setting up farms and other ecosystems provide a safe habitat for valuable species and support sustainable production.

12. Be creative and responsive to change: This principle considers ecosystems as ever-changing and resilient to changes in environment. Agricultural ecosystems must be resilient to respond to natural changes and disturbances such as flooding or

droughts. Techniques such as climate change management and rotational grazing use natural processes to maintain systems and productivity.

Section 2.3.1: Benefits of Permaculture

The benefits of permaculture may be analysed through the studies by Hirschfeld and Van Acker (2021), Didarali and Gambiza (2019), and Bastien (2016). Ecologically, there is the encouragement of diversifying plants by improving as nutrient absorption and pest resistance. Socially, it bonds different social groups, improving quality of life, and upsurges nutritional diversity, as shown by Didarali and Gambiza (2019) and Mohapatra et al. (2020). As shown by Bastien (2016), economically, permaculture increases productivity by supporting market competitiveness, and reduces prices. In addition. Therefore, the integration of permaculture principles within agricultural practices provides a potential solution for ensuring ecological balance, social well-being and economic prosperity, thus making significant contributions to agricultural systems.

Having familiarised the many benefits of permaculture, these are debated in more detail in subsequent sections. First, the environmental benefits will be explored by examining how gardening with permaculture supports ecosystems, nutrient cycling, and pest control. The discussion later focuses on community well-being, including how permaculture aids community relations, improves livelihoods, and increases dietary diversity. Finally, the economic benefits will be studied by focusing on the nature of productivity, market competitiveness, and expenses deduction. Through a detailed analysis of these parameters, this review aims to provide a detailed narrative of the different benefits of gardening in developing a sustainable agricultural system.

Ecological Benefits of Permaculture

Consistent with the views of Hirschfeld and Van Acker (2021) and Didarali and Gambiza (2019), Permaculture offers various ecological benefits. Their work shows how permaculture enhances a variety of plants in different soils conditions by nourishing plants and controlling pests. Permaculture not only creates such

ecosystems by classifying strategies and planting crops, but also increases productivity, especially in degraded agriculture.

In fact, Hirschfeld and Van Acker (2021) highlight the role of permaculture in facilitating ecosystem practices through long-term polycultures in different regions. This method secures the habitats of the species that provides a unique opportunity to improve the environment. They recommend more research to assess the agricultural influences of environmentally friendly practices and emphasised their value as a design for sustainable agriculture.

Didarali and Gambiza (2019) complement this idea by focusing on the effectiveness of permaculture in abetting farmers solving environmental challenges. While stressing for environmental balance, they appraise the development of permaculture as a sustainable production system as it supports the formation of various environmental practices that play an important role in public well-being vis-à-vis environmental resilience.

Social Benefits of Permaculture

Didarali and Gambiza (2019) and Mohapatra et al. (2020) describe the various social benefits of permaculture. Both studies focus on the role of permaculture in the improvement of living standards, diet diversification, and social resilience.

Permaculture indeed supports sustainable lifestyles by creating more self-sufficient and economically viable farming groups. Didarali and Gambiza (2019) advocate that it strengthens the diversification in diets as it encourages the cultivation of a variety of crops used in households. Part in parcel, Strong community relations and knowledge sharing, increases resilience in the face of environmental and economic challenges.

Mohapatra et al. (2020) identify increased biodiversity, seed integrity, and indigenous seed preservation as key benefits. As a result, permaculture reduces farmers' vulnerability to disasters by increasing food security and improves the earnings of farmers during such circumstances. To this effect both studies appraise how permaculture is independent from foreign imports and comes useful when mitigating agricultural crisis's by reducing economic instability through food security, clean food, and self-sustaining incomes.

The same studies also support public awareness by the inclusion of permaculture in education facilities to create new employment opportunities and have a sustaining effect on society in terms of climate.

Economic Benefits of Permaculture

Despite differences in their work approaches, Didarali and Gambiza (2019) and Bastien (2016), emphasize the economic benefits of Permaculture. Didarali and Gambiza (2019) accentuate that permaculture cares for social activities that develops more economically strong and self-sufficient farmers.

Their common argument is that with permaculture productivity and environmental stability are maintained by reducing the reliance on external benefits, which comes costly in the long run. Such studies delve into market competition and income diversification from sustainable practices of agriculture. Similarly, Bastien (2016) argues that permaculture farms may be more economically stable than traditional farms due to the diversity in organism integration, and long-term orientation. These attributes aid in the efficiency and effectiveness of environmental operations, where despite the numerous workforces, some farms continue to make a profit, signifying normal profits. Nonetheless Bastien (2016) values the economic influence when obtaining organic certification and selling value-added goods. Interestingly, his research suggests that focusing on smaller sustainable yields of lands bolsters profitability and makes permaculture more affordable for young farmers.

However, both studies acknowledge limitations, such as the prerequisite for skilled workers and the assurance of economic stability in general. Therefore, Didarali and Gambiza (2019) value the importance of educating farmers on upright management practices, while Bastien (2016) suggests policy measures that abet natural farming, by increasing environmental awareness, granting organic certifications, increasing financial support and quotas, and permitting free choice of trade unions. These steps can eradicate challenges for livestock farmers with the promotion of equity, equality, and health in the agricultural sector

Therefore, the encouraged interest in organic and community farming among young people represents a positive shift, and supporting these goals will profit society as a whole.

Section 2.4: Current Agricultural Policies

Section 2.4.1: The European Policies

The European Green Deal and other strategies linked to it, including the Farm to Fork strategy, Biodiversity strategy, and Soil strategy 2030, have sparked an intense debate on they are addressing global environmental and agricultural challenges. Critics such as Vela Almeida et al. (2023) argue that the European Green Deal perpetuates colonial patterns of socio-ecological degradation and racial oppression by transferring risks onto a non-European workforce. The argument is mainly how the European Green Deal overuses a non-European workforce and natural resources, ignoring the role of healthy communities in developing international financial markets and governance. Vela Almeida et al therefore emphasize the need to end this colonial perspective and distinguish the enduring consequences of the wealth inherited by occupied inhabitants that continued to reside in Western Europe.

In relation to the Maltese context, criticisms of such international policies are particularly relevant to agricultural issues. As reviewed earlier, Malta faces serious challenges such as soil degradation, water scarcity and an ageing farming population. Such European policies may offer ways to address these issues, but they also have consequences if they are not implemented rightly at the local level.

For example, as demonstrated by Boix-Fayos & de Vente (2023), a focus on sustainable soil management is in line with Malta's need to combat soil erosion and salinisation (Sultana, 2017; Zdruli and Trisorio Liuzzi, 2004). However, such transition from broad policy objectives to practical operation requires clear measures that may be hard to implement without support from the Maltese agricultural sector.

Similarly, the scarceness of Maltese water resources, augmented by its intensive extraction and consequently increase of saltwater (Hartfiel, 2020; Papadimitriou et al., 2019), requires innovative water management practices. The European Green deal's effort on sustainable water use and wastewater treatment could help Malta address these issues, but the high energy costs associated with disposing wastewater

and the economic strain on local farmers may pose significant obstacles (Hartfiel, 2020; Spiteri et al., 2015).

