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**Advising the Romanian bell pepper farmers in
overcoming the limiting factors regarding
meeting supermarket requirements. A case
study of Olt and Dolj.**



In partial fulfilment of the requirements for the award of
master degree in Agricultural Production Chain
Management, specialization Horticulture Chain

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APCM - Horticulture Chain

Velp, the Netherlands
8 September 2021

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DEDICATION

I dedicate this work to the company I work for (Holland Farming Agro Ltd.), my family, and every person who contributed to it. Special dedication to Marius Velea helped me get in touch with important stakeholders and participate with valuable information towards finalising the report. I would also like to dedicate this work to my fiancée, Andreea Brezeanu, who decided to support me in starting and finalising a master degree in a foreign country, the Netherlands. She encouraged me throughout one of the most challenging years of my life by saying everything is possible if you believe.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

TABLE OF CONTENTS

PERMISSION TO USE	i
ACKNOWLEDGEMENT	ii
DEDICATION.....	ii
LIST OF TABLES.....	vi
LIST OF FIGURES.....	vi
EQUIVALENTS	vii
ABBREVIATIONS.....	vii
ABSTRACT	viii
1. INTRODUCTION.....	1
1.1. Structure of the report.....	1
1.2. Background information	2
1.3. Background of Holland Farming Agro Ltd. and Land of Farming Ltd.	2
1.4. Problem owner	3
1.5. Problem statement	3
1.6. Objective of the research	3
1.7. Research questions	4
2. LITERATURE REVIEW	5
2.1. Romanian agricultural sector	5
2.2. Bell pepper characteristics	6
2.3. High tunnels.....	7
2.4. Bell pepper cultivation	7
2.4.1. Bell pepper production in open field	7
2.4.2. Bell pepper production in high tunnels.....	8
2.4.3. Bell pepper's pests and diseases.....	8
2.5. Bell pepper's storage and shelf life.....	9
2.6. Limiting factors for Romanian bell pepper farmers.....	10
2.7. Supermarket collaboration	11
2.7.1. Farmers collaborating with the supermarkets	11
2.7.2. Romanian supermarket information.....	13
3. METHODOLOGY	14

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

3.1 Study area	14
3.2. Research strategy	15
3.3. Data collection and analysis	17
3.3.1. Data collection	17
3.3.2. Data analysis	18
3.4. Research framework	19
4. RESEARCH FINDINGS	20
4.1. Farmers' survey analysis	20
4.1.1. Background information of the farmers.....	20
4.2. Limiting factors affecting the bell pepper farmers collaborating with the supermarkets	34
4.3. Farming factors influencing bell pepper quality and yield entailed by the farmers	36
4.4. Supermarket requirements	37
5. DISCUSSION	38
5.1. The needed volumes the supermarkets require	38
5.2. Pests and diseases	39
5.2.1. Bell pepper pests.....	39
5.2.2. Bell pepper diseases.....	40
5.3. Pesticides residues.....	40
5.4. Grading, packaging, storing and transport of the bell peppers.....	41
5.5. Application of fertilizers	41
5.6. Reflection on research process and methodology	42
5.7. SWOT analysis.....	43
6. CONCLUSIONS	44
7. APPLIED RECOMMENDATIONS	47
REFERENCES.....	49
ANNEXES.....	53
Annex 1. Survey questions for the bell pepper farmers	53
Annex 2. Interview questions with the supermarkets involved in the bell pepper sub-sector in the regions Olt and Dolj	57
Annex 3. Interview questions with the input suppliers activate in the bell pepper sub-sector in the regions Olt and Dolj	58
Annex 4. Interview questions with bank representative	59

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Annex 5. Interview questions with the sales agent from the regions Olt and Dolj.....	60
Annex 6. List of all interviewed persons and their function	61
Annex 7. Raw data obtained from SPSS Statistic Software.....	54
Annex 8. SPSS Statistic Software output.....	55
Annex 9. Production stream sheet	80

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

LIST OF TABLES

Table 1. Farmers' age, number and per cent of total farmers in Romania	5
Table 2. Research strategies per sub-research question	15
Table 3. Average age of the farmers	20
Table 4. Farmers taking part in Farmer's Associations or Cooperatives	22
Table 5. Selling location of the bell peppers	23
Table 6. The distance the farmers need to get through to the wholesaler market	23
Table 7. The average time the farmers spend to the wholesaler market	24
Table 8. Number of farmers who choose to analyse the soil and the water	24
Table 9. The most devastating pest in the regions Olt and Dolj	27
Table 10. The most devastating disease in the regions Olt and Dolj	27
Table 11. The average selling price obtained by the farmers	28
Table 12. Farmers trying to collaborate with a supermarket	29
Table 13. Price difference between the selling locations (wholesaler market, supermarket)	30
Table 14. The challenges faced by the farmers when trying to collaborate with a supermarket	30
Table 15. Farmers grading the harvested bell peppers	31
Table 16. Packaging materials used by the farmers	31
Table 17. The number of farmers willing to cultivate niche products	32
Table 18. The challenges faced by the farmers when trying to cultivate niche products	33
Table 19. SWOT analysis	43

LIST OF FIGURES

Figure 1. The structure of the value of vegetal production on the main crop groups	5
Figure 2. Olt region	14
Figure 3. Dolj region	14
Figure 4. The regions Olt and Dolj and the offices of Holland Farming Agro Ltd. and Land of Farming Ltd.	14
Figure 5. Research Framework	19
Figure 6. Average farm size in the regions Olt and Dolj	21
Figure 7. The most cultivated hybrid of bell pepper in regions Olt and Dolj	21
Figure 8. Reasons for farmers not taking part in Farmer's Associations or Cooperatives	22
Figure 9. The region where is located the wholesaler market where farmers choose to sell the bell peppers	23
Figure 10. The reasons why the farmers choose not to analyse the soil and the water before cultivating	25
Figure 11. Pest management	26
Figure 12. The selling price farmers obtained at the beginning of harvest - end of May	28
Figure 13. The selling price farmers obtained at the field work's week - middle of July	29
Figure 14. The relationship between the farmers which take part in a Cooperative and the selling location the supermarkets	34
Figure 15. The relationship between the farmers which take part in a Cooperative and the usage of temperature control van to carry the output	35

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

EQUIVALENTS

1 € = 4.94 lei

1 leu = 0.20 €

ABBREVIATIONS

ANPC – National Authority for Consumer Protection

BNR – National Bank of Romania

BOPP – Bi-axially Oriented Polypropylene

CMV – Cucumber Mosaic Virus

EC – European Commission

EC – Electrical Conductivity

EU – European Union

FOPCD – Filamentous Oomycete Phytophthora Capsici Diseases

GAP – Good Agriculture and Practices

GMO – Genetically Modified Organism

HFA – Holland Farming Agro Ltd

INS – National Statistical Institute

IPM – Integrated Pests Management

LDPE – Low Density Polyethylene

MADR – Ministry of Agriculture and Rural Development

MAP – Modified Atmospheric Packaging

MRL – Maximum Residue Level

NGO – Non-Governmental Organisation

PP – Polypropylene

TOC – Total Organic Carbon

TSWV – Tomato Spotted Wilt Virus

USA – United States of America

USAID – United States Agency for International Development

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

ABSTRACT

Bell pepper is a very popular crop in Romania's Western and Southern parts, and many smallholder farmers choose it. This study focused on the farmers' practices and relationships with the supermarkets in the Southern regions Olt and Dolj.

The study involved a literature review on bell pepper, high tunnels cultivation, limiting factors for the farmers of the Romanian bell pepper, and Romanian supermarket information. Moreover, field work was conducted with the help of Sever Meleru, the sales agent in the mentioned regions, and the General Director of Holland Farming Agro Ltd. in two periods: 12-18 July and 16-18 August. The data were collected through a farmers survey and semi-structured interviews with the other stakeholders involved in the bell pepper sub-sector.

The survey was analysed using SPSS Statistic Software for statistics analysis graphs, the Independent Sample T-test was used to verify the differences in scale data between two different groups and the Chi-Square test was used to find differences between two groups. The confidence level was taken at 95% ($P < 0.05$). To find answers to the main question of the research, both quantitative and qualitative data were collected and triangulated.

The study revealed that most farmers work as individuals, not being part of any form of association. The small percent of farmers who are taking part in a cooperative were the only ones collaborating with the supermarkets.

Pests, diseases, and incorrect fertilization schemes have proved to be significant challenges for the Romanian smallholder farmers. Other challenges include the low selling price of the bell peppers in the wholesaler markets, excessive use of plant protection solutions, farmers travelling far distances to the wholesaler markets, and many others.

Recommendations were guided towards farmers' future improvement highlighting the advantages of basing a local cooperative and how farmers can deal easily with pests and diseases infection and spread.

Finally, future research is suggested to focus on-farm practices and the exact output the farmers obtain.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

1. INTRODUCTION

1.1. Structure of the report

This study is about the limiting factors affecting the bell pepper farmers from the South of Romania, the regions Olt (Figure 3) and Dolj (Figure 4) in supermarket requirements. Moreover, the map of Romania highlighting the two regions and the headquarters of the mentioned companies can be seen in Figure 5. This study has been selected because although the bell pepper is cultivated across Romania, the farmers cannot increase the income to improve their livelihoods or production systems.

This study aims to test the factors that limit the Romanian bell pepper growers from the Olt and Dolj regions to meet the supermarket requirements. The ultimate goal of the research is to provide suggestions for bell pepper producers to solve their problems.

The report is structured around the research questions into six other chapters.

The subsequent sections of this chapter are presented some background information about the bell pepper sub-sector in the mentioned regions, background information of HFA and Land of Farming Ltd., the problem statement, the problem owner, the objective of the research and the research questions.

Chapter two presents a crucial literature review section on bell pepper characteristics and cultivation, high tunnels cultivation, limiting factors for Romanian bell pepper farmers and Romanian supermarket information. While chapter three is highlighting the methodology, including the study area, the research strategy, the process of data collection and data analysis and the limitations of this study.

Chapter four deals with research findings directly related to the research questions presented in chapter one based on the farmers' survey and the interviews with the other stakeholders involved (input suppliers, a bank representative, supermarkets and the field officer from HFA).

Chapter five presents the discussion by critically looking at the qualitative and quantitative data collected and comparing it with existing scientific literature. Some results based on the field work realised are presented in the form of a SWOT analysis.

Chapter six illustrated the report's conclusions based on the findings (chapter four) and discussion (chapter five) by presenting the answers to every research question mentioned in chapter one, section six. The last chapter is applied recommendations for future farmers' improvement.

This study has nine annexes placed after the references: the first one is illustrating the farmers' survey, annexes 2-5 presents the based questions used for the interviews with stakeholders, annex six is revealing the names of all participated persons and their function, annex seven contains the raw data from the SPSS programme, annex eight presents the output from SPSS Statistic Software and annex nine is an example of production stream sheet for supermarket requirements.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

1.2. Background information

I represent two Romanian-based companies: an input supplier (*Holland Farming Agro Ltd.*) and a sweet pepper producer (*Land of Farming Ltd.*). Both companies participate in a sweet pepper value chain governed by the *Cooperative FVHC Fresh Vegetables for Healthy Consumers*.

The main characteristic of indoor bell pepper production is that the production happens 100 % in soil, in unheated tunnels (plastic-covered greenhouses). The growing season starts at the end of March and ends in November. On the other hand, the harvesting season starts at the end of May and ends in November. The production is depending on climatic factors. If it is a chilly end of March, the production and the harvesting seasons are delayed by a minimum of 1-2 weeks.

An essential characteristic of the Romanian indoor bell pepper sector is that the farmers' cultivation area for production is on average 3.000 m², but the farmer's number is very high. As stated in the interview with the General Director of Holland Farming Agro Ltd., Velea (2021), in the regions Olt and Dolj are approximately 2.300 indoor bell pepper farmers, cultivating around 700 ha.

According to Velea (2021), across Romania, the pepper sector is divided as follows:

- 65-70 % Yellow Wax bell pepper (the most popular type of bell pepper cultivated);
- 25 % Kapy type;
- 5 % Tomato pepper.

1.3. Background of Holland Farming Agro Ltd. and Land of Farming Ltd.

Holland Farming Agro Ltd. is a Romanian input supplier with headquarters in Romania, Bucharest, but is active in the whole country with the help of the sales agents and the local distributors. The company was born 24 years ago and started imported a bio stimulator from the Netherlands, Cropmax. At this moment, the company is importing more than 600 products from developed countries from well-known producers, such as the Netherlands (Rijk Zwan, Barenbrug), Spain (Agrobio, Atlantica Agricola), Israel (ICL) and Germany (van Waveren).

Moreover, HFA owns an internal laboratory for soil and water analysis. It is well known that an elaborate fertilisation scheme is needed to have a successful production regarding yield and quality. Agrochemicals play an essential role in modern industrialised and intensive farming methods, making possible the growth of foods on previously uncultivable land and maximising the yield of a given soil. The only way for the farmers to know what quantity and type of fertilizer they need is to analyse the soil and the water.

Land of Farming Ltd. is a California sweet pepper producer on a two ha surface in a high-tech greenhouse. The company was born five years ago with funding from the EU and was among the first hydroponic greenhouses from Romania. Pest management is realised by using biological control with predators, so the sweet pepper is free from pesticide residues. The company is annually producing 400 tons of sweet pepper distributed by the cooperative Fresh Vegetables for Healthy Consumers to the supermarket chains active all over Romania.