Malta's aging farmer population has further complicated the situation. The younger farmers face high and unaffordable land prices that are not covered by European Green Deal. To this regard, Schoenherr (2022) points out that policies need to be reorganised for agriculture to have an impact on younger generations. Policies that promote sustainable agriculture should also consider providing support and funding incentives adequate to Malta's unique situation.

Section 2.4.2 Permaculture Principles and European Policy

The following section points out the obstacles to achieve the Green Deal's goals in Malta. Vela Almeida et al. (2023) argue that a decolonial transition in agriculture prioritizes cultural, economic, and territorial independence and requires a fundamental reform of agricultural production and consumption. Such argument echoes for reparations when debts are caused from environmental strains. As continued, these are to be met with efforts that promote social and environmental, cultural, and economic independence, facilitating agricultural land ownership, improving agricultural science programs.

Similarly, Boix-Fayos and de Vente (2023) identify key challenges in the transition towards sustainable agriculture, including maintenance of crop yields, meeting nitrogen requisites, soil management, replacing nutrients and reducing food waste, and preventing external impacts. This holistic approach, as argued by the authors, achieves social, economic, cultural, technical and environmental aspects of the food system. Sustainable agricultural practices, such as sustainable energy and agriculture, offer ways to achieve these goals. The implementation of integrated agriculture and sustainable agriculture can improve ecosystem services, promote expansion and transition to sustainable agriculture. These efforts should be integrated with essential resources, the environment, and economic prosperity, and farmers should be valued as managers of agricultural and environmental services.

To conclude this section, while the European Green Deal and other relevant policies provide the framework for a sustainable agricultural policy, effective implementation in Malta requires addressing the three challenges the agricultural sector faces. Both

Vela Almeida et al. (2023) and Boix-Fayos and de Vente (2023) emphasise the need for a different perspective that recognises responsibility of implementing such policies and aiding all levels of civil society.

In summary, the above policies and strategies suggested by the European Union intend to transform agriculture in European member states into a sustainable and resource-efficient system. Nonetheless, these policies face consequences when it comes to the decline in agricultural workforce and ageing population (Agius, 1992; Schoenherr, 2022). Within the Farm to Fork's strategy, the changeover to organic farming and the reduction of pesticides and fertilisers needs to be timely to not harm the environment and rejuvenate the economies of small farms who currently struggle with labour shortages and high operating costs. For such reasons, permaculture principles advocated by Didarali and Gambiza (2019) and Mohapatra et al. (2020) could play an important role. Permaculture encourages innovative ways to increase production that enhances ecological stability by limiting dependency on imported resources and support biodiversity. By integrating these principles, the European agreement can better address the economic and financial problems of agriculture. For example, the principle of using small and slow solutions is steadfast with the necessity for small-scale, well-managed agriculture that can be economically sustainable (Didarali and Gambiza, 2019).

Furthermore, building permaculture communities and knowledge sharing can counter the trend of an ageing agricultural workforce by helping younger generations participate in innovative practices of agriculture (Mohapatra et al., 2020). Therefore, while the Green Deal and Farm to Fork strategies set robust environmental milestones, their success is to be contingent with the implementation of product standards for social and economic sustainability in agriculture. By addressing these many issues, policy can support Malta's agricultural sector and ensure a bright and sustainable future.

Section 2.5 Conclusion

In conclusion, this fusion of literature provides a comprehensive overview of Malta's agricultural context. It reveals the potential of permaculture principles to reduce major problems and promote innovative sustainable development. It also explains the

important role of Governmental institutions in promoting sustainable agriculture. This review should therefore contribute to the wider discussion on sustainable agriculture by propagating the need for an integrated holistic approach to environmental sustainability and food security in Malta.

Essentially, the main proposal of this study is that integrating permaculture principles into Maltese agriculture so as support sustainable development that is resilient to various challenged. As shown in the sections above, hypothesis is based on research conducted by Holmgren (2012) and Rodriguez et al. Furthermore, the studies of Hirschfeld and Van Acker (2021) and Didarali and Gambiza (2019) further reinforce the intentions of this study by backing the notion that permaculture can provide environmental, social and economic benefits.

Despite these extensive overviews provided by the above studies, there are still significant gaps in the literature, predominantly with regards to the understanding of permaculture in the specific case of Malta. Indeed, there is a considerate lack of research solely on the application of permaculture principles in the Maltese agricultural sector. Malta's unique socio-economic environment demands research designed to comprehend the nature of permaculture how it can be effectively applied to discourse local challenges such as soil degradation, water scarcity and the ageing of the farming population.

There is also a gap in research on how permaculture principles can be integrated into current agriculture policy in Malta. By understanding this integration, one ensures to implement policy strategies that support sustainable adoption. In addition, another step involves a thorough review of local policies to recognise obstacles and opportunities to the integration of permaculture into Maltese agricultural policy.

All in all, these gaps indicate the need for continuing research to validate existing knowledge and provide practical information to policy makers, practitioners and stakeholders in Malta. To this effect, thesis aims to address these gaps through a critical analysis of existing literature, policy frameworks and practical applications, ultimately contributing to sustainable agriculture in Malta.

Chapter 3 - Methodology

3.1 Introduction

This chapter explains the research methodology for this dissertation, which intends to integrate the principles of permaculture into Maltese agricultural policies. The methodological approach used is qualitative and is mirror the insights of case study qualitative research as described diversly by Astalin (2013), Merriam & Tisdell (2015) and Priya (2021). This approach enables a comprehensive understanding of the intricate challenges facing Maltese agriculture by providing a complete narrative from different perspectives. Therefore the methodology is primarily desk research, supported by a case study, and aims to answer the following key research question:

“What potential practical strategies can policymakers adopt in the sphere of permaculture to foster a resilient and sustainable future for Malta’s agricultural scene?”.

The literature review served as an important overview covering the Maltese agricultural sector, permaculture principles and key issues in European agricultural policy. However, by the inclusion of this methodology an analysis of data relevant to Maltese policies and relating them to Holmgren’s agricultural principles as explained in Chapter 2 would be possible. Essentially it is intended to develop final recommendations that are well-suited with local policies and sustainable agricultural practices, ultimately contributing to the resilient and sustainable agricultural development in Malta.

3.2 Research Design

This qualitative design therefore, relies on the evaluations of secondary information rather than numeric calculations. The decision to take qualitative methods, that with the lines of Astalin (2013), Merriam & Tisdell (2015) and Priya (2021), was justified by the need to understand the complex nature of permaculture principles and their application in the specific case of Maltese agriculture. In fact, according to Merriam and Tisdell (2015), qualitative research is very convenient in exploring the complexities of a phenomenon of a specific case, making this insight applicable for this study.

3.3 Case Study Framework

The research uses a case study methodology, as outlined by Priya (2021). From this viewpoint, the case study permits for an in-depth analysis of a precise example – in this case, the integration of agricultural principles in Malta. This approach delivers a detailed analysis based on the challenges and opportunities in the Maltese agricultural sector as reviewed in Chapter 2, allowing for a better understanding of how permaculture can be better integrated.

3.4 Data Collection

The data collection process involves gathering information from existing literature on permaculture principles, the challenges of Maltese agriculture and relevant local policies, frameworks and schemes. This comprehensive approach allows the researcher to understand the subject better. Sources include research articles in peer-reviewed journals and articles on permaculture principles, their benefits, and applications in different contexts. Agricultural policies and other relevant authorities are also evaluated to understand their impact on Maltese agriculture. Studies of permaculture practices in similar settings are analysed to identify best practices and potential problems. This method is in line with Merriam and Tisdell (2015), who focus on the importance of a variety of sources in qualitative research to develop a comprehensive knowledge of the research topic.

3.5 Data Analysis

Analysing data within this study contains a descriptive analysis of themes elicited for the data collected. This method is checks out with qualitative research methods and eases the growth of insights to answer the research question. As explained by Merriam and Tisdell (2015) and Piya (2021), the phases involved in the process of analysing the data include acquainting oneself with the data through careful reading and rereading. Similarities within literature are then grouped together to form up a number theme. The themes are then vetted and adjusted accordingly for consistency of information. Each theme is then clearly defined and given a descriptive name. Finally,

the research findings are compiled into sectioned narratives that address the research problem and research objectives; providing a comprehensive overview of the integration of agricultural principles into the Maltese agricultural sector.

To this regard, given the lack of literature that specifically discourses the integration of permaculture into Malta's unique agricultural challenges, it becomes essential to conduct a comprehensive content analysis. This approach will enable the analysis of existing themes related to permaculture principles in the Maltese context. By reviewing and synthesizing previous literature, content analysis will provide a better understanding of how permaculture can potentially be integrated into Maltese agricultural policy. This method will help to fill the current gaps in the literature and provide a stronger basis for developing strategies adapted to the environmental and socio-economic case of Malta.

3.6 Validation and Reliability

During the course of this dissertation, key themes were primarily identified from an extensive review of secondary data literature. These included prevalent themes such as the transition to permaculture, and agricultural sustainability. To further validate and refine these results, the sophisticated software tool 'VOSviewer' was used to confirm the validation of certain themes over others. The software highlighted strong links between keywords and specific concepts, emphasising the position of themes such as resource efficiency and biodiversity. This mutual approach ensured that the thematic analysis of the study was all-inclusive and supported by influential data visualisation tools.

To determine whether the research as a whole is valid and reliable, it must meet a number of important criteria (Merriam & Tisdell, 2015; Astalin, 2013; Piya, 2021). First, triangulation is used to draw on multiple sources of data to better understand the findings and provide a more complete explanation of the research question. In addition, the process involves consultation with agricultural expertise in Malta to validate the analysis of secondary data and thus improve the research. Peer review is also conducted by seeking feedback from peers and supervisors to ensure the reliability of the research process and results. Together, these measures should contribute to the validity and reliability of the research.

3.7 Ethical Consideration

While secondary data research has many advantages, it also has limitations. Analysis based on current literature may limit the depth of results because the information available may not be complete or useful. In addition, the lack of primary data collection means that the research does not capture the current and local views of the Maltese workforce, thus missing out on new developments and insights into the community. Maltese agriculture. Furthermore, this data alone cannot capture Malta's unique and dynamic characteristics given that the socio-economic and environmental context makes it intricate to generalise such findings.

3.8 Limitations of Study

Despite that secondary data research benefits the study in different ways, it also has its limitations. Initially, the research focused on conducting semi-structured interviews to collect detailed information from practitioners within the Maltese Agriculture. However, identifying the suitable participants proved difficult due to arable farming being a relatively new concept in Maltese agriculture. These difficulties in sharing new concepts within the sector required reliance on alternative data which, although valuable, may not sufficiently capture certain conditions and trends in Maltese agriculture.

3.9 Conclusion

Therefore, this methodological approach of this study as explained previously, combines qualitative research methods applying secondary data analysis to provide strong foundation in exploring the integration of permaculture principles into Maltese agriculture. With the analysis of literature and review current policy practices, the research aims to offer insights and final recommendations to policy makers, practitioners and stakeholders. This approach would not only address the research question, but also contributes to the broader debate on sustainable agriculture and

environmental sustainability in Malta. Thus, this holistic approach shows that research builds on existing knowledge, while at the same time identifying areas and areas for research and practice.

Chapter 4 : Thematic Analysis

Introduction

Along the following section the thematic analysis of this study is discussed by shedding light on the integration of permaculture into the Maltese agricultural sector. The analysis involves various data sources and policy frameworks to analyse key themes. Themes were essentially established through an in-depth review of secondary data, using software tools such as VOSviewer, securing a comprehensive analysis. Each theme observes specific characteristics of permaculture, such as sustainability, economic sustainability, cultural integration, policy alignment and technology application. By relating these ideas with National Funding Schemes and the Governmental policies of the Agricultural and Rural Payments Agency, this analysis aims to provide a clear understanding of the potential impact of permaculture on Malta's agricultural landscape.

Theme 1 : Sustainability and Environmental Stewardship

It is true that Permaculture in essence offers an innovative perspective to agriculture, emphasizing sustainability and environmental stewardship. Permaculture practices are designed to create self-sustaining ecosystems that prioritize long-term environmental health. This theme explores how permaculture, combined with Maltese policies such as National Funding Schemes and the Common Agricultural Policy (CAP) strategic plan, can promote sustainable agricultural practices that address intricate Maltese challenges such as soil degradation, water scarcity and the loss of biodiversity. This theme analysis in particular focuses on three sub-themes: soil conservation and Development, water resources management and biodiversity conservation.

Subtheme 1. 1: Soil Conservation and Development

Robust soil conditions is essential to have sustainable agriculture, and permaculture suggests a variety of practices aimed to preserve and strengthen soil quality. In Malta, soil degradation notably challenging given its vulnerabilities to erosion, compaction and salinisation. Galdies and Vella (2019) indicate that Maltese soils are commonly shallow, with little organic substance content giving limited fertility and further degraded by traditional agricultural practices. Permaculture counters these challenges through practices that restore and maintain soil fertility.

For example, Practices such as composting and mulching add organic matter to the soil, refining its structure and facility to retain water (Boix-Fayos & de Vente, 2023). Crop rotation and polycultures improve soil fertility by diversifying plant species, thus promoting a stronger ecosystem that fend off to dynamic climatic changes. It is studied that this diversity helps to reduce the accumulation of pests and common diseases in monocultures, thus reducing the need for chemical inputs. (Altieri et al, 2024)

To this regard, the Maltese Common Agricultural Policy Strategic Plan filtrate with these permaculture principles by allocating funds to improve soil management practices. The plan aims to improve soil health through incentives for organic farming and ecological programs that promote sustainable land use (European Commission, 2024). This Policy intervention supports permaculture's focus on soil conservation and improvement, especially in a context like Malta, where soil erosion and degradation threaten agricultural sustainability.

Subtheme 1.2: Management of Water Resources

An ever-increasing challenge to Maltese farmers is water availability, where limited fresh water resources and collective demand threaten its use in agriculture. Permaculture hands out various strategies to efficiently use and conserve water, which is crucial to for agricultural production particularly in the arid climate of Malta. Short (1997) and Hallett (2017) emphasize the importance of water conservation in arid environments by noting how permaculture principles can augment water use.

Rain-water harvesting is of permaculture's main strategies that involves collecting and storing rainwater for agricultural use. The dependence on groundwater and exploitation of surface water resources would then be reduced drastically. Other strategies such as ditches (shallow trenches that capture and direct water into the ground) are particularly effective in Malta, where rainfall is rather periodic and unpredictable (Bezzina & Scicluna Laiviera, 2016). By capturing and storing water during the rainy season, farmers can ensure a more reliable water supply during periods of drought.