Among the cooperative members are all the high-tech greenhouses from Romania. The cooperative has proved to be a reliable way to negotiate better prices and control the retailer.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

1.4. Problem owner

The problem owner is the General Director of the input supplier company Holland Farming Agro Ltd. The company is interested in developing the bell pepper sub-sector in Romania because it imports many inputs for bell pepper cultivation (hybrid and varieties seeds, bio stimulators, chemical fertilisers, seedling pots, peat and many others).

Holland Farming Agro Ltd. (HFA) is becoming an important input supplier for the agricultural sector in Romania. In the bell pepper sub-sector, most of the farmers and most of the company's clients growing bell pepper are located in the Southern parts of Romania, especially in the regions Olt and Dolj.

1.5. Problem statement

The bell pepper is cultivated across Romania in many districts, especially in the South and West in the lowland parts. The problem that needs to be solved is farmer's low return from bell pepper cultivation. Many causes affect this sub-sector, including low production in terms of quality and quantity, lack of supermarket access, lack of organisation among the farmers, the unwillingness of the farmers to apply modern technologies, the lack of associations between farmers, and many others.

Moreover, the prices obtained from the farmers from selling the bell peppers in the wholesaler markets are relatively low many times, and they are very unhappy with this situation. A collaboration with the supermarkets would increase the selling price for the farmers, but to do so, many things need to be improved.

To solve the problem of farmer's low return, HFA needs to know more about supermarket requirements (and regulations), the farmers' current produced volumes, their actual potential and the problems entailed by the farmers during a cultivation year. With this information, Holland Farming Agro Ltd. can help the farmers by solutions for bottlenecks they entailed during the yearly bell pepper cultivation.

The low return obtained by farmers affects HFA: late payments from the farmers (sometimes the lawyers need to solve the refund problems). Moreover, the company goes by the Central and West Europe trends: applying on-field technologies, complex fertilisation schemes, biological control of the pests, etc. Because the farmers obtain a low return from their crops, it is clear that they are not willing to apply modern technologies which can increase their production, respectively, their income.

1.6. Objective of the research

This research aims to detect the factors that limit the Romanian bell pepper farmers from the regions Olt and Dolj in meeting supermarket requirements. The final objective of the research is to advise the bell pepper farmers in solving the entailed problems because the problem owner (HFA) has an interest in the well-being of its clients, ensuring prosperity in both ways.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

1.7. Research questions

The objective results in the following main research questions with sub-questions:

- 1. What are the limiting factors which affect the Romanian bell pepper farmers' increase in their income?**
 - 1.1. What are supermarket requirements in terms of quality and quantity?
 - 1.2. What are the factors which limit the farmers in meeting the supermarket requirements?
 - 1.3. What are the farming factors influencing bell pepper quality and yield entailed by the farmers during a cultivation cycle?
- 2. How can the Romanian bell pepper farmers increase their income?**
 - 2.1. What opportunities and constraints are in the bell pepper sub-sector?
 - 2.2. What are possible solutions to the problems entailed by the farmers?

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

2. LITERATURE REVIEW

2.1. Romanian agricultural sector

According to the Romanian Ministry of Agriculture and Rural Development (MADR) (2015), Romania has an agricultural capacity of approximately 14.7 million hectares, of which 10 million are considered arable land.

The INS (National Statistical Institute) provided the structure of the total value of agricultural products in terms of vegetal production across Romania in the year 2020. The structure of the value of vegetal production on the main crop groups can be seen below in Figure 1. By comparing the situation with the past year, 2019, the INS mentioned a few differences:

- Increases in the share of production were recorded for: vegetables (+ 4.2 %), fruits and grapes (+ 3.6 %), fodder plants (+ 1.2 %) and potatoes (+ 1.0 %);
- Decreases in the share of production values were recorded for: cereals (- 7.6 %), other groups of products (- 1.6 %) and oil seed plants (- 0.8 %).

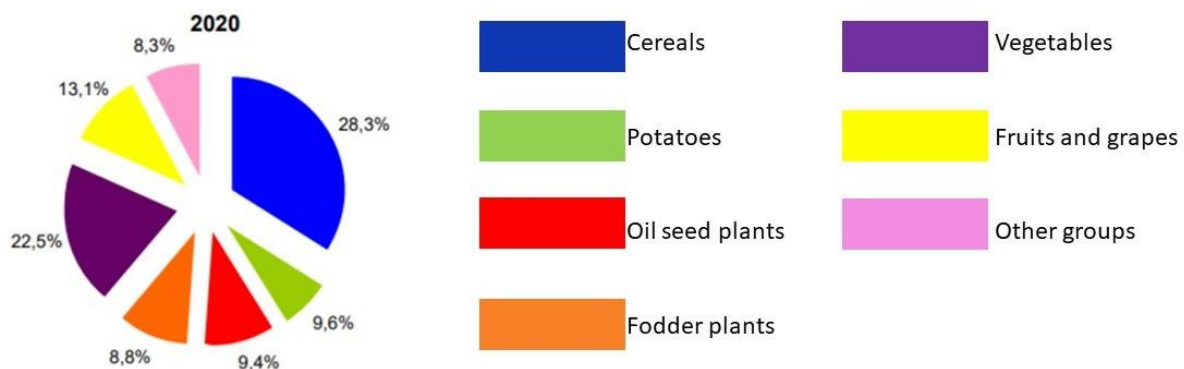


Figure 1. The structure of the value of vegetal production on the main crop groups. Source: The Author, 2021

Ionescu, Paschia and Coman (2019) noted that the Romanian agricultural sector is being threatened by aged farmers and farm managers, which are adversely affected by development, modernisation, competitiveness and acceptable environmental practices. Young farmers need to take over, increase productivity, expand organic crops and increase market access. Statistical data conducted by the European Commission (EC) in 2020 also shows a big difference between the numbers of young farmers versus the numbers of old farmers, as shown in Table 1.

Table 1. Farmers' age, number and per cent of total farmers in Romania

Farmers' age	Number	Per cent (%)
< 35 years	105,590	3.1 %
35-44 years	399,850	11.7 %
45-54 years	632,780	18.5 %
55-64 years	765,450	22.4 %
> 65 years	1,515,570	44.3 %

Source: European Commission, 2020

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

According to Scurtu and Lacatus (2013), one of the main entailed problems in the Romanian vegetable sector is the small number of used agricultural land per farmer – too many small farms and few big farms. The EC also backed up this information in 2020. The smallest farms, accounting for 91.8 % of the total number of farms, have less than 5 ha, while the largest (over 100 ha) represent 0.4 % of the total number of farms.

The same study revealed that the farmers apply fertilisers and plant protection products without a scientific base. The knowledge acquired by Holland Farming Agro Ltd. during the years is in line with this statement. The majority of the farmers are unwilling to analyse the soil and the water used before applying various products. A study conducted by Ge et al. (2010) revealed that incorrect farm management practices applying fertilisers without a scientific base affect soil chemical practices in terms of pH, EC (Electrical Conductivity), exchangeable Potassium (K⁺), Calcium (Ca), Magnesium (Mg), Sodium (Na), Phosphorus (P), TOC (Total Organic Carbon) and total Nitrogenous (N total). Moreover, microbial activity and growth are also affected by the excess use of chemical products without a scientific base.

2.2. Bell pepper characteristics

There are four types of common bell peppers in terms of colour: green, orange, yellow and red, but rare varieties exist as well: white, brown and purple. It is well known that the unripe bell peppers begin as green on the plants, and the colour changes from green to yellow, orange, and red the longer it is allowed to mature on the plant. The green bell peppers have a bitter flavour, while the orange and yellow bell peppers are sweaters. The sweetest type of bell pepper is the red one.

The yellow coloured bell pepper is commonly known in Romania as the *Yellow Wax* bell pepper. It is one of the most cultivated types of bell pepper in Romania, and most of the bell pepper farmers choose this type.

Bell pepper (with the botanical name – *Capsicum annuum* L. ssp. *annuum*) is a thermophile vegetable species, which according to statistics from Tridge (2019), worldwide produces over 38 million tons of fruits. A study conducted by Sreeramulu and Raghunath in 2010 revealed that bell pepper fruits are an essential source of antioxidants (such as ascorbic acid, carotenoids and tocopherols). Moreover, another study conducted by Serpeloni et al. in 2015 revealed the beneficial bioactivities of the bell pepper fruits to human health, reducing the risk of cancer, heart diseases and diabetes.

The high concentration of antioxidants in bell peppers is well known. Literally, “antioxidants” means “against oxidation”. Dekkers, Doornen and Kemper (1996) stated that antioxidants are effective because they are willing to give their electrons to free radicals. When free radicals obtain electrons from antioxidants, they no longer need to attack cells, breaking the oxidation chain reaction.

There are two types of antioxidants: synthetic and natural. On the one hand, the synthetic antioxidants have been used in the composition of various foods since the beginning of this century. Although according to a study conducted by Ito et al., (1983), restrictions in using these compounds are introduced due to the carcinogenic effect. On the other hand, as reported by Dorman et al., (2008),

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

natural antioxidants have been extensively studied for their ability to protect the body and the cells from damage induced by oxidative stress.

Vitamin C is considered an essential compound in the body, as collagen production, a fat transporter, a cholesterol regulator, and an immune enhancer. The bell peppers are well-known for their richness in vitamin C. A study conducted by the University Sebelas Maret (2018) revised the concentration of vitamin C in various colours of bell peppers. The determination of vitamin C content in sweet peppers shows that sweet yellow peppers have the highest vitamin C content, while sweet green peppers have the lowest.

2.3. High tunnels

The Romanian bell pepper production is realised in tunnels (plastic-covered greenhouses) having a metallic or wood structure on standard soil cultivation. According to a study realised by Scurtu and Lacatus in 2013, bell pepper production happens on a surface of 9,500 ha spread all over South and West Romania's agricultural areas, producing yearly 285 thousand tons.

According to Wells (1996), high tunnels (or plastic tunnels) are portable, greenhouse-like structures with one or two layers of plastic and may or may not be heated, powered or ventilated. The benefits of high tunnels include higher daytime temperatures, higher growth days and faster crop maturity (Waterer and Bantle, 2000), higher night temperatures which help the warm-season crops avoid early or late frost (Waterer, 2003), and the ability to produce crops or varieties that are not feasible or reliable in open-air production (Wildung and Johnson, 2010).

A study conducted by Fitzgerald and Hutton (2012) interviewed 31 vegetable farmers with 52 plastic tunnels across Maine (USA) to collect information about their plastic tunnel use compared to open field cultivation. As stated by the authors, the extended season can allow Maine farmers to grow crops that are not allowed in the short season in an uncovered system. The early supply of products can be translated into higher market prices. Additionally, the farmers reported that when plastic tunnel crops are harvested, less time is needed for the labourers to clean, sort and prepare for market.

2.4. Bell pepper cultivation

2.4.1. Bell pepper production in the open field

A study conducted by Coolong, da Silva, and Shealey (2019) assessed the yield of bell pepper cultivation in the open field about Nitrogenous (N) fertilization. The authors organised field research for two years at The University of Georgia Tifton Vegetable Park in Tifton (USA). Before transplanting the bell pepper seedling, the soil was analysed pH and the concentration of Phosphorous (P), Potassium (K), and Calcium (Ca). After the analysis and during the cultivation season, additionally, fertilization was necessary with Nitrogenous (N), Phosphorous (P), Potassium (K) and Calcium (Ca) by using different chemical fertilizers from local suppliers. The study concluded that no increase in production was observed with increased fertilisation and total production was below commercial expectations in the region.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

2.4.2. Bell pepper production in high tunnels

A study conducted by Sideman (2020) compared bell pepper cultivars in three different environments (high-tech greenhouse, high plastic tunnels and open field) in Northern New England by assessing the marketable fruits. According to the author, the tunnel was equipped with manual roll-up sides and automatic ventilation fans. Moreover, each cultivation season, the plastic tunnel was prepared by rototilling and forming raised beds using a small tractor-mounted bed former. The fertilization scheme was rigorous and on point with chemical fertilizers, and the pests were controlled using Integrated Pests Management (IPM) and foliar applications of compatible and homologated chemical insecticides.

At the end of the study, the author revealed that using a correct fertilization scheme and optimal IPM combined with chemical insecticides allows farmers to obtain a large amount of marketable bell peppers, more than 85 %, with an average of 1.5-2.2 kg of marketable fruits per plant. Sideman stated that the varieties developed for protected crops are more likely to exhibit stable and continuous production throughout the growing season than the field varieties (Sideman, 2020).

A study conducted by Zheng et al., (2019) evaluated the beneficial effects on temperature changes within the high tunnel system in eastern Tennessee (USA) and further studied the effects of temperature changes on crop production. According to the authors, the high tunnels influence the indoor microclimates by raising climatic factors such as solar radiation, air and ground temperature, wind speed and relative humidity. The study concluded that the plastic tunnels could stimulate bell pepper's growth and extend crop yields caused by positive environmental changes, such as higher air and soil temperature in the high tunnel during the day and night compared with the outside temperature.

2.4.3. Bell pepper's pests and diseases

2.4.3.1. Bell pepper's pests

A study conducted by Kumar (1994) determined the pests which affect yearly the bell pepper production: thrips (*Scirtothrips dorsalis* Hood), white fly (*Bemisia tabaci* Gennadius), aphids (*Myzus persicae* Sulzer), broad mites (*Polyphagotarsonemus latus* Banks), fruit borer (*Helicoverpa armigera* Hubner) and tobacco caterpillar (*Spodoptera litura* Fabricius). Applying chemical pesticides to control the infection harm the environment and, bell pepper fruits can retain a high level of pesticides residues.

Sardana, Bhat and Sehgal (2012) stated that incorporating integrated pest management (IPM) strategies into participatory methods can significantly reduce the use of harmful pesticides. The study showed that bell peppers from IPM fields that receive fewer chemical sprays might contain fewer pesticides at harvest than products from non-IPM fields that receive more chemical sprays, which is crucial to the environment and human health. Therefore, the IPM technology used is directly environmentally friendly, but the increase in biodiversity (natural enemies, soil flora and fauna) is more sustainable.

According to Velea (2021), a new pest can decimate the bell pepper crop, a relatively new pest – the Sunn pest, *Eurygaster integriceps*. According to Olanca et al., (2016), the Sunn pest affects the

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

wheat crops in Russia by injecting digestive enzymes into the seed endosperm. Furthermore, a study conducted by Vilkova et al., (2018) revealed that the potential loss of wheat yield caused by this pest could reach 20-50 %, depending on the soil and climatic zone, planting techniques and varieties, without protection measures, the loss of susceptible varieties can be even more significant.

2.4.3.2. Bell pepper's diseases

According to Lanour et al., (2012), the Filamentous Oomycete *Phytophthora Capsici* Diseases (FOPCD) decimates the bell pepper production worldwide and is responsible for 1 billion \$ in losses in vegetable production every year. This fungus causes root and crown rot simultaneously with the aerial blight of leaves, fruit, and stems, but the symptoms differ according to crop type, infected plant parts and environmental conditions.

A study conducted by Sundaramoorthy et al., (2012) revealed that *Fusarium Wilt* is the most entailed soil-borne disease in bell pepper cultivation, causing many losses in different countries worldwide. The *Fusarium* disease can also affect the internal part of the bell pepper fruits.

Tomato Spotted Wilt Virus (TSWV) is causing a significant decline in the global production of bell pepper. A study conducted by Rice et al., (1990) determined the complex control of the disease due to the wide host range of viruses and thrips, low chemical control efficiency, and low resistance to insecticides are quickly acquired by thrips species. The authors mentioned that the resistance cultivars of bell pepper to TSWV are an effective way to control the disease and positively impact the environment caused by the non-abuse of chemical insecticides and plant protection products.

According to Avilla et al., (1997), the Cucumber Mosaic Virus (CMV) is a seed-borne disease in peppers, which can cause more than 80 % of the yield loss in years of severe local epidemics. A study conducted by Palukaitis and Garciaarenal in 2003 revealed that more than 80 species of aphids (*Myzus Persicae* Sulzer) could transmit the virus between plants. There are plenty of ways to control the CMV infection in bell pepper cultivation, such as chemical or biological control of the aphid's infection or eradicating the infected plants. Although, according to Yao et al., (2013), the most effective way to stop and to control the CMV infection is to use disease-resistant bell pepper cultivars or hybrids.

2.5. Bell pepper's storage and shelf life

Bell pepper is a perishable vegetable and requires proper handling and care to maintain its shelf life and quality. Gross, Wang and Saltveit (2016) defined clearly the optimal storage conditions for bell peppers. After harvest, the authors recommend that the bell pepper for the fresh market be cooled at no lower than 7 °C with a maximum of 12 °C and at high relative humidity (90-95 %) to reduce water loss shrivel and desiccation. The fresh bell peppers can be stored for 2-3 weeks by using the optimal storage conditions.

Moreover, the bell peppers are subject to chilling damage when stored at temperatures below 7 °C. The most common symptoms are surface pitting, water-soaked areas, decay (especially *Alternaria*), and discolouration of the seed cavity. While storing above 13°C, the ripening will accelerate, and bacterial rot may appear. Storage at 5°C can reduce water loss and maturity, but chilling injury will occur after two weeks (Gross, Wang and Saltveit, 2016).

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

The shelf life of the bell pepper is commonly 2-3 weeks, depending on the cultivar and on the storage and handling practices. A study conducted by Rai and Paul (2007) reported that using different polymer films to package fresh produce can extend shelf life by up to 7-10 days. The combination of polymer film packaging and cold storage has succeeded in maintaining physical and chemical components and extending the shelf life. However, choosing the correct packaging film and packaging technology is an important benchmark for its shelf life. Incorrect film selection and packaging technology will lead to quality degradation in a short period.

Additionally, a study conducted by Sahoo et al., (2014) compared different packaging materials in ambient and refrigerated conditions used for the freshly harvested bell peppers assessing the product's shelf life. The materials used were the following: modified atmospheric packaging (MAP) with low-density polyethylene (LDPE), MAP with polypropylene (PP), MAP in perforated LDPE films, MAP with perforated PP films, shrink packaging with bi-axially oriented polypropylene (BOPP) film and vacuum packaging with PP film. The study concluded that MAP with perforated PP film was the best under refrigeration conditions among the different packaging materials and storage conditions, followed by vacuum packaging with PP film under refrigeration conditions. It can be inferred that compared to 4 days in ambient conditions, the MAP with perforated PP film packaging can store bell peppers under refrigeration conditions for 20 days and maintain the texture, colour, and ascorbic acid marketability.

2.6. Limiting factors for Romanian bell pepper farmers

According to the data obtained from the General Director of Holland Farming Agro Ltd., Velea (2021), there is no nursery for young plants in Romania. Every farmer grows seedlings in a small tunnel heated with primitive equipment (stove, ovens etc.). Most of the time, the tunnel is located near their homes. Other farmers are producing the seedlings in their own houses. This strategy allows them to delay the planting period.

According to Velea (2021), farmers load their bell peppers in vans and go to different agro-food markets (in proximity or not of their cultivating areas), waiting for traders to step in and buy their products. The waiting sometimes lasts for 1-2 days. In this time, the crop is neglected, being attacked by different diseases or by pests. Because the farmers are usually responsible for selling the bell peppers, they do not have sufficient time to observe the crop. Hence, they cannot apply modern technologies to increase their yield or quality.

Most Romanian bell pepper farmers are not organised in any associative form (cooperatives, producer groups etc.). Every farmer is acquiring the inputs independent of other farmers. In the same way, the farmers individually realise the selling of their output. On the other hand, according to Florea et al. (2020), Romanian agricultural cooperatives had developed, starting in 2005 (when there was a total number of 25 cooperatives), up to the last year – 2020 (when the total number of registered cooperatives was beyond 1,500). However, as the authors mentioned, the number of active cooperatives is crucial, not the actual total number. A functional cooperative is one through which the rollover is carried out. It positively influences its members and can ensure the value chain during a cultivation cycle/year (Florea et al., 2020).

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Velea (2021) highlighted that the Romanian bell pepper farmers do not have: good logistic and good post-harvest practices, time to package the output in special crafts or boxes, the funds needed to invest in a frigorific deposit or vans with controlled temperature, so they cannot deliver as the supermarket requires.

A study conducted by Sala, Rujescu and Constantinescu (2016) at the Didactic Station (BUASVM) Timisoara, Romania, assessed the low interest in N-P-K fertiliser usage in the wheat sector. The experimental study included the differential distribution of fertilisers with N and PK complexes to control nutritional deficiencies. Based on the yield obtained and the related economic factors, two scenarios were used: changes in wheat sale prices and fertiliser prices. Each scenario had several variants. According to the authors' recommendations, for the use of N-P-K fertiliser to be profitable, the farmers should receive a higher price for their output.

This study offered a different view of the research because the prices of the inputs are getting expensive year after year and the growing difference between the Euro (€) currency and the Romanian leu. Most of the inputs from the Romanian market are produced abroad (the United Kingdom, the Netherlands, USA, and Israel etc.) and imported by several companies.

According to the National Bank of Romania (BNR) (2016 & 2021), the difference has grown by 8.13 % in the last five years, comparing the currency from 30th June 2016 and the current date of the document 10th of June 2021. Perhaps the increase in the inputs and the decrease in the output's selling price affect the bell pepper farmers even more.

2.7. Supermarket collaboration

Lee et al., (2010) mentioned the most important difference between wholesalers and supermarkets. First of all, wholesalers usually buy everything that farmers want to sell, regardless of the size or other characteristics of the product, and pay cash for the product on the spot. While on the other hand, supermarkets have centralized purchasing systems equipped with specialized wholesalers, and they coordinate the purchase and classification of products according to private standards. Farmers selling products to supermarkets need infrastructure, inputs, and knowledge to meet product size, shape and quality standards, as well as flexible and timely deliveries of large quantities of products.

2.7.1. Farmers collaborating with the supermarkets

According to Reardon and Berdegue (2002), over the past 20 years in the Global South, countries liberalized their economies and encouraged foreign direct investment, prompting capital inflows from multinational retail companies such as Ahold, Carrefour, and Wal-Mart, supermarkets began to expand rapidly.

In Nicaragua, the smallholder farmers were helped to develop and commercialize agricultural products by an NGO financially supported by USAID (United States Agency for International Development) from 2007 until 2012 through a development program. The project developed other three international NGOs which supported four local farmers' Cooperatives by negotiating supply

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

agreements and mediating communication between farmer cooperatives and the two supermarket chains management (La Colonia and Walmart) (Escoto et al., 2012).

In the study of Nicaragua, Escoto et al., (2012) highlighted that the farmers were selected in areas where the average farm is less than 10 ha. They have already been producing fresh vegetables, but the production and the value-added technologies were inappropriate or inefficient, the level of agricultural competitiveness was low, and access to credit was limited. The program targeted existing cooperatives, which had between 254 and 30 members each in 2013.

Moreover, the authors mentioned the NGO was vital in this supply chain by providing the farmers with technical assistance, training, and subsidized irrigation to improve their ability to meet supermarket requirements for fresh fruit and vegetables, including product standards. A crucial characteristic of the cooperatives was that the farmers joined voluntarily to meet their economic needs and aspirations. The farmers were expected to sell the output via the local cooperatives to the supermarket chain they had an agreement with.

Seven years after the program ended, a study conducted by Elder (2019) was focused on the impact of specific cooperative-supermarket supply chain relationships on smallholder farmer cooperatives in Nicaragua. The field surveys included surveys of 110 farmers who grow vegetables in two supermarket chains (Walmart and La Colonia) and 51 surveys of Walmart and La Colonia executives, government authorities, NGOs, representatives and cooperative leaders.

The study results showed that the performance of cooperation depends on the characteristics of farmers and farms, such as cultivation area and irrigation. When designing development interventions that link farmers to the market, NGOs should consider the characteristics of farmers and farms and the way buyers manage their supply chains not to increase smallholders' vulnerability. Although, it was concluded that it was beneficial to create these linkages between farmers and supermarkets via local cooperatives.

Especially for fresh fruits and vegetables, supermarkets often sign contracts directly with farmers to ensure consistent, high-quality supplies. This is commonly known as contract farming. Reardon and Timmer (2014) stated that agricultural contract agreements, especially contracts with supermarkets, can provide new marketing opportunities for small farmers in developing countries. Smallholder farmers can benefit from higher and more stable prices and better access to inputs, technology, and information.

A study conducted by Ogutu, Ochieng and Qaim (2020) assessed the implications of supermarket contract farming in terms of income in the Kiambu region, Kenya. The authors interviewed 402 smallholder vegetable farmers, out of which 33 % had a supermarket contract, and the rest were supplying the traditional markets.

The data from vegetable growers in the Kiambu region indicated that supermarkets and contract farming had contributed to significant income growth for the smallholder farmers. Having a supermarket contract can increase household income by an average of about 40%. The increase in

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

revenue was mainly because supermarkets paid higher prices than vegetable buyers in traditional markets.

2.7.2. Romanian supermarket information

During his working experience as a director of a Californian sweet pepper producer, Velea (2021) realised the supermarkets are very strict when selecting sweet peppers, and most of the time, the farmers cannot meet the requirements. On the other hand, the competition from Turkey, Jordan, and Spain meet the supermarket requirements, so their bell peppers are accepted to the detriment of the Romanian bell pepper farmers (Velea, 2021).

Romania is part of the European Union (EU) since 2007, so it has to obey the standards and requirements imposed by the European Commission (EC) when retailing various fresh vegetables of fruits (European Commission, 2021).

The EC has many regulations, but the most significant one is related to the use of pesticides. To avoid risks to health and the environment, the European Union (EU) has established the Maximum Residue Level (MRLs) of pesticides in food. Supermarket chains maintain the highest standards, requiring 33% to 100% of the legal MRL (CBI, 2021).

Moreover, plant health and phytosanitary regulations are widespread in Europe. Fruits and vegetables exported to the EU must comply with European legislation on plant health. The European Union has established sanitary and phytosanitary requirements to prevent the introduction and spread of organisms harmful to European plants and plant products. Most fresh fruits and vegetables undergo sanitary inspections and require a phytosanitary certificate before retail sales. The phytosanitary certificate is provided by the phytosanitary authority and must guarantee that the product is properly inspected, free of pests, and complies with the phytosanitary requirements (CBI, 2021).

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

3. METHODOLOGY

This chapter introduces the research fields, questions to be answered in the research, research strategies, including data collection and analysis, and highlights some inherent weaknesses in the methodology.

3.1 Study area

The area was selected because the districts Olt (Figure 2) and Dolj (Figure 3) represent two significant agricultural areas from Romania, where most of the farmers cultivate vegetables in plastic tunnels, such as bell pepper, Kapya pepper, tomatoes etc. Moreover, in these two regions, the sales agent is one of the most experienced one working with HFA since 2012, Sever Meleru. He has excellent relationships with the local distributors and with the farmers, generating an important percent of the company's annual turnover.