National Funding Schemes as recognised by the Agriculture and Rural Payments Agency (2024) support water conservation initiatives, providing financial assistance for the adoption of technologies and practices that improve the efficiency of water use in agriculture (Agricultural and Rural Payments Agency, 2024). For example, funds are assigned to water reusing, conservation and efficient irrigation systems, that are pivotal in limiting any exploitation from Malta's groundwater. These policy interventions balance permaculture practices, making water resource management more sustainable and resilient.

Subtheme 1.3: Conserving Biodiversity

Biodiversity is important to maintain robust ecosystems by offering essential agricultural practices such as pollination, pest control and nutrient cycling. Permaculture essentially promotes this kind of biodiversity when inspiring the cultivation of a wide variety of plants and integrating other organisms into agricultural systems. Holmgren (2012) and Didarali and Gambiza (2019) point out that permaculture's principle on diversity provisions ecosystem health and improves the resilience of agricultural systems to environmental shifts.

In Malta, where agriculture is traditionally dominated by monocultures, the adoption of permaculture can significantly improve biodiversity. By planting a diverse range of crops, including native species, permaculture helps in the restoration and upkeep of local biodiversity. This diversity, as explained further within Reiff, J. *et al.*'s (2024) study, creates habitats for a wide range of organisms, from soil microbes to pollinators, essential for the running of the agricultural ecosystem.

The CAP strategic plan reinforces these efforts by incentivising the promotion of biodiversity through sustainable agricultural practices. These include incentives for

agroforestry, organic farming and the conservation of native species, in line with permaculture principles (European Commission, 2024). National funding programs also contribute to biodiversity conservation by funding projects that protect native species and improve habitat diversity, thus supporting the ecological integrity of Maltese agricultural landscapes (Agricultural and Rural Payments Agency, 2024).

Theme 1 Conclusion

Therefore, this first thematic overview has put forward the notion that by focusing on soil conservation, water resource management and biodiversity conservation, permaculture rightly enhances the environmental health of agricultural landscapes. It supports the long-term sustainability of agriculture in regions countering significant environmental stress. The integration of permaculture principles into Maltese policy interventions, such as the CAP Strategic Plan and national funding programmes, further strengthen the potential for sustainable agricultural practices that contribute positively to the environment and society.

Theme 2: Resource Efficiency and Economic Viability

The economic viability of permaculture, especially in resource-limited contexts such as Malta, is pivotal to understand its potential for adoption. As a sustainable agricultural practice, permaculture emphasizes resource efficiency and long-term financial stability. This analysis explores the potential economic influence of permaculture adoption through three subtopics: cost-benefit analysis of the transition to permaculture, resource efficiency in small-scale agriculture, and the impact on local food security and market sustainability. This information is further assimilated through the viewpoint of Malta's National Funding Schemes and the Agricultural and Rural Payments Agency (ARPA) policies, which provide a background for financial and resource support for sustainable agricultural practices in Malta.

Subtheme 2. 1: Cost-benefit analysis of Permaculture Transitioning.

The initial cost of transitioning to permaculture can be challenging to farmers, especially in areas with limited resources such as Malta. Vela Almeida et al. (2023)

designate that the preliminary infrastructural costs of implementing permaculture practices, such as structuring rainwater collection systems, establishing perennial crops and improving soil fertility, can be substantial. However, these are type of investments which are compensated over time by deducing chemical input supplies and enhanced plant resilience against environmental conditions such as drought and soil degradation. Similarly, Mohapatra et al. (2020) argue the application of low-cost methods, such as natural fertilizers and integrated pest management to reduce the long-term operational costs, making it economically sustainable in the long term.

In Malta, National Funding Schemes such as the Fertilizer Voucher Scheme provide financial support to farmers to offset the rising costs of chemical inputs such as fertilisers, which have been aggravated by supply disruptions global chain (Agency for Agricultural and Rural Payments, 2024). However there needs to be more encouragement for the use of natural fertilizers and sustainable agricultural practices to align with permaculture principles, allowing farmers to switch to more sustainable methods without facing sudden financial strains. The Maltese government's direct subsidies programs aim to ease the initial financial burden of sustainable farming practices, thus making permaculture a more attractive and feasible option for small farmers.

In addition to this , Malta's CAP Strategic Plan allocates significant funding to stabilize farmers' incomes and support infrastructure investments in line with sustainable agriculture. For example, the plan provides 16.4 million euros to stabilize incomes in sectors that face difficulties, such as milk production and tomato cultivation (European Commission, 2024). These financial interventions provide a safety net for farmers switching to permaculture, ensuring that initial costs are not compromised.

Subtheme 2.2: Resource efficiency in Small-scale Farming

Another principle of permaculture, resource efficiency, is particularly important for small-scale farming, where yielding high production with minimal resource input is essential for the farmer's economic sustainability. In Malta, where agricultural land is fragmented and resources such as water and fertile soil are scarce, resource efficiency is essential to preserve the sustainability of the agricultural sector. Galdies and Vella

(2019) examine the challenges of resource scarcity in Malta, particularly water scarcity and land degradation, which are intensified by traditional agricultural practices that depend heavily on chemical fertilizers and irrigation. Permaculture in the eyes of Hirschfeld & Van Acker (2021), mentions these issues by encouraging practices that optimize the use of natural resources, such as rainwater harvesting, mulching and crop diversification. These methods reduce dependence on external non-sustainable inputs and allow better use of available resources, thereby reducing costs and improving long-term sustainability.

The National Pig Welfare Scheme and similar initiatives encourage farmers to adopt practices that go beyond legal requirements, promoting resource efficiency through animal welfare and farm management practices (Agricultural and Rural Payments Agency, 2024). These programs are consistent with permaculture's emphasis on creating closed systems where waste is minimized and resources are recycled within the agricultural ecosystem. The CAP strategic plan also highlights resource efficiency, particularly in the water management sector. With more than 30 million euros earmarked for water conservation projects such as water recycling and conservation, the plan supports permaculture's focus on reducing water waste and the optimization of irrigation practices (European Commission, 2024). By integrating the principles of permaculture into these national policies, Malta can promote a more efficient use of its limited resources, ensuring that small-scale agriculture remains sustainable in the face of environmental and economic challenges.

Subtheme 2.3: Impact on Local Food Security and Market Resilience.

In another thematic aspect, Permaculture has the potential to strengthen local food security and develop market resilience by fostering diverse and sustainable agricultural systems. In Malta, where small farms depend on imported products make the agricultural sector vulnerable to external shocks in supply chains, the adoption of permaculture would reduce this dependence and increase self-sufficiency. Agius (1992) and Schoenherr (2022) emphasize the development of local self-sufficient food systems so as to withstand market fluctuations and the risk of supply chain disruptions. Permaculture's emphasis on growing diverse crops and integrating a diversity of organisms into agricultural systems improves biodiversity and ensures a

more sustainable and reliable food supply. By diversifying production, farmers can diminish their dependence on a single crop or product, making them less vulnerable to market price fluctuations and environmental changes. This approach is consistent with the objectives of the CAP strategic plan, which supports the diversification of the agricultural sector through investments in specific sectors and non-agricultural economic activities (European Commission, 2024).