Figure 5 presents the map of Romania, the two regions where the field work happened and the offices of Holland Farming Agro Ltd. and Land of Farming Ltd.



Figure 3. Olt region.
Source: pe-harta.ro

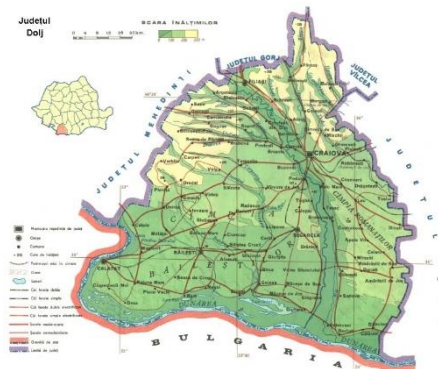


Figure 2. Dolj region.
Source: pe-harta.ro

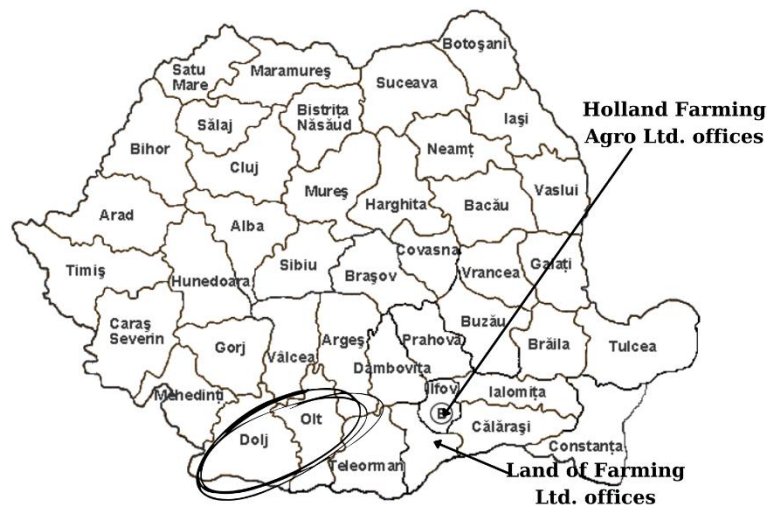


Figure 4. The regions Olt and Dolj and the offices of Holland Farming Agro Ltd. and Land of Farming Ltd.
Modified source: cmvro.ro

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

3.2. Research strategy

To find answers to two main research questions, quantitative and qualitative data will be collected and triangulated. The methods for data collection included a desk study, case study, and survey study. Table 2 illustrates the planned strategies used for collecting data, divided for every sub-research question.

Table 2. Research strategies per sub-research question

No.	Sub-research question	Source of data	Methods to collect data	Expected output
1.1.	What are supermarket requirements in terms of quality and quantity?	<ul style="list-style-type: none"> Retailers active in the regions of Olt and Dolj; Literature. 	<ul style="list-style-type: none"> Semi-structured interview with supermarkets: Carrefour and Mega Image; Desk study. 	The specific supermarket requirements.
1.2.	What are the factors which limit the farmers in meeting the supermarket requirements?	<ul style="list-style-type: none"> Bell pepper farmers; Input suppliers; Sale agent of HFA; Literature. 	<ul style="list-style-type: none"> Farmers' survey; Semi-structured interview with input suppliers, sales agent of HFA; Desk-study. 	Factors limiting the farmers in accessing the supermarkets as retailers.
1.3.	What are the farming factors influencing bell pepper quality and yield entailed by the farmers during a cultivation cycle?	<ul style="list-style-type: none"> Bell pepper farmers; Input suppliers; Sale agent of HFA; Literature. 	<ul style="list-style-type: none"> Farmers' survey; Semi-structured interview with input suppliers, sales agent of HFA; Desk-study. 	Factors affecting bell pepper quality and yield entailed by the farmers.
2.1.	What opportunities and constraints are in the bell pepper sub-sector?	<ul style="list-style-type: none"> Input suppliers; Supermarkets; Bell pepper farmers; Bank representative. 	<ul style="list-style-type: none"> Farmers' survey; Semi-structured interview with supermarkets, input suppliers, sales agent of HFA, bank representative. 	SWOT analysis about the bell pepper sub-sector in regions Olt and Dolj.
2.2.	What are possible solutions to the problems entailed by the farmers?	<ul style="list-style-type: none"> Input suppliers; Supermarkets; Bell pepper farmers; Bank representative. 	<ul style="list-style-type: none"> Farmers' survey. Semi-structured interview with supermarkets, input suppliers, sales agent of HFA, bank representative. 	Possible solutions focused on the problems discovered from the farmers.

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

For the first sub-research question, desk-study research was conducted to gain information about the Romanian supermarket requirements and national regulations. Information was gained from the Ministry of Agriculture and Rural Development (MADR) online website in Romania. Additionally, a semi-structured interview with supermarkets from Olt and Dolj was conducted to gain more specific knowledge regarding the quality checks and bell pepper's weekly or monthly needed volumes.

Four specific supermarket chains are active in the mentioned area: Carrefour, Profi, Penny and Mega Image. Initially, I have chosen to have interviews with the first three mentioned. During the field work, Profi and Penny were denied participation and were replaced by Mega Image. The interviews with the supermarkets took place face-to-face, and audio recording was used only when the interviewer agreed. From Carrefour was interviewed Daniel Lespezeanu and from Mega Image Diana Dobre. A list of all interviewed people can be seen in Annex 6.

For the second and third sub-research question, structured interviews with 40 bell pepper farmers from Olt and Dolj were organised (25 farmers from Olt and 15 from Dolj). The semi-structured interviews were based on a survey (questionnaire), seen in Annex 1.

After a discussion with the sales agent of HFA, the most effective way to have the interviews with the farmers was to wait for them at the local distributor, the place where the farmer buys the needed inputs. It was quite a bad moment to have interviews with the farmers because the selling price of the bell pepper in the wholesaler market was very low, less than 1 leu per kg. The farmers were very unhappy with the current conditions, but the Olt regions were willing to answer the questions. On the other hand, some farmers from the Dolj district were unwilling to answer the questions, so I decided to have more interviews with farmers from the Olt region.

Besides the structured interview with farmers, I also choose the desk-study research for the third sub-research question to find valuable secondary data about current factors (soil type, pests, diseases, etc.). Furthermore, I interviewed input suppliers (Holland Farming Agro Ltd. and four local distributors, two from each region) active in the mentioned regions. I obtained valuable primary information from the input suppliers regarding the farming factors influencing bell pepper quality and yield. The input suppliers were also selected from the list of clients of Holland Farming Agro Ltd, taking into consideration which are the most valuable and knowledgeable ones, by having a short discussion in advance with the General Director (Marius Velea) and with the sales agent of the company in the mentioned regions (Sever Meleru).

For the first sub-research question of the second main research question, information was gained from desk study, the interviews with the input suppliers, the bell pepper farmers and the bank representative recommendations were formulated to help the farmers realise the entailed problems and find possible solutions. The interview with the bank representative was beneficial because it was needed to know if the farmers tried to access some funds to develop the production system and under what circumstances funds from banks can be approved to a regular farmer.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

For the second sub-research question of the second main research question, a SWOT analysis will better understand the bell pepper sub-sector in Olt and Dolj. Afterwards, the SWOT analysis will be very useful for the recommendations of the report.

3.3. Data collection and analysis

3.3.1. Data collection

Data collection was conducted in two distinct periods: 12-18 July and 16-18 August. The first interviewed were the farmers and the input suppliers (from Olt region Baetica Tomel, and Petroi Floarea and from Dolj region Crusuveau Mircea and Militaru Mirela) in parallel, in the period 12-17 of July.

The four participating input suppliers provide farmers various inputs from all agricultural segments, such as chemical and organic fertilizers, hybrids and varieties seeds, biostimulants, chemical and organic plant protection solutions (fungicides, herbicides and insecticides), peat and many other products. The name of the four input suppliers, the regions they activate and the company they represent are stated below:

- Baetica Tomel – Olt region – Tomel Agro Ltd.;
- Petroi Floarea – Olt region – Ciroka Prod Ltd.;
- Militaru Mirela – Dolj region – Superior Seeds Ltd.;
- Crusuveau Mircea – Dolj region – Dana Timexim Ltd.;

Afterwards, the day of the 18th was reserved for the interview with the only bank representative who was willing to participate in the research, Tudor Muruzuc from ING Bank. The interview with the retailers (Daniel Lespezeanu – Carrefour and Diana Dobre – Mega Image) has been realised 16-18 of August because in July the regional directors of the representative companies have been taking some time off, being on holiday.

For the first sub-research question of the first main research question, the data was collected from Daniel Lespezeanu (Carrefour) and Diana Dobre (Mega Image) with the help of a semi-structured interview and from the literature obtaining valuable information.

For the second and third sub-research question of the first main research question, information was collected from 40 bell pepper farmers, four input suppliers, one sales agent of HFA (Sever Meleru) and literature. The data was collected from the farmers with a survey, while the rest of the stakeholders contributed with data via semi-structured interviews.

For the first sub-research question of the second main research question, all stakeholders (farmers, input suppliers, bank representative, supermarkets, and sales agent) were interviewed to capture information. The data was collected from the farmers with a survey, while the rest of the stakeholders contributed with data via semi-structured interviews.

For the second sub-research question of the second main research question, input suppliers, bank representative, supermarkets, and sales agent gave a better view of the actual situation, and recommendations were able to come out.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

3.3.2. Data analysis

The quantitative data obtained from the survey has been analysed using the SPSS Statistics Software for frequency statistics analysis graphs and Independent Sample T-tests, and the Chi-Square test. The confidence interval was taken at 95% ($P < 0.05$). The SWOT analysis was used to understand the bell pepper sub-sector better and present the qualitative data from the stakeholders involved.

The frequency tables were used for simple data analysis, such as farmers' age, farm size, selling location, selling price, farm decisions and practices and many others, the Independent Sample T-test was used to verify the differences in scale data between two different groups (for example difference in selling price between farmers selling the output in the wholesale markets and farmers collaborating with the supermarkets) and the Chi-Square test was used to find differences between two groups (for example difference in selling location between farmers taking part in a cooperative and those who do not).

The expected output for the first sub-research question of the first main research question is represented by the specific supermarket requirements, and the retailer, Daniel Lespezeanu, contributed towards obtaining it.

The expected output for the second sub-research question of the first main research question is the factors that affect the bell pepper farmers in meeting supermarket requirements. The desk study, the organised survey and the semi-structured interviews gave the specific limiting factors.

The expected output for the third sub-research question of the first main research question is represented by the farmers' factors affecting bell pepper quality and yield. The information was obtained from the input suppliers, the farmers and the sales agent of HFA.

The expected output for the first sub-research question of the second main research question is a SWOT analysis which gave a view of the bell pepper sub-sector. At the same time, the expected output for the second sub-research question of the second main research question is represented by a list of possible recommendations guided towards the farmers.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

3.4. Research framework

The research was based on a research framework which can be seen in Figure 5. The research framework presents the steps followed in the entire research process. It all started with defining the research problem, objective and research questions.

Data collection included three crucial parts: literature, interviews with the stakeholders involved and the farmers' survey. Afterwards, the data was analysed, and the answers to the research questions started to broad appear. The final part of the research is represented by three essential chapters: discussion, conclusions and recommendations.

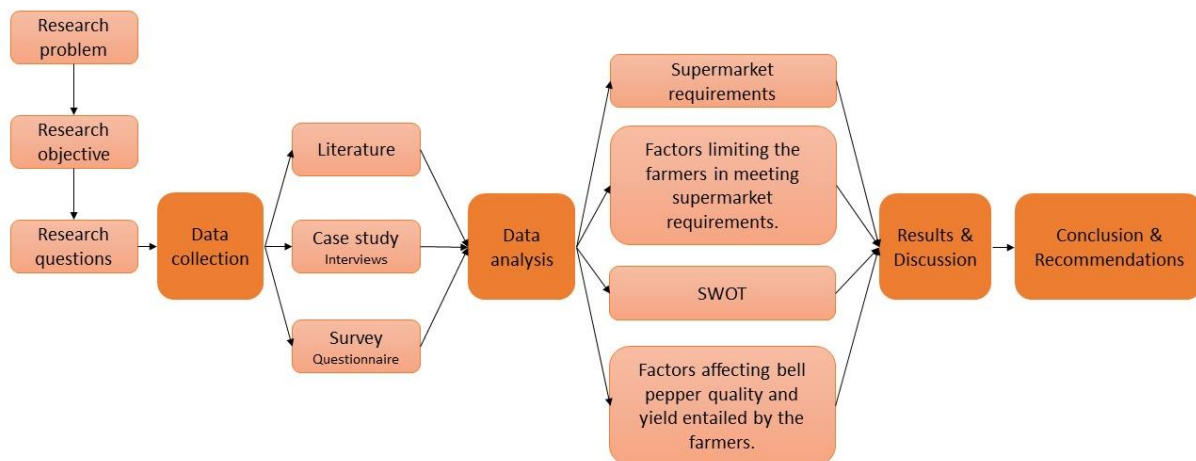


Figure 5. Research Framework. Source: The Author, 2021

4. RESEARCH FINDINGS

This chapter firstly presents the results of the farmers' survey integrated with the knowledge obtained from the other stakeholders (bank representative, input suppliers, sales agent of HFA and supermarkets) involved in the bell pepper sub-sector in the regions Olt and Dolj.

Afterwards, are presented the research findings, including the limiting factors affecting farmers meeting supermarket requirements and the factors which affect bell pepper quality and yield entailed by the farmers during a cultivation year.

4.1. Farmers' survey analysis

In this section, the results from the farmers' survey are presented to highlight the background information about the farmers (age, farm size, the hybrids used, collaboration or association with other farmers, selling location, selling price and many more), the farming factors influencing bell pepper quality and yield entailed by the farmers and the factors which limit the farmers in meeting supermarket requirements.

Moreover, this section is also incorporated with the qualitative data obtained from the other stakeholders involved.

The raw data obtained from the SPSS Statistic Software programme can be seen in Annex 7, and the output for each test is illustrated in Annex 8.

4.1.1. Background information of the farmers

Age

The farmers from the Olt region had an average age of 39 years while the farmers from the Dolj region had an average of 48 years. The overall age of an interviewed farmer was 42. Table 3 shows the average of the farmers who participated at the research. In Annex 8 it can be seen a histogram highlighting farmers' age in both regions.

According to the frequency statistics for farmers' age, the minimum age of a farmer was 20 years and the maximum age was 66 years.

Table 3. Average age of the farmers

In which region do you activate?	Average age (Mean)	Number of respondents
Olt	39	25
Dolj	48	15
Total	42	40

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Farm size

The average farm size is located in the second group category, 2,000 – 4,000 m², with 18 respondents (45 %). Figure 6 illustrates the average farm size in percentages.

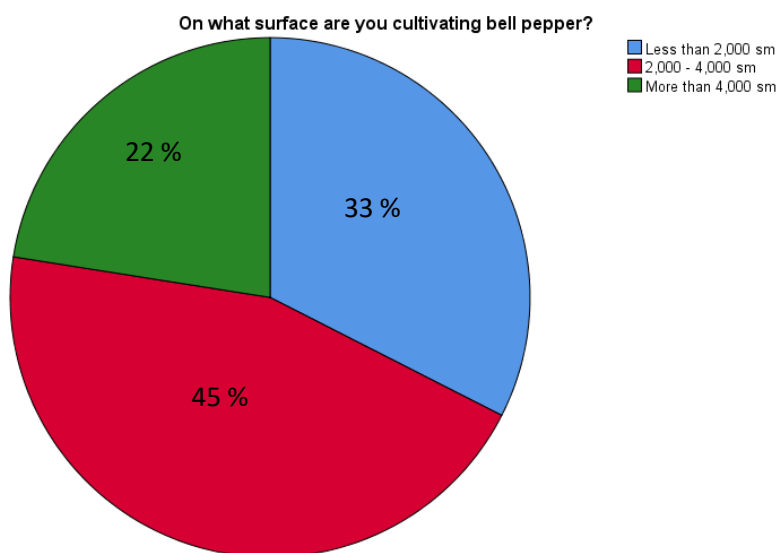


Figure 6. Average farm size in the regions Olt and Dolj. Source: The Author, 2021

The most cultivated bell pepper hybrid in the regions Olt and Dolj

There are four well-known bell pepper hybrids from the yellow wax category: Blancina F1, Barbie F1, Silverado F1, and Bernita F1. From this list, the most cultivated hybrids in the regions Olt and Dolj is Silverado F1. This is highlighted by the bellow pie chart (Figure 7).

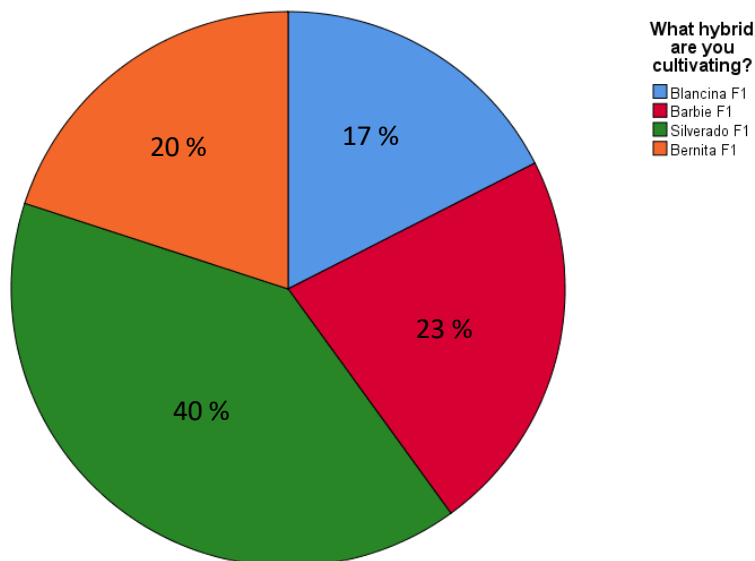


Figure 7. The most cultivated hybrid of bell pepper in regions Olt and Dolj. Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Farmer's Associations or Cooperatives

Most of the participating farmers in the survey choose to act alone, not being part of a Farmer's Association or Cooperative. Table 4 demonstrates that 95 % of the participants cultivate on their own not being part of a Cooperative or of a Farmer's Association.

The rest of 5 % of the farmers take part in a Cooperative. A pie chart which shows the percentages of growers taking part in Farmer's Associations or Cooperatives can be seen in Annex 8.

Table 4. Farmers taking part in Farmer's Associations or Cooperatives

Do you take part in a Farmer's Association or Cooperative?	Frequency	Percentage
No	38	95 %
Yes	2	5 %
Total	40	100 %

Source: The Author, 2021

The participating farmers are not part of a Farmer's Association or Cooperative due to the following reasons: lack of trust among other farmers (53 %), involves too much bureaucracy (32 %) and lack of willpower (10 %). This is also illustrated in figure 8.

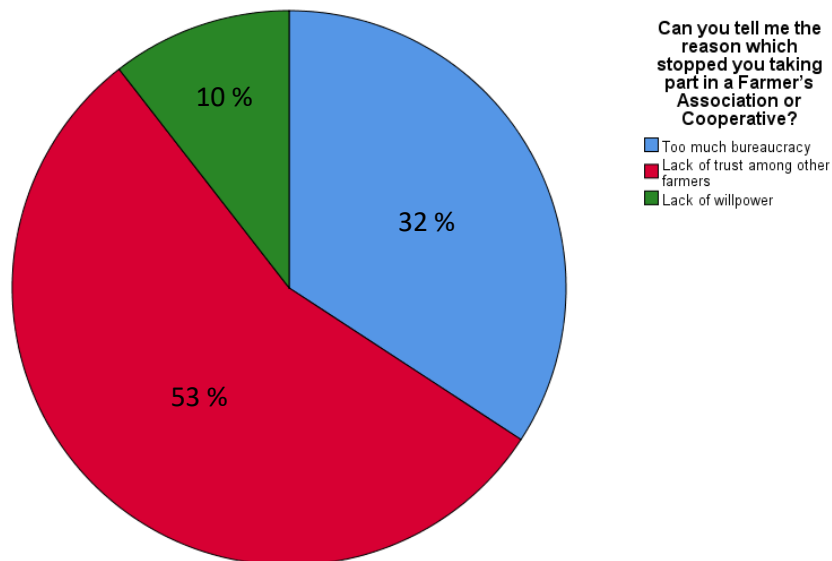


Figure 8. Reasons for farmers not taking part in Farmer's Associations or Cooperatives. Source: The Author, 2021

Selling location

95 % of the participating farmers mentioned they sell the bell peppers to the wholesaler markets, either from nearby or far away from their cultivation location, while the rest of 5 % sell the output to the supermarkets. Table 5 illustrates this statement.

The distances farmers travel to the wholesaler markets and the time spent on the way are obtained from the survey (Annex 1, question 29) by estimating an average distance and an average time spent using a maps programme (Google Maps).

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Table 5. Selling location of the bell peppers

Where do you sell the bell peppers?	Frequency	Percentage
Wholesaler market	38	95 %
Supermarket	2	5 %
Total	40	100 %

Source: The Author, 2021

The favoured wholesaler markets by the farmers

Figure 9 shows the favoured wholesaler markets by the farmers by using a pie chart.

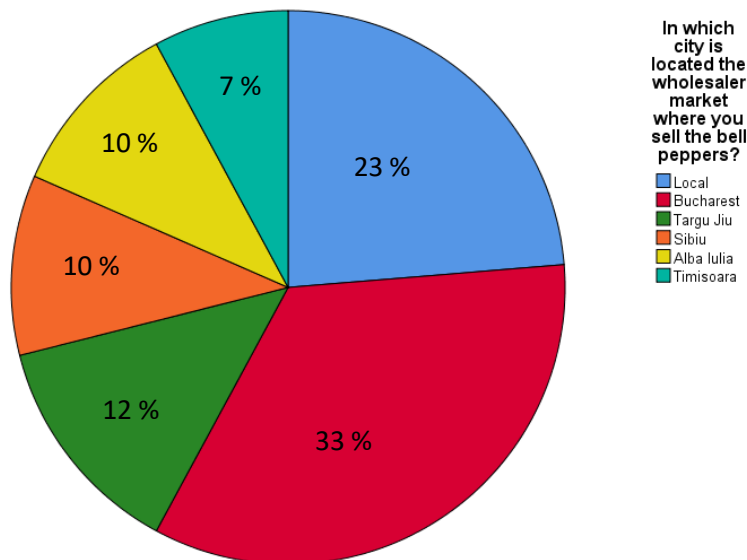


Figure 9. The region where is located the wholesaler market where farmers choose to sell the bell peppers. Source: The Author, 2021

The average distance (Mean) the farmers are spending to the wholesaler market is 175 km, while the minimum distance is 30 km and the maximum distance is 475 km. Table 6 illustrates the distances the farmers travel to the wholesaler markets.

Table 6. The distance the farmers need to get through to the wholesaler market

What distance do you have to get through to the wholesaler market? (km)	Frequency	Percentage
30 km	9	23 %
175 km	13	33 %
225 km	5	12 %
275 km	4	10 %
375 km	4	10 %
475 km	3	7 %
Total	38	95 %

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

The average time (Mean) the farmers are spending to the wholesaler market is 150 minutes, while the minimum time is 15 minutes and the maximum time is 360 minutes. Table 7 presents the average time spent by the farmers to the wholesaler markets.

Table 7. The average time the farmers spend to the wholesaler market

What is the average time you spend in your way to the wholesaler market? (min)	Frequency	Percentage
15 min	9	23 %
150 min	13	33 %
180 min	5	12 %
240 min	4	10 %
270 min	4	10 %
360 min	3	7 %
Total	38	95 %

Source: The Author, 2021

According to the interviews with the input supplier from the Olt region, Baetica Tomel and Petroi Floarea, the farmers choose to travel very long distances and to waste many hours on the way to sell the output, even though the price obtained is not much higher than in the wholesaler markets from nearby. Sometimes, the farmers sell at the same price. In a bad scenario, the farmers may also come back home with output, not receiving the price they liked. They mentioned that the farmers choose to travel long distances hoping to receive a reasonable price from the traders.

The other two input suppliers from the Dolj region, Militaru Mirela and Crusuveau Mircea, mentioned that the farmers act in the same way in procuring the inputs. They go with their car to many input suppliers from the nearby regions (Olt, Dolj, Teleorman, Arges, Vrancea, Gorj and Mehedinti) and choose the "best price", even though the price difference is with 1-5 %. The input suppliers mentioned that farmers should focus more on ways to upgrade the yield, not to chase the lower price and waste much time.

Chemical analysis of the soil and water

According to the frequency statistic table and the bar chart showed in Annex 7, the majority of the interviewed farmers (90 %) choose not to analyse the soil and the water before planting the crop. Table 8 shows the exact percentage and the number of farmers who choose not to analyse.

Table 8. Number of farmers who choose to analyse the soil and the water

Before cultivating, do you analyse the soil and the water?	Frequency	Percentage
No	36	90 %
Yes	4	10 %
Total	40	100 %

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

63 % of the farmers who do not analyse the soil and the water argue that the analysis represents an extra cost and that they are unwilling to pay for it. At the same time, the remaining 27 % consider that the analysis is not useful enough and that the crops can be fertilised without preliminary analysis. The pie chart can be seen below in figure 10.

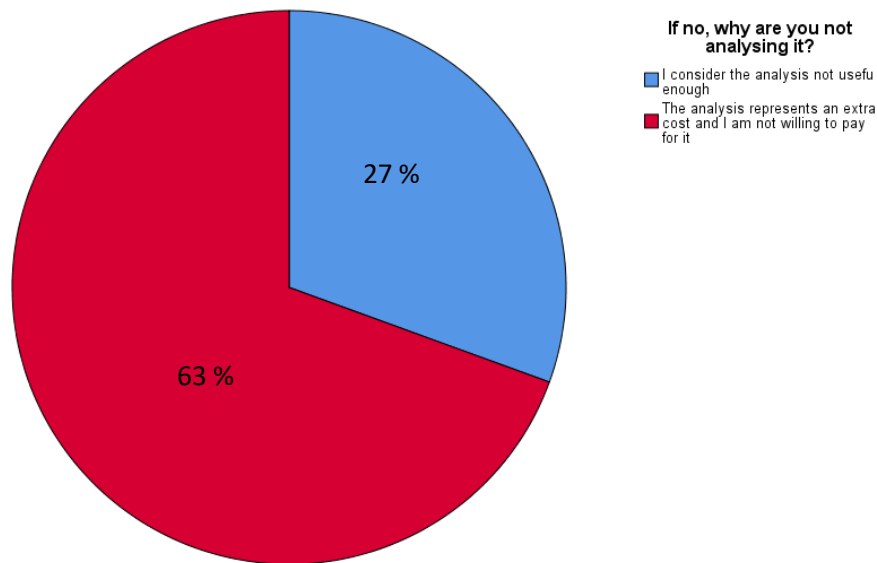


Figure 10. The reasons why the farmers choose not to analyse the soil and the water before cultivating. Source: The Author, 2021

How the farmers apply the quantities of fertilizers to the crop

Moreover, all the interviewed farmers apply the fertilizers without a scientific base, without the help of a mini-computer which tells the farmer the exactly needed quantity per plant or m^2 . This is presented in Annex 8.