The Young Farmers Training Scheme, part of Malta's National Funding Scheme, also supports this transition by opening opportunities to young farmers to expertise in implementing sustainable practices. Therefore, by encouraging the next generation of farmers to adopt resource-efficient and economically sustainable farming methods, Malta can build a more resilient agricultural sector that contributes to local food security and reduces dependence on imported products (Agriculture and Rural Payments Agency, 2024).

In addition, permaculture's ability to create healthy soils and conserve water ensures that agricultural systems are more resilient to environmental conditions, such as drought and soil erosion, which can have a significant impact on crop production. By improving the complete health of the agricultural ecosystem, permaculture supports long-term food security, making it a potential strategy for countries like Malta, where environmental degradation and climate change pose significant threats to agricultural productivity.

Theme 2 Conclusion

In conclusion of this theme, Permaculture offers a sustainable economic model for small-scale, resource-constrained farming environments like Malta. A cost-benefit analysis clearly shows that the long-term economic benefits of permaculture, such as reduced input costs and increased sustainability, outweigh the initial financial challenges. Furthermore, permaculture's focus on resource efficiency aligns with Malta's agricultural policies, particularly those outlined in the National Funding Programs and the CAP Strategic Plan, which merge finance and technology within sustainable practices. Finally, by cultivating local food security and market sustainability, permaculture can help Malta reduce its dependence on imports and build a more self-sufficient agricultural sector.

Theme 3 : Cultural and Social Integration

Involving the community with the application of permaculture fosters a collective action and shared responsibility towards sustainable development. The correct implementation of permaculture principles depends not only on environmental and economic aspects, but also on cultural and social dimensions. This theme therefore examines how permaculture fits into the cultural practices and community structures of Malta, with a focus on community involvement, education and knowledge transfer, as well as the role of tradition in the adoption of new agricultural methods. Through an analysis of Malta's national funding programs and Agricultural and Rural Payments Agency (ARPA) policies, this section examines how permaculture can be culturally and socially integrated into the Maltese agricultural landscape.

Sub-theme 3.1: Cooperative Farming and Community Involvement

Community involvement is the basis of permaculture, as it promotes the collective accomplishment and shared responsibility in sustainable agricultural practices. Vela Almeida et al. (2023) argue that community-based approaches are pivotal to create resilient agricultural systems, especially in environments countering environmental and social challenges.

In Malta, where small-scale farming predominates, cooperative farming models offer farmers the opportunity to share resources and knowledge whilst collaborating in the implementation of permaculture techniques. Mohapatra et al. (2020) also point out that permaculture prospers in environments where there is strong community involvement, as it enables the openness of ideas between farmers.

Maltese National Funding Schemes such as the Young Farmers Training Program foster community involvement by providing platforms for knowledge sharing and collaboration however not directly concerning permaculture. These programs encourage young farmers to work alongside veteran farmers, fostering a sense of community and mutual support in the agricultural sector (Agency of Agriculture and Rural Payments, 2024). By creating opportunities for cooperative farming, these programs align with the permaculture principle of community collaboration, helping farmers overcome challenges related to resource scarcity and financial constraints.

In addition, the Malta CAP Strategic Plan highlights the importance of community involvement in achieving its socio-economic and environmental objectives. Through initiatives such as the LEADER program, the plan supports local development strategies that improve the quality of life in rural areas by promoting social cohesion and community projects (European Commission, 2024). These policies reflect the fundamental principles of permaculture, which encourage collaborative efforts to build self-sustaining agricultural systems that benefit the entire community.

Subtheme 3.2 Education and Knowledge Transfer within Agricultural Communities

Education and knowledge transfer are also essential to the successful adoption of permaculture practices, as they equip farmers with the skills and knowledge to effectively implement sustainable methods. Holmgren (2012) emphasizes the need of education in permaculture, noting that it is essential to spread awareness of sustainable agricultural techniques and encourage farmers to adopt these new practices. Similarly, Reiff and Bach (2018) argue that education not only empowers farmers, but also it also nurtures a deeper understanding between farming communities and the land they farm. In Malta, the Agricultural Knowledge and Information System (AKIS), which is part of the National Funding Schemes, aims to facilitate knowledge transfer and innovation in the agricultural sector. The system connects researchers, practitioners and farmers, creating a platform through which knowledge can be shared and circulated (Agriculture and Rural Payments Agency, 2024). This initiative is essential for the future promotion of permaculture practices, because it allows farmers to access ongoing research regarding sustainable agricultural practices.

The CAP Strategic Plan also supports education and knowledge transfer through vocational education and training programmes, targeting more than 4,100 people in the Maltese agricultural sector (European Commission, 2024). These programs are designed to improve the sustainability and resource efficiency of agricultural practices, aligning with permaculture's goal of educating farmers to manage resources more efficiently and sustainably. By prioritizing education, Malta's agricultural politicians are creating a solid foundation for the integration of permaculture into the country's agricultural systems.

Subtheme 3.3: The Role of Tradition in the Adoption of New Agricultural Practices

With the smooth integration of traditional agricultural practices into permaculture can improve its acceptance and implementation in cultural environments such as Malta, where certain agricultural practices have deep cultural roots. Agius (1992) explains how traditional agricultural practises in Malta have long accentuated resource conservation and adaptation to the local environment conditions, which are fundamental principles of permaculture however at times they were not self-sustaining enough. Based on these traditional practices, permaculture can be seen an easily assimilation from those already established practices, but as a natural development that compliments and enhances Malta's agricultural heritage. Vela Almeida et al (2023) emphasize the importance of integrating cultural practices into sustainable agricultural models, noting that already established traditional knowledge can provide valuable information on resource management and environmental management. In Malta, where small family farms are common, the adoption of permaculture practices in line with traditional farming methods can help ensure a smoother transition and more accepted by farmers.

National funding schemes and policies welcome this integration by offering financial assistance and training to farmers who want to adopt sustainable practices that build on their existing knowledge. For example, the Fertilizer Voucher Scheme encourages the use of organic fertilizers, a practice that mirrors with traditional methods of soil enrichment (Agriculture and Rural Payments Agency, 2024). Such policy interventions aid in the aim to bridge the generational gap between farmers and culturally accept sustainable practices. The CAP Strategic Plan also recognizes the importance of tradition in developing agricultural practices, particularly in its efforts to preserve local breeds and indigenous species, such as the Maltese black hen and carob trees (Commission European, 2024). These efforts to safeguard Malta's agricultural heritage align with permaculture's focus on promoting a deep connection between farming communities and their local environment whilst also conserving biodiversity.

Conclusion

The transitioning to permaculture in Malta depends heavily on its cultural and social integration into the country's agricultural practices. Through community participation, education and the preservation of traditional knowledge, permaculture can be adapted to suit the unique social structure of Malta's agricultural sector. National funding programs and the CAP strategic plan provide the necessary support for these efforts, providing financial incentives, educational programs and community initiatives that promote sustainable agriculture. By aligning permaculture with Malta's cultural values and community structures, the country can develop a more resilient and sustainable agricultural system that benefits the environment and society.