The interview with the sales agent from Holland Farming Agro Ltd., Sever Meleru, also gave insights to understanding the situation in Olt and Dolj regions. According to him:

- The farmers do not trust each other. They are unwilling to cooperate and do not want others to know what fertilizers they apply and their seeds.
- The farmers apply much more fertilizer than is recommended by the manufacturer or by the importer. Hence, the soil's pH and EC are very high, and a crucial element like Phosphorus becomes blocked up in the soil, and the plants cannot assimilate it. In some cases, the farmers use a standard formula, such as 20-20-20 (N-P-K), throughout the whole cultivation cycle and important elements become blocked up in the soil, Calcium and Magnesium.
- A preliminary soil and water analysis is necessary because just afterwards, a personalized fertilization scheme may be applied, taking into consideration the composition of the soil and the water and the growing phase of the crop;
- Moreover, farmers do not homogenize the fertilizers before applying through the fertigation system, so they have no idea what exact quantity is provided to each plant. Even when the

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

fertilizer is 100 % water-soluble in cold water (less than 20 °C), it still needs to be mixed with ICL Specialty-Fertilizer or Haifa Group.

Daniel Lespezeanu argued that an average farm size of 2,000 m² – 4,000 m² (45 % of the respondents) makes it almost impossible for the big supermarket chains, such as Carrefour, to work with the nearby smallholder farmers. The retailer mentioned a few recommendations for the farmers which may help them in the future if they are willing to cooperate with the supermarkets:

- The smallholder farmers should be organised in Farmer's Associations or cooperatives, and they should all cultivate the same hybrid and use similar technologies. The only difference that can be made is in the fertilization scheme depending on the farmer's soil and water characteristics, which a certificated laboratory should analyse before planting;
- The Cooperative should own special transportation trucks equipped with a temperature control system that can be directly accessed from the warehouses' platforms.

Pest infection and management

Figure 11 illustrates how bell pepper farmers deal with pest infection. The majority (58 %) choose to use Integrated Pests Management in the drawback of old-fashioned chemical control (22 %). The rest of 20 %, equivalent of 8 farmers, choose to use both IPM and chemical control to deal with the pest infection.

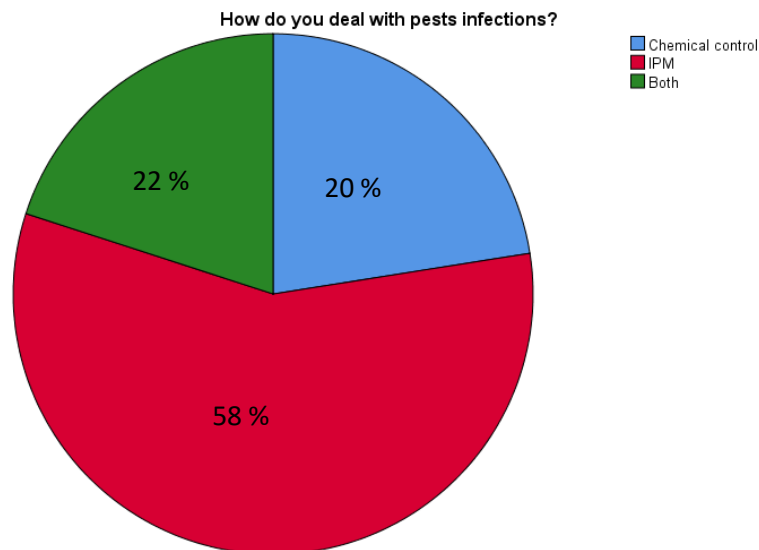


Figure 11. Pest management. Source: The Author, 2021

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Thesis Research Project

8 September 2021

While looking at the pest that caused problems in recent years, the farmers mentioned the Aphids as the most devastating one, while Thrips was located in the second place and the Sunn pest as the third option. Table 9 shows the exact percentages and number of respondents.

Table 9. The most devastating pest in the regions Olt and Dolj

What pest was the most devastating one in the past few years?	Frequency	Percentage
Thrips	11	28 %
Aphids	22	55 %
The Sunn pest	7	17 %
Total	40	100 %

Source: The Author, 2021

All four input suppliers mentioned the three pests as sometimes being hard to control. Baetica Tomel argued that the Thrips and the Aphids could be controlled by using natural predators. He mentioned that sometimes IPM is not working because the farmers intercede with chemical insecticides and it is also possible to affect the natural predators in the wrong way. There are also certified chemical insecticides that affect only the pests' population and kill less than 10 % of the natural predators' population.

Both Petroi Floarea, the input supplier from Olt, and Sever Meleru, the sales agent from HFA, stated that for the Sunn pest at the moment, there are no certified insecticides for usage in the high tunnels cultivation. They mentioned that the Sunn pest comes in the high tunnel at the soil level by effectively walking in when the plastic front door or the lateral areas of the high tunnel are open for ventilation. Their recommendation was to use a specific type of chemical insecticide on the high tunnels' area, which will not kill the Sunn pest; it will keep it away.

The regional director from Carrefour, Daniel Lespezeanu, revealed that the farmers from Olt and Dolj are well-known for the excessive usage of chemical insecticides and forbidden substances in the EU. He mentioned that the farmers illegally procure these substances from the black or parallel market. There are lists with forbidden substances in agriculture due to the carcinogenic effect of the residues in the vegetables.

Disease infection and management

Table 10 shows the most devastating diseases that affect the bell pepper crops in the farmers' opinion.

Table 10. The most devastating disease in the regions Olt and Dolj

What disease do you think is the most devastating one?	Frequency	Percentage
CMV	25	63 %
TSWV	15	37 %
Total	40	100 %

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

63 % of the interviewed farmers mentioned CMV (Cucumber Mosaic Virus) as the causing disease, and the rest of 37 % mentioned TSWV (Tomato Spotted Wilt Virus). While looking at how the farmers stop the disease infection, 100 % of them are using chemical plant protective solutions. Both diseases are well-known in the entire world, but for both of them exists a treatment.

The input suppliers and the sales agent from HFA highlighted a logical and easy way to prevent the TSWV infection – using hybrids with resistance at TSWV. Even if the farmers choose a hybrid without TSWV resistance, there is a mix of fungicides that can stop the disease. CMV is transmitted from one plant to another with the help of Aphids. Hence, if the Aphids infection is stopped, the CMV infection will be automatically reduced. However, also the highly infected plants should be removed from the high tunnel.

The average selling price of the bell peppers in the regions Olt and Dolj

Table 11 shows the average selling price for the interviewed farmers at the beginning of the harvest (end of May) and in the week when field work started – 12-18 July. Figure 12 shows a histogram revealing the selling price at the end of May – at the beginning of the harvest, while figure 13 illustrates the selling price in the middle of July when the interviews took place.

As mentioned earlier, the farmers were very unhappy with the prices obtained in the wholesaler markets. They compared the prices with the past year's experience, when the prices obtained were satisfying even after the first harvest. Nevertheless, last year experience, at the beginning of the COVID 19 pandemic, the imports of vegetables had been closed for an extended period, and every trader was forced to buy vegetables from the local markets.

Table 11. The average selling price obtained by the farmers

Average selling price of the output (lei/kg)	At the beginning of the harvest (end of May)	12-18 July period
	6.20 lei/kg	1.50 lei/kg

Source: The Author, 2021

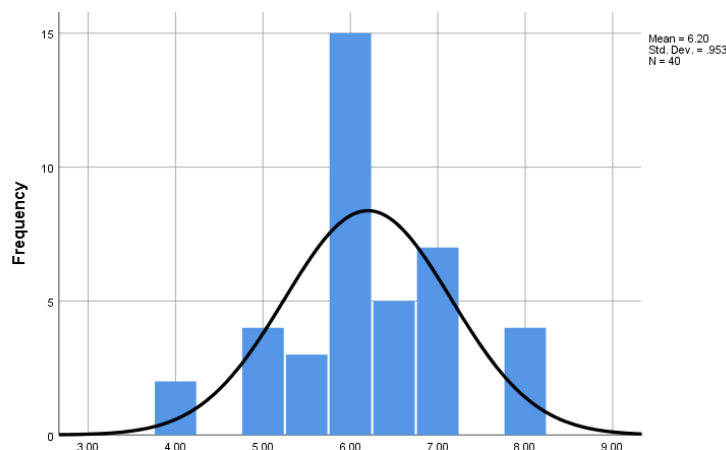


Figure 12. The selling price farmers obtained at the beginning of harvest - end of May.

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

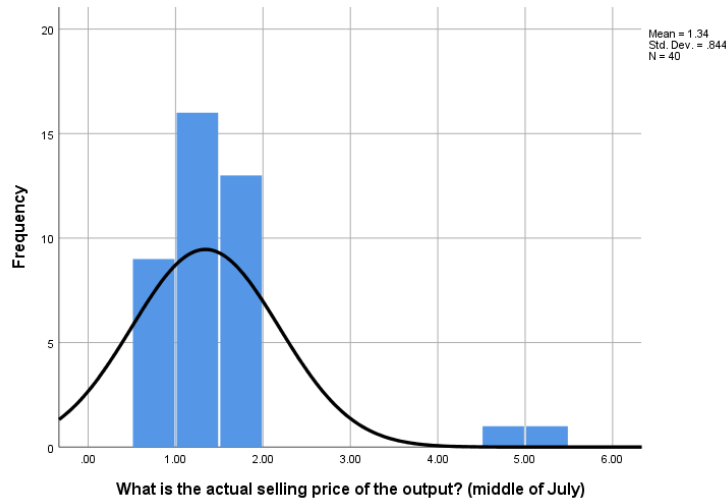


Figure 13. The selling price farmers obtained at the field work's week - middle of July.

Source: The Author, 2021

According to the interview with Sever Meleru, it is quite normal to have a difference between the first selling price, when the bell peppers just started to be harvested in Romania, and the later selling price, when almost every farmer had an output to sell.

A selling price between 0.80 and 1.5 lei is a meager selling price and it is normal for farmers to be unhappy and unwilling to continue working in the high tunnel. Many of them mentioned an excellent opportunity for the Romanian smallholder farmers is the government to make a regulation regarding the priority of the productions, and the locally produced agriculture products to have priority in the drawback of the imported ones from foreign countries.

Collaboration with the supermarkets

95 % of the interviewed farmers tried to collaborate with the supermarkets but with no luck. Table 12 represents the number of respondents who tried working with a supermarket and the ones who actually are selling the output to the supermarkets.

Table 12. Farmers trying to collaborate with a supermarket

Have you ever collaborated with a supermarket?	Frequency	Percentage
No	38	95 %
Yes	2	5 %
Total	40	100 %

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

According to the Independent Sample T-test ($p = 0.000 < \alpha$), there is a difference in the actual selling price between farmers who collaborate with the supermarket and farmers who sell the output in the wholesaler markets. In table 13, it can be seen the price difference between farmers who collaborate with the supermarket and farmers who sell the output in the wholesaler markets.

Table 13. Price difference between the selling locations (wholesaler market, supermarket)

Average selling price of the output (lei/kg)	Wholesaler markets	Supermarkets
	1.16 lei/kg	4.75 lei/kg

Source: The Author, 2021

A significant difference in the selling price can be observed: in the wholesaler markets, farmers obtain an average selling price of 1.16 lei/kg and at the supermarkets, farmers receive a higher price, 4.75 lei/kg.

The only farmers who obtain a higher price (4.50 lei and 5 lei) are the two farmers collaborating with the supermarkets being members of a Cooperative. The rest of the farmers (95 %) would have liked to collaborate with the supermarkets, but when trying to do so, they received negative responses from the retailer, such as:

- The production is not sufficient, and it cannot fulfil a regular supply contract. With other words, the production happens in a small area. In order for a farmer to cultivate on a higher area, he/she needs funds to extend the production area;
- A supermarket has many controls, including pesticides residues tests, which should be realised in a specialised laboratory. According to the interview with Sever Meleru, the farmers apply plant protective substances without a scientific base, not taking into consideration whether are fruits on the plant or not;

The above statements are illustrated in table 14, showing the challenges entailed by the farmers when trying to collaborate with a supermarket. 35 % of the interviewed farmers mentioned the many requirements a supermarket has, while 20 % complained about the many controls and the lack of necessary output.

Table 14. The challenges faced by the farmers when trying to collaborate with a supermarket

What challenges have you faced when trying to work with the supermarket?	Frequency	Percentage
Many requirements	14	35 %
Lack of necessary output	12	20 %
Too many controls	12	20 %
Total	38	95 %

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Grading and packaging

Table 15 highlights the number of farmers who grade the bell peppers before heading away to the wholesaler markets.