Theme 4: Policy Alignment and Government Support

Permaculture is gaining gratitude as a promising solution to several sustainability challenges in agriculture. However, for its successful application into Malta's agricultural framework, it is essential that it aligns with current agricultural policies and receives adequate government backing. This theme will henceforth investigate how permaculture aligns with Malta's Common Agricultural Policy (CAP) and the European Green Deal, evaluate available government incentives and funding programs, and identify challenges along with recommendations for enhancing policy implementation to promote sustainable farming practices.

Sub-theme 4.1: Compatibility with the European Green Deal and Malta's Common Agricultural Policy

The principles of permaculture, which emphasize sustainability, resource efficiency, and biodiversity, are fundamentally compatible with the goals of the European Green Deal and Malta's CAP. The Green Deal, particularly through its Farm to Fork strategy and Biodiversity Strategy 2030, underscores the inevitability for resilient and environmentally sustainable farming practices throughout European member states (Boix-Fayos & de Vente, 2023).

Malta's CAP Strategic Plan (2024), which aligns with EU agricultural policies, similarly prioritizes sustainability, shedding light on soil conservation, water management, and biodiversity. Permaculture's emphasis on enhancing soil health through practices like

composting, mulching, and polycultures aligns with the CAP's objectives to combat soil degradation (Boix-Fayos & de Vente, 2023). Moreover, Malta's CAP aims to increase organic farming, targeting an expansion of active organic agricultural land from 66 hectares to 272 hectares by 2027 (European Commission, 2024). This goal complements permaculture practices, which often incorporate organic methods and aim to reduce dependence on chemical inputs.

Additionally, the European Green Deal advocates for biodiversity conservation, a fundamental aspect of permaculture. By developing local ecosystems through diverse plantings and agroforestry, permaculture can aid Malta in its biodiversity restoration efforts as outlined in its CAP (Galdies & Vella, 2019). Thus, permaculture not only fits within the broader EU policy framework but also strengthens Malta's selective objectives of developing environmental resilience and sustainability in agriculture.

Sub-theme 4.2: Government Incentives and Funding Schemes for Sustainable Practices

The National Funding Schemes (ARPA, 2024), such as the Fertiliser Voucher Scheme, addresses pivotal challenges faced by local farmers, including rising expenses. which permaculture can lighten by promoting organic soil management and decreasing reliance on synthetic fertilizers. This scheme aligns with permaculture's principles of resource efficiency by inspiring sustainable farming practices that minimise chemical use.

Not only becoming economically stable with sustainable efforts and schemes could be beneficial, but Permaculture practitioners could also benefit from the provisions within the CAP, which provide over €42 million in direct payments and €120 million in rural development funds (European Commission, 2024). Water-efficient irrigation systems, soil conservation techniques, and biodiversity-enhancing practices are supported by Governmental provisions.

Indeed, the Training Scheme for Young Farmers can motivate the next generation of Maltese farmers to embrace permaculture principles (ARPA, 2024). By investing in younger individuals to their involvement in the sector through financial incentives and educational programs, the problem of an aging farmer population is countered.

Sub-theme 4.3: Challenges in Policy Implementation and Recommendations for Improvement

A considerable drawback in the process of adopting permaculture to counter agricultural challenges, is the fragmentation the Malta's agricultural fields consisting making them rather small-scaled compared to foreign farmers. This empowers the struggle to invest in innovative, sustainable farming technologies for such small land area (European Commission, 2024). Infrastructure like rainwater harvesting systems and composting facilities can indeed discourage farmers who are already have profit margins.

The limited awareness and understanding of permaculture among Maltese farmers is another drawback which was also a limitation encountered during this research. As noted by Vela Almeida et al. (2023), a lack of knowledge and expertise presents a considerable barrier to the adoption of such sustainable agricultural practices. While government initiatives like the Training Scheme for Young Farmers offer valuable support towards sustainable practices, there is a pressing need for specific educational programs that promote permaculture's benefits.

To address these challenges, policy enhancements should prioritize targeted support for small-scale farmers. This could include increasing direct subsidies for those transitioning to permaculture, akin to the support provided for organic farming under the CAP (European Commission, 2024). Furthermore, the Maltese government could develop more flexible financing options that enable farmers to adopt permaculture practices incrementally, thereby alleviating the financial strain of significant upfront investments. Incorporating permaculture principles into local development strategies through the LEADER initiative could also promote community-based approaches to sustainable agriculture, fostering collective action and knowledge sharing among farmers (ARPA, 2024).

Theme 4 Conclusion

Lastly, by emphasizing on principles that foster sustainability, resource efficiency, and biodiversity, permaculture presents a viable pathway to conquest the environmental

and economic objectives outlined in Malta's agricultural policies and the European Green Deal.

Governmental support such as targeted subsidies, and expanded educational initiatives specifically towards permaculture could necessitate the overcoming of Maltese agricultural challenges.

Theme 5: Challenges and Opportunities in Implementing Permaculture in Malta

The current challenges from Maltese agriculture but promising opportunities offered if permaculture was to be integrated in Malta's agricultural sector shall be analysed in this section. Specifically, the thematic analysis delves into the obstacles hindering the adoption of permaculture, the innovative practices that can facilitate its implementation, and the long-term resilience it offers in the face of climate change and economic fluctuations. It is crucial to connect these insights with Maltese policies and support mechanisms, such as the National Funding Schemes and initiatives from the Agricultural and Rural Payment Agency (ARPA), which intend to promote sustainable farming.

Sub-theme 5.1: Barriers to Entry for Small-Scale Farmers

A primary challenge in adopting permaculture practices in Malta is the array of barriers encountered by small-scale farmers. The Maltese agricultural sector is predominantly composed of small and micro farms, often family-operated on a part-time basis (Galdies & Vella, 2019). These farmers typically manage fragmented plots of land, which restricts their ability to achieve economies of scale and adapt to new agricultural methods like permaculture, which necessitates initial investments in knowledge, infrastructure, and labor.

The fragmented nature of Maltese farms complicates the implementation of large-scale permaculture techniques, such as agroforestry or rotational grazing, which require contiguous land areas (European Commission, 2024). Additionally, limited access to financial resources and the high cost of land in Malta further impede small farmers' ability to transition to permaculture practices. While the National Funding

Schemes and CAP direct payments offer some financial assistance, these funds often fall short of covering the expenses associated with the significant changes that permaculture entails. For example, the Fertilizer Voucher Scheme provides support to farmers for chemical fertilizers, rather than promoting organic alternatives (ARPA, 2024). Consequently, small farmers continue to rely on conventional, less sustainable agricultural methods.

The lack of widespread knowledge and education regarding sustainable farming practices further complicates the adoption of permaculture. Although the Training Scheme for Young Farmers aims to attract younger individuals to agriculture, the training's content may not adequately emphasize permaculture techniques or equip farmers with the necessary skills for a successful transition (ARPA, 2024). Overcoming these barriers requires not only financial support but also a shift in education to highlight the long-term benefits of permaculture for small-scale farming in Malta.

Sub-theme 5.2: Opportunities for Innovation in Agriculture

Despite the challenges, permaculture offers numerous opportunities for innovation within Maltese agriculture. As Didarali and Gambiza (2019) point out, permaculture's focus on sustainability and resource efficiency creates opportunities for integrating innovative technologies and practices that can help small-scale farmers overcome their limitations. For instance, permaculture's emphasis on water management is particularly relevant in Malta, where water scarcity is a pressing concern (Galdies & Vella, 2019). Techniques such as rainwater harvesting, greywater recycling, and swales—integral components of permaculture—could significantly reduce reliance on groundwater, which is already being overexploited in Malta (Short, 1997; Hallett, 2017).