Table 15. Farmers grading the harvested bell peppers

After harvesting, do you grade the bell peppers?	Frequency	Percentage
No	38	5 %
Yes	2	95 %
Total	38	100 %

Source: The Author, 2021

The farmers mentioned that it is not profitable for them to grade the bell peppers and package the graded bell peppers in different packages at a small price. The only farmers who were grading the bell peppers were the ones who are part of a Cooperative and collaborate with a supermarket.

Table 16 shows the various ways the farmers are packaging the output.

Table 16. Packaging materials used by the farmers

In what do you pack the output?	Frequency	Percentage
Big plastic bags	27	68 %
Carton boxes	11	27 %
Reusable plastic boxes	2	5 %
Total	40	100 %

Source: The Author, 2021

68 % of the farmers use big plastic bags when packaging the loose harvested bell peppers, while the rest of 27 % use the carton boxes. Two farmers, both participating in a Cooperative, were using reusable plastic boxes.

According to the interview with Daniel Lespezeanu from Carrefour, if a regular farmer wants to collaborate with a supermarket, he/she needs to grade and package the bell peppers, place them on a EUR pallet and to store the bell peppers in a cold storage room. He also argued that in the future the whole Carrefour chain will try requesting to vegetable suppliers a biodegradable or eco-friendly packaging. The regular farmers use a lot of big plastic bags to sell the output.

Subsidies

All the participating farmers in the research mentioned they apply government subsidies, more specifically for APIA.

The Rumanian Ministry of Agriculture and Development (MADR) generates these kinds of subsidies in collaboration with the European Union (EU). For this subsidy, the farmers should cultivate various vegetables for fresh consumption or processing in high tunnels or greenhouses, including tomatoes, bell peppers, eggplants, cucumbers, and cabbage. The farmers need to cultivate an indoor area bigger than 2,000 m² and fill a form at the APIA local centres. The farmers receive the money obtained from this subsidy in September.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Bank loans

All the interviewed farmers mentioned they are currently not taking any loans from the banks used to develop the production system.

The interview with Tudor Muruzuc, a Business Strategy Manager from the well-known bank, ING, mentioned that farmers do come to request loans from the banks to develop the production system during the years. These requests are often turned down because even though the farmers own a form of a company, such as a Registered Sole Trader, they do not operate too much on it. Muruzuc Tudor mentioned a few recommendations which may help in the future the farmers to obtain a loan:

- The farmers should make transactions on the company they own. For example, the inputs acquired regularly and the selling of the output. At the end of a year, the company should have an annual turnover and a profit or loss margin;
- On the same company, the farmer shall transfer the land where the production takes place (only if it is own by them) and every asset he/she has, such as: the van used, the fertigation system, the high tunnel or the greenhouse etc.;
- A good recommendation for the farmers would be to be organised in the form of a Farmer's Association or Cooperative. By doing so, it will become much easier to take a loan because many assets would be involved.

Niche bell pepper products

The niche products started to be highly consumed in the Romanian market, which is reflected in the supermarkets' sales with the niche products. At the niche products, the market is dominated by the tomatoes varieties, such as: cherry tomatoes in various colours (red, orange, yellow and black) and cocktail tomatoes.

There are also niche products in the pepper sector: orange Kapya pepper, Californian bell pepper, snack pepper sweat and tinny, and Dolce Italiano bell pepper. Most of the interviewed farmers, 98 %, mentioned their interest in the bell pepper niche products cultivation, but also in this part, some challenges appear. Table 17 highlights the percent of farmers willing to cultivate.

Table 17. The number of farmers willing to cultivate niche products

Have you ever consider cultivating bell pepper niche products (California type, Dolce Italiano type, snack bell pepper)?	Frequency	Percentage
Yes	39	98 %
No	1	2 %
Total	40	100 %

Source: The Author, 2021

The farmers mentioned a few challenges that stopped them from cultivating bell pepper niche products. 45 % of the farmers mentioned they would be willing to cultivate, but the costs of the high seeds are the major entailed challenge.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

According to the interview with Dobre Diana from the supermarket chain Mega Image, the niche products are specialities in every supermarket, and the price given to the farmers is constant all year round. Sever Meleru, the sales agent of HFA, argued that the seed cost is high because it is not easy for the seeds producers to create a solid and productive hybrid.

Table 18 illustrates the reasons which stopped the farmers from cultivating niche bell pepper products.

Table 18. The challenges faced by the farmers when trying to cultivate niche products

Can you tell me the main reason which stopped you from cultivating the specialities?	Frequency	Percentage
High costs for inputs (especially seeds)	18	45 %
Insecure for finding a market for the output	11	28 %
It is a new crop and I don't want to risk	10	25 %
Total	39	98 %

Source: The Author, 2021

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

4.2. Limiting factors affecting the bell pepper farmers collaborating with the supermarkets

The research realised help to figure out the specific factors which limit the Romanian bell pepper farmers in meeting supermarket requirements. These factors are presented below.

Farmers by themselves do not have the needed quantity required to collaborate with a supermarket. The majority of horticulture Romanian farmers are smallholders. They work on a limited land with limited financial resources. The interviews with Daniel Lespezeanu (Carrefour supermarket representative) and Petroi Floarea (input supplier from Olt region) mentioned that the farmers should start trusting each other more and basing a local cooperative. In this way, when many farmers would be collaborating and cultivating the same bell pepper hybrid, the cultivating area would increase, the yield would be much higher, and by doing so, it can fulfil supermarket requirements in terms of the needed output.

Moreover, Diana Dobre and Daniel Lespezeanu argued that the supermarkets prefer working with local Farmer's Associations or Cooperatives rather than with the many individual producers. They both mentioned that the consumers frequently buy locally produced vegetables in a supermarket because the price is lower and quality is much higher than imported vegetables.

As stated in figure 14, the only farmers able to collaborate with the supermarket were also taking part in a local Cooperative. Moreover, these two farmers mentioned also a higher selling price for the bell peppers.

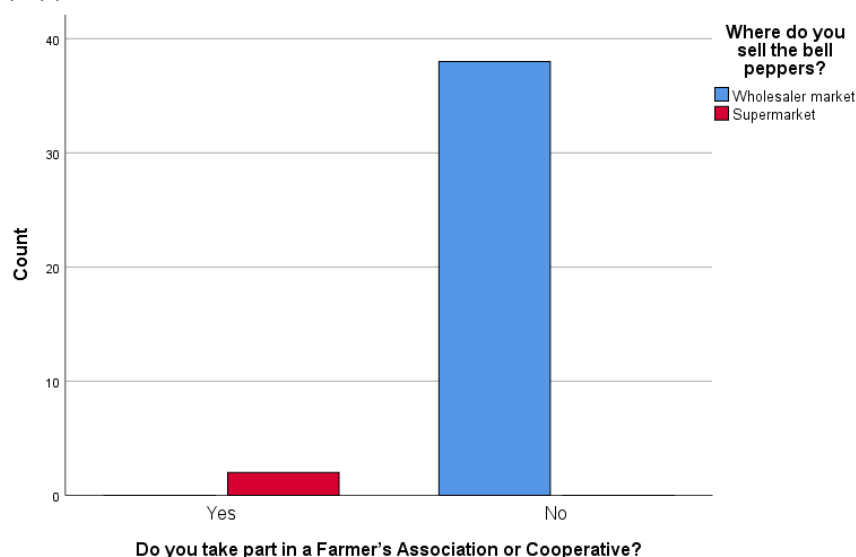


Figure 14. The relationship between the farmers which take part in a Cooperative and the selling location the supermarkets. Source: The Author, 2021

The Chi-Square Test from the SPSS revealed that the p-value ($0.001 < \alpha$) there is a difference in selling channel between farmers participating in a cooperative and does who do not. Unfortunately, the Chi-Square Test is not reliable because the number of samples is small, and the expected count is less than 5. The result of the test is presented in Annex 8 (6).

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

A decisive factor when trying to sell the output to the supermarkets is the pesticides residues test the supermarket must do before retailing the fresh vegetables. The supermarkets are afraid to work with the bell pepper farmers from Olt and Dolj due to the excess of plant protection solutions applied to the crop. The survey analysis observed that 42 % (22 % use only chemical control and 20 % use both IPM and chemical control) of the farmers still use chemical insecticides to control the pest infections.

Another important factor is represented by grading the harvested output. The farmers do not grade the bell peppers, and the supermarkets accept only graded vegetables. Moreover, the farmers should also place the output on a EUR pallet, store it in a cold storage room and afterwards deliver it to the supermarket with a temperature control transport facility which must have direct access from the supermarket's warehouse.

The bell pepper farmers do not have the necessary equipment to deliver at a supermarket, such as a transport facility equipped with a temperature control system and a cold storage room for the output. As presented in figure 15, the only farmers who mentioned using a transport facility equipped with a temperature control system were the only farmers taking part in a Cooperative.

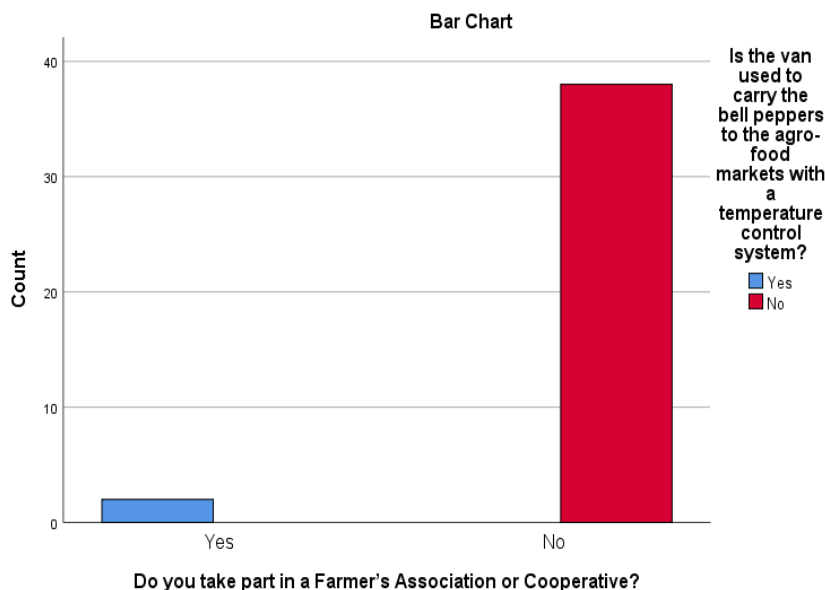


Figure 15. The relationship between the farmers which take part in a Cooperative and the usage of temperature control van to carry the output. Source: The Author, 2021

The situation presented in figure 14 also recurs in the above situation. The Chi-Square Test resulted from the SPSS revealed that the p-value ($0.001 < \alpha$) there is a difference in the usage of temperature control van between farmers participating in a cooperative and does who do not. Unfortunately, the Chi-Square Test is unreliable because the number of samples is small, and the expected count is less than 5. The result of the test is presented in Annex 8 (7).

They both mentioned that an employee of the Cooperative comes every 5-7 days to load the harvested bell peppers and carry them at the warehouse where packaging and delivery to the supermarkets occur.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

All the other farmers mentioned they have considered acquiring a temperature control van to carry the bell peppers at the wholesaler markets, but the lack of funds was the majority reason which stopped them from purchasing one (75 %). The farmers know the advantages of owning temperature control van, but the price seems to be the entailed problem.

The farmers do not want to start cultivating the niche bell pepper products because it is a new crop, the seeds are costly, and they fear insecurity in finding a market. The niche products have a constant selling price in the supermarkets, and the Romanian customers buy them regularly.

4.3. Farming factors influencing bell pepper quality and yield entailed by the farmers

The research realised help to figure out the specific factors which affect bell pepper quality and yield entailed by the farmers in Dolj and Olt region:

- The farmers entail problems with the following pests: Thrips, Aphids and the Sunn pest;
- The farmers face two important and hard to control diseases: CMV and TSWV;
- The farmers are unwilling to analyse the soil and the water, and they use fertilizer for the crops without a scientific base. In this case, essential elements can be blocked up in the soil structure and unavailable for the plants.

The majority of the farmers (73 %) choose to travel considerable distances to sell the output, even though the prices obtained are not much bigger than those obtained at the local wholesaler markets. Afterwards, the farmers may wait up to two days for a trader to step in and buy the output. In this time, the crop is neglected, being attacked by various pests and diseases.

The survey helped figure out a critical factor in the bell pepper sub-sector in the regions Olt and Dolj – the distances the farmers choose to cover to sell the output in the wholesaler markets. The farmers from Olt and Dolj region sell the bell peppers to the wholesaler markets in the following regions:

- In the proximity of their cultivation areas (Local) – 10 – 50 km away;
- Bucharest – 150 – 200 km away;
- Targu Jiu – 200 – 250 km away;
- Sibiu – 250 – 300 km away;
- Alba Iulia – 350 – 400 km away;
- Timisoara – 450 – 500 km away.