Moreover, permaculture's focus on biodiversity to enhance ecosystem services aligns with Malta's environmental and biodiversity objectives outlined in its CAP Strategic Plan (European Commission, 2024). Technologies like precision farming, which utilizes data to optimize resource use and minimize waste, can complement permaculture's resource-efficient practices. By employing methods such as agroforestry and intercropping, permaculture not only boosts biodiversity but also opens new market opportunities for farmers by diversifying their crop production,

thereby enhancing economic resilience during periods of market volatility (Mohapatra et al., 2020).

Sub-theme 5.3: Long-Term Resilience Against Climate Change and Economic Shifts

The adoption of permaculture in Malta presents a compelling opportunity to enhance long-term resilience against environmental and economic challenges. Vela Almeida et al. (2023) highlight that permaculture's design principles are inherently resilient, making them ideal for regions like Malta, which face climate change and economic instability. By promoting practices that regenerate soil health, conserve water, and support biodiversity, permaculture equips farmers to cope with erratic weather patterns (Holmgren, 2012). Techniques such as mulching, composting, and polycultures improve soil's capacity to retain water and nutrients, addressing Malta's pressing issues of water scarcity and soil degradation (Galdies & Vella, 2019).

Economically, permaculture diversifies income streams for small farmers, reducing reliance on single crops and minimizing financial risks associated with market fluctuations (Mohapatra et al., 2020). This approach not only strengthens food security but also fosters local markets by enhancing self-sufficiency and reducing dependence on imports.

Successful implementation of permaculture requires robust policy support and investment. While Malta's CAP Strategic Plan has initiated funding for sustainable practices, targeted support and education are essential for widespread adoption. By aligning permaculture with existing policies and addressing farmers' unique challenges, Malta can cultivate a more sustainable and resilient agricultural future.

Additionally, government initiatives, such as Malta's CAP plan, which allocates funds for sustainable investments and agricultural innovations, provide a pathway for farmers to experiment with and adopt permaculture practices. The CAP's eco-schemes offer financial incentives for farmers who implement environmentally friendly practices, which can be harnessed to support permaculture initiatives (European Commission, 2024). These schemes encourage farmers to exceed minimum legal requirements regarding environmental protection and climate action, positioning permaculture as a viable strategy for sustainable farming in Malta.

Theme 5 Conclusion

In conclusion, despite the significant barriers to adopting permaculture in Malta, especially for small-scale farmers, the potential for innovation and long-term resilience makes a strong case for its integration into the agricultural sector. With robust government support, including targeted funding schemes and educational initiatives, along with the adoption of innovative technologies, permaculture can significantly enhance the sustainability, resource efficiency, and resilience of Malta's agriculture. By aligning permaculture practices with existing policies and addressing the specific challenges faced by Maltese farmers, the country can pave the way for a more sustainable and self-sufficient agricultural future.

Theme 6: Technological and Practical Applications

The effective implementation of permaculture principles in Maltese agriculture necessitates a combination of technological innovations and comprehensive training programs for farmers, particularly in light of Malta's distinct agricultural challenges. This theme examines how technology can enhance permaculture practices, highlights successful initiatives, and underscores the importance of capacity building among Maltese farmers. The analysis references national policies, including the National Funding Schemes and the Common Agricultural Policy (CAP) Strategic Plan, to illustrate how government incentives support these efforts.

Sub-theme 6.1: Technological Innovations and Their Role in Permaculture

Technological advancements are crucial for the practical application of permaculture principles, especially in resource-constrained environments like Malta. Holmgren (2012) notes that while permaculture is traditionally low-tech, integrating modern technologies can significantly boost efficiency and productivity. Reiff and Bach (2018) further emphasize that innovations such as precision agriculture, water-saving technologies, and renewable energy sources can enhance permaculture's focus on sustainability and resource conservation.

In Malta, where water scarcity and fragmented land holdings pose significant challenges, technology can make permaculture more feasible. For instance, the implementation of drip irrigation systems and automated water management can

optimize water usage, addressing the critical issue of water scarcity highlighted by Galdies and Vella (2019). The CAP Strategic Plan promotes investments in infrastructure that support sustainable farming practices, including renewable energy and water recycling systems, aligning with permaculture's objectives of reducing resource dependency (European Commission, 2024). Additionally, national funding schemes have allocated resources to assist farmers in adopting these technologies, particularly through grants aimed at water conservation and soil regeneration (ARPA, 2024).

By incorporating technology, permaculture can evolve beyond its traditional practices, becoming more adaptable and efficient in the context of Malta's unique environmental and economic landscape. These innovations not only enhance the viability of permaculture for small-scale farmers but also strengthen its potential to contribute to long-term sustainability and resilience.

Sub-theme 6.2: Case Studies of Successful Permaculture Projects

Several successful permaculture projects offer valuable insights into how these practices can be tailored to Maltese agriculture. Although Malta has a limited number of large-scale permaculture initiatives, lessons from similar contexts can be applied locally. Vela Almeida et al. (2023) present case studies from Mediterranean regions where permaculture has been effectively implemented despite challenges akin to those faced in Malta, such as limited water resources and small-scale farming operations.

A notable example is a permaculture project in southern Spain, where farmers have successfully employed agroforestry techniques and water management systems that could be adapted for Malta. These initiatives have demonstrated how permaculture can rejuvenate degraded landscapes, enhance biodiversity, and provide economic benefits through diversified crops and livestock. Such projects are supported by policies similar to Malta's CAP and National Funding Schemes, which offer financial incentives for adopting sustainable practices (European Commission, 2024).

In Malta, smaller-scale permaculture initiatives are emerging, particularly in community gardens and educational farms, serving as pilot projects for broader agricultural applications. These examples illustrate that permaculture can thrive even within Malta's constrained agricultural environment, providing a model for wider

adoption. The key takeaway from these case studies is the necessity of adapting permaculture principles to local conditions and ensuring that farmers have access to the resources and training required for effective implementation.

Sub-theme 6.3: Training and Capacity Building for Farmers

Training and capacity building are vital for promoting permaculture in Malta, particularly given the aging farmer population and the limited knowledge of sustainable practices among younger generations (Galdies & Vella, 2019). Holmgren (2012) underscores the importance of education in reshaping farmers' relationships with the environment, while Reiff and Bach (2018) stress the need for knowledge transfer in communities reliant on traditional methods.

National Funding Schemes and the CAP Strategic Plan recognize the role of education in advancing sustainable agriculture. Initiatives like the Training Scheme for Young Farmers, implemented by the Agricultural and Rural Payments Agency (ARPA), provide essential training in modern techniques, including permaculture (ARPA, 2024). However, the success of these programs depends on farmers' willingness to adopt new practices. Resistance to change is common, especially in areas with entrenched traditional methods (Vela Almeida et al., 2023).

To address this, training must highlight the long-term economic and environmental benefits of permaculture, supported by practical demonstrations. Government incentives under Malta's CAP can further encourage participation by offering financial support for adopting sustainable practices (European Commission, 2024). By integrating technological innovations with targeted training, Malta can develop a more sustainable agricultural system that meets both environmental and economic goals.

Conclusion

The effective implementation of permaculture principles in Maltese agriculture requires integrating technological innovations with comprehensive training programs. Advancements such as water-saving systems and renewable energy solutions are crucial for overcoming Malta's resource constraints and improving the efficiency of permaculture practices. Successful examples from other Mediterranean regions

demonstrate that permaculture can be tailored to address Malta's specific agricultural challenges, providing a viable framework for broader adoption.

However, for permaculture to thrive in Malta, substantial investment in farmer education and capacity building is necessary, bolstered by supportive national policies like the CAP and National Funding Schemes. These initiatives should focus on equipping farmers with the knowledge and skills needed to implement sustainable practices effectively. By merging technological advancements with targeted training, Malta can cultivate a more sustainable and resilient agricultural system that meets both environmental and economic goals, ultimately enhancing food security and promoting ecological balance.

Conclusion

Introduction

This chapter summarizes the key findings of the research, addresses the central research question, and reflects on the initial hypotheses. It also discusses the limitations encountered during the study and highlights its significance in the broader context of agricultural development. Furthermore, this conclusion explores opportunities for future research and offers policy recommendations aimed at fostering a resilient and sustainable agricultural sector in Malta through the integration of permaculture principles.

Study Overview

The thesis aimed to investigate the integration of permaculture into Malta's agricultural policies to tackle critical issues such as soil degradation, water scarcity, and an aging farmer population. Utilizing a qualitative methodology that included desk-based research and a comprehensive literature review, the study analysed various Maltese agricultural policies, including the National Funding Schemes and the Common Agricultural Policy (CAP) Strategic Plan. By examining the alignment of permaculture principles with these frameworks, the research aimed to provide policymakers with

actionable strategies for promoting sustainable agricultural practices in Malta, focusing on sustainability, economic viability, resource efficiency, and socio-cultural integration.

Salient Points

The findings reveal significant potential for permaculture to address the challenges facing Malta's agricultural sector. Key insights include:

- **Sustainability and Environmental Stewardship:** Permaculture principles, such as soil conservation and biodiversity preservation, offer effective solutions to Malta's environmental challenges, enhancing agricultural resilience (Galdies & Vella, 2019; Boix-Fayos & de Vente, 2023).
- **Economic Viability and Resource Efficiency:** Transitioning to permaculture could optimize resource use and reduce waste, benefiting small-scale farmers who face high production costs. National Funding Schemes, like those from the Agricultural and Rural Payments Agency (ARPA), could support this transition (ARPA, 2024).
- **Cultural and Social Integration:** Successful permaculture initiatives require community engagement. By integrating traditional farming practices and promoting cooperative models, permaculture can strengthen community ties and foster sustainability (Vela Almeida et al., 2023).
- **Policy Alignment and Government Support:** There is a strong alignment between permaculture principles and Malta's agricultural policies, particularly within the CAP Strategic Plan and the European Green Deal. However, challenges in policy implementation and the need for increased government support for sustainable practices remain (European Commission, 2024).

Answering the Research Question

The central research question was: "What practical strategies can policymakers adopt in the sphere of permaculture to foster a resilient and sustainable future for Malta's agricultural sector?" The analysis identified several strategies:

- **Integrating Permaculture with Existing Policies:** Policymakers could enhance the CAP Strategic Plan by promoting eco-schemes that incentivize soil conservation, organic farming, and water management (European Commission, 2024).

- **Government Support for Small-Scale Farmers:** Many small-scale farmers could benefit from targeted government incentives to transition to permaculture, addressing barriers such as limited financial resources and land access. Policies like the National Pig Welfare Scheme and the Fertilizer Voucher Scheme could facilitate this transition (ARPA, 2024).
- **Promoting Education and Training:** Developing training programs on permaculture techniques is essential. Collaborations with local institutions like MCAST and government agencies such as ARPA, which already offer training for young farmers, could be beneficial (ARPA, 2024).
- **Community-Based Initiatives:** Permaculture thrives in community settings that emphasize knowledge-sharing and cooperative farming. Policymakers should encourage the formation of community-based initiatives to support these practices.

Results of the Hypothesis and Propositions

The hypothesis posited that integrating permaculture into Malta's agricultural policies would foster a more sustainable, resilient, and economically viable agricultural system. The findings substantiate this hypothesis, revealing that permaculture provides effective solutions to many challenges confronting Malta's agricultural sector. The congruence between permaculture principles and existing policies, particularly in water conservation and soil management, further bolsters this proposition. The results suggest that permaculture could significantly enhance the long-term resilience of Malta's agricultural landscape, especially when bolstered by supportive government policies and funding initiatives.

Limitations of the Study

This research faced several limitations, primarily the reliance on secondary data. While desk-based research offered a comprehensive overview of permaculture's potential in Malta, the lack of primary data from local practitioners limited the depth of the findings. Additionally, the nascent status of permaculture in Malta resulted in a scarcity of case studies or empirical examples. To address these limitations, the study synthesized existing literature and analyzed relevant policy documents. Future research would

benefit from field studies or pilot projects that yield real-time data on permaculture practices in Malta.

Significance of the Findings

The findings hold significant implications. Firstly, they contribute to the sparse literature on permaculture's application in Malta, offering insights for policymakers and practitioners aiming to promote sustainable agriculture. Secondly, the study underscores the importance of government support in facilitating permaculture adoption through financial incentives and training programs. Lastly, the findings highlight permaculture's potential to tackle broader environmental and socio-economic issues in Malta, including water scarcity, soil degradation, and food security.

Further Studies

Future research could explore various aspects of permaculture and agriculture in Malta. One avenue is the implementation of pilot permaculture projects across different regions, which could provide empirical data on the effectiveness of these practices in local contexts. Additionally, investigating the economic impacts of permaculture adoption through cost-benefit analyses and market resilience studies would be valuable. Another promising area for research is the role of technology in enhancing permaculture practices, particularly in water management and digital farming solutions.

Conclusion and Recommendations

In conclusion, this study illustrates that permaculture offers a viable pathway toward a more sustainable and resilient agricultural system in Malta. The alignment of permaculture principles with existing agricultural policies, such as the CAP Strategic Plan and National Funding Schemes, lays a robust foundation for its successful integration into national strategies. To facilitate this implementation, several key actions are recommended:

1. **Increase Government Support:** Policymakers should enhance funding for permaculture initiatives, particularly in water conservation, soil enhancement, and biodiversity preservation, aligning these efforts with

the CAP Strategic Plan and the European Green Deal for maximum impact.

2. **Develop Training Programs:** Education and capacity-building initiatives are crucial for promoting permaculture among Maltese farmers. Collaboration with institutions like MCAST and ARPA to provide technical training and mentorship is essential.
3. **Encourage Community-Based Projects:** Policymakers should support community-based permaculture projects that engage local farmers, schools, and environmental organizations, fostering cooperative farming and knowledge-sharing to strengthen local agricultural resilience.

To this effect, permaculture presents a holistic approach to addressing the environmental, economic, and social challenges facing Malta's agricultural sector. By integrating permaculture into national policies, Malta can pave the way for a more sustainable and equitable agricultural future.

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