Sometimes the distances they need to cross to sell the output can be very far away (500 km), and they also need to wait in the wholesaler markets for traders to buy the product. The waiting sometimes can be up to two days. In the meantime, the crop is neglected, and the bumpy road and the temperature short the outputs shelf life and quality because the transportation van is not equipped with a temperature control system. Moreover, the profit margin for the farmers is shorted because the van used has maintenances and fuel costs.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

4.4. Supermarket requirements

The only supermarket representative who was willing to talk freely about the requirements was Daniel Lespezeanu from Carrefour. Although he detailed the requirements by speaking about them, he was unwilling to share the specific document because it is considered confidential and should be seen only by the supplier. Daniel Lespezeanu has spoken during the interview about the specific supermarket requirements, and the most crucial parts for vegetable suppliers can be seen below:

- The final product should be freshly harvested, graded and stored at the recommended temperature. For the bell peppers, the optimal storage temperature should be 8-10 °C. Moreover, the storage should be realised for short periods, not to cause the diseases appearance and spread;
- The bell peppers may be loosely packed in boxes, individually packed in transparent plastic foil, duo or trio packaged or packaged in paper or small plastic bags of one kg;
- The grading can be realised by hand or by professional machinery;
- The pesticides residues in fruits must be below the intervals imposed by the laws. The supermarkets are obligated to test the fruits for pesticides residues at a certified laboratory. The results should also be sent to ANPC (National Authority for Consumer Protection) besides the supplier;
- The supplier needs to own Global GAP (Good Agriculture and Practices) certification – Registration document for food safety no. 2803/2020. They should be willing to accept the CAC (Carrefour Audit Control) two times per year/cultivation cycle;
- The supplier should have qualified staff at three different levels: Commercial Representative, Quality Representative and Legal Representative;
- The supplier needs to have a register where he/she notes down the fertilizers used, the plant protection products and the date of the applications;
- The first batch of harvested products will be the subject of a file that will be sent to the Carrefour Quality Manager and which will contain:
 - Minimum 3 samples of finished product packaged by Carrefour;
 - Finished product analysis bulletin related to the sent samples (with specified batch and expiration date);
 - Upstream traceability sheet.
- The label must represent a specific batch. At a new harvest, the label must be changed accordingly;
- The products are delivered to supermarket's warehouses only with transport facilities equipped with a temperature control system. The optimum temperature interval for delivery is 8-10 °C. The temperature is registered during the delivery by a thermograph system which can provide the retailer with a thermo-diagram for the entire delivery time.

Moreover, the suppliers should also fill a production stream sheet. The example used by the California bell pepper producer company, Land of Farming Ltd., can be seen in Annex 8.

5. DISCUSSION

This chapter critically discusses the qualitative and quantitative data collected during the field work by comparing it with existing scientific literature and critically reflecting on the research process and methodology. The SWOT analysis is also presented below in this chapter.

5.1. The needed volumes the supermarkets require

The participating farmers at the research are smallholder farmers, and the dominant category while looking at the cultivated area is the interval 2,000 m² and 4,000 m², with 18 respondents (45 %). As Daniel Lespezeanu, the Carrefour representative, a small area used for production also means a low quantity of bell peppers, making it impossible for big supermarket chains to work with individual farmers.

A study conducted by Escoto et al., (2012) revealed that the smallholder farmers in Nicaragua become able to collaborate with the supermarkets only via local-based cooperatives. This situation is very different from the Romanian one. First of all, because a powerful player was involved – an NGO supported by USAID. The NGO helped to improve the situation in many ways:

- It has negotiated the supply agreements and mediating communication between farmer cooperatives and the two supermarket chains management;
- Provided the farmers with technical assistance, training, and subsidized irrigation to improve their ability to meet supermarket requirements for fresh fruit and vegetables, including also product standards.

Another crucial factor was present in Nicaragua: the farmers joined the local cooperatives freely because they realised it is in their favour by meeting the economic needs and aspirations. In the regions Olt and Dolj, the farmers mentioned they are not part of a cooperative due to the lack of trust (53 %).

The case of Nicaragua presented by Escoto et al. (2012) also reveals that there should be a more significant movement in the sector. NGOs and cooperatives should be present to help farmers improve and negotiate the supply with the supermarkets. Moreover, the government should also have field representatives, which could help improve the situation.

On the one hand, the earlier presented situation, the Nicaragua case, has some aspects in common with the situation from Olt and Dolj region: the farmers in Nicaragua are smallholders, the same as in the Romanian bell pepper sub-sector, with limited knowledge, funds and technology. On the other hand, there are also crucial differences present:

- The farmers from Nicaragua followed their interests and joined the local cooperatives. In Olt and Dolj the farmers do not trust each other enough to base a local cooperative;
- An influential stakeholder was involved – an NGO supported by USAID to help the development of local farmers. In Olt and Dolj, it seems there is no such player involved. It is assumed this situation is actual because at least Sever Meleru (the sales agent of HFA) or Marius Velea (General Director of HFA) would have heard about it;

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

- The farmers from Nicaragua worked a land of less than 10 ha. In Olt and Dolj, the farmers cultivate on an average of only 2,000 m² – 4,000 m². The local cooperatives in Nicaragua had 25-30 members each. This means the Romanian farmers should group themselves into cooperatives of a minimum of 250 members to be able to collaborate with a supermarket;
- The authors collected data from more stakeholders in the vegetable sector than for this report: 110 farmers, two Walmart and La Colonia executives and four procurement staff, four farmer cooperative leaders, 18 NGO representatives and two government officials;

Only 5 % of the participating farmers (the equivalent of two respondents) to the research take part in a Farmer's Associations or Cooperative. Both of them mentioned a higher selling price (average price – 4.75 lei/kg) of the output compared to the other farmers who were selling to traders at the wholesale markets (average price – 1.16 lei/kg). Receiving a low and unsatisfying price results in the farmers being unhappy about the situation and unwilling to apply fertilizers or continue working in the high tunnels. The unhappiness is even more pronounced when the farmers travel long distances to sell the output (see table 6). The survey analysis revealed that the most favoured wholesaler market was the one in Bucharest (with 13 respondents – 33 %), on an average distance of 175 km from the farms' locations. Moreover, the farmers have to spend on the way approximatively 150 minutes.

Contrary to the Nicaragua situation and the one in the regions Olt and Dolj, the case of Kiambu region, Kenya studied by Ogutu, Ochieng and Qaim in 2020 presented the smallholder farmers collaborating with the supermarkets by themselves, not being part of an association or cooperative. This study analysed the income obtained from the farmers collaborating with the supermarkets versus the farmers selling their output through the traditional markets. This situation is not presenting the way farmers became able to collaborate with the supermarkets. It only analyses the income differences between the two categories of farmers. The authors revealed that the farmers collaborating with a supermarket mentioned an increased household income by an average of about 40 %. This increase in revenue mainly was obtained from supermarkets paying higher prices than vegetable buyers in traditional markets.

5.2. Pests and diseases

5.2.1. Bell pepper pests

The farmers in this research mentioned they entail farming problems with pests (Thrips, Aphids and the Sunn pest). A study conducted by Kumar (1994) listed all the pests affecting the bell pepper crop, including the first two early mentioned. The author argued that applying chemical pesticides to control the pests harm the environment, and the bell pepper fruits can retain a high level of pesticides residues. In Olt and Dolj regions, farmers consider Aphids as the important and hard to control pest, being chosen by 22 respondents (55 %). Baetica Tomel, an input supplier from Olt region, mentioned during the interview that Thrips and Aphids could be controlled by using the IPM (Integrated Pest Management) with natural predators. This study revealed that the Romanian bell pepper farmers from Olt and Dolj choose IPM to control the pests (58 %), while only 20 % choose chemical control. The rest of 22 % choose both chemical control and biological control.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Unfortunately, no literature was found on the Sunn pest (*Eurygaster integriceps*) affecting the horticulture crops in high tunnels. Only literature was found regarding the brickfield crops, such as wheat. In the wheat sector, Vilkova et al., (2018) analysed the potential yield loss caused by the Sunn pest. It can reach 50 % loss depending on the soil and climatic zone, planting techniques and varieties. Without protection measures, the loss of susceptible varieties can be even more significant. According to Velea (2021), the Sunn pest is a new pest that affects horticulture crops in Romania.

5.2.2. Bell pepper diseases

The farmers also mentioned problems with diseases affecting the bell pepper crop: CMV and TSWV. A study conducted by Rice et al., (1990) TSWV (Tomato Spotted Wilt Virus) is challenging to control due to the broad host range of viruses and thrips, chemical control efficiency is low, and the thrips species quickly acquire resistance to insecticides. In this research, the input suppliers and the report authors agreed that TSWV can be controlled by using hybrids with resistance to this specific disease. Moreover, the input suppliers also mentioned a mix of chemical fungicides that can stop the spread of TSWV.

Studies have also been conducted analysing the disease CMV (Cucumber Mosaic Virus). Firstly a study by Avilla et al., (1997) revealed that CMV is a seed-born disease in peppers, generating more than 80 % of yield losses in cases of severe epidemics. Afterwards, a study conducted by Palukaitis and Garciaarenal (2003) discovered more than 80 species of Aphids (*Myzus Persicae* Sulzer) that can transmit the virus between plants. As researched by Yao et al., (2013) and mentioned by the input supplier, the most effective way to stop and control the CMV infection is to use disease-resistant bell pepper cultivars or hybrids.

In terms of diseases, information about Filamentous Oomycete *Phytophthora Capsici* Diseases (FOPCD) and Fusarium Wilt are found in the literature. The researcher is aware of the existence and the possibilities to control Fusarium, but regarding FOPCD, there is a knowledge gap.

5.3. Pesticides residues

Furthermore, for farmers to collaborate with a supermarket, the output must pass the pesticides residues test. In other words, the farmers should start using the IPM instead of traditional chemical spraying for controlling the pests. The survey concluded that an important number of farmers still use chemical control combined with IPM or just chemical control for pest infections – 43 %, the equivalent of 17 respondents. According to CBI (2021), the European Union (EU) has established the MRLs (Maximum Residue Levels) of pesticides in food products, and the supermarket chains maintain the highest standards, requiring just 33% to 100% of the legal MRL.

This information is also backed up by the sales agent of HFA, Sever Meleru, who mentioned that the farmers apply various mixtures of pesticides, not considering the developing phase of the crop. The bell peppers may contain a pesticides residue level beyond the limit, and the supermarkets are forced to return the output. During the interview, Daniel Lespezeanu, Carrefour representative, mentioned that the farmers from Olt and Dolj are well-known for the excessive usage of chemical insecticides and forbidden substances in the EU. There are lists with forbidden substances in agriculture due to the carcinogenic effect of the residues in the vegetables.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Baetica Tomel, an input supplier, argued that the pests could be easily controlled with IPM, but in some cases, it fails because the farmers intercede with chemical insecticides, and it is possible also to affect in a wrong way the natural predators. There are also lists of pesticides that can be used when natural predators are active in the high tunnels. These lists are in the portfolio of the importers and also at the input suppliers. Moreover, the researchers' knowledge revealed that the plants could enter a stress phase when excessive chemical plant protection solutions are applied. The plants respond far better to organic or natural control.

5.4. Grading, packaging, storing and transport of the bell peppers

Another crucial factor is represented by grading the bell peppers. The farmers' survey detected that none of the farmers grade the output before heading towards the wholesale markets. Daniel Lespezeanu from Carrefour mentioned that the supplier must grade the output. Otherwise, the contract cannot be fulfilled.

The survey detected that the farmers loosely package bell peppers wholesale in big plastic bags (68 %) or carton boxes (28 %). 95 % of the farmers mentioned in the survey are not using a transport facility equipped with a temperature control system. As mentioned earlier, the farmers travel long distances to the wholesale markets, where they wait up to two days for traders to buy the output. At this time, the bell peppers' shelf life is shortened by the long and bumpy road and ambient temperature.

Gross, Wang and Saltveit (2016) identified the optimal storage conditions for bell peppers at a temperature of 7-12 °C. They also mentioned that storing above the recommended interval, the ripening will accelerate, and bacterial rot may appear. Additionally, Sahoo et al., (2014) discovered that MAP (Modified Atmospheric Packaging) with perforated PP (Polypropylene) film is the most suitable packaging material under refrigeration conditions maintaining the texture, colour and marketability with up to 20 days.

5.5. Application of fertilizers

All participating farmers at the research mentioned that the application of fertilizers is realised without a scientific base, and 36 respondents mentioned they do not even analyse the soil and the water before cultivating or fertilizing. This information is on the same page as the study conducted by Scurtu and Lacatus in 2013, which showed that the Romanian farmers apply fertilizers without a scientific base. 90 % of the farmers do not analyse the soil, the water, and 63 % argue that the analysis represents an extra cost and they are not willing to pay for it.

Sever Meleru, the sales agent of HFA, argued in the interview of this study that many times essential elements can become unavailable to the plants due to the inappropriate fertilization scheme used by the farmers. Moreover, as reported by Ge et al. (2010), incorrect fertilization affects soil chemical composition in terms of pH, EC and crucial elements, such as Potassium (K), Calcium (Ca), Magnesium (Mg), Sodium (Na) and Phosphorus (P).

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

5.6. The total production capacity of bell pepper in the regions Olt and Dolj

In the two regions (Olt and Dolj), approximately 2,300 bell pepper farmers cultivate 700 ha of vegetables. Unfortunately, no studies were conducted to reveal the production obtained by the farmers from bell pepper cultivation. Hence, it makes it almost impossible to determine an estimate for the total bell pepper production.

The only knowledge regarding the production capacity is the researcher experience with bell pepper hybrids, which is 2 kg/plant. The plant density used by the farmers is 50,000 plants/ha. It results in a production capacity of 100 tons/ha.

If it is assumed that 100 % of the farmers from both regions cultivate at least one cycle of bell pepper and the yield loss is 25 %, the total production capacity of the region is around 50,000 tons of bell pepper per year.

5.7. Reflection on research process and methodology

The study had a considerable number of limitations in terms of methodology and data analysis:

- The research did not include data from important members in the bell pepper sub-sector, the traders in the wholesaler markets. The researcher assumed in the first phase that the farmers sell the output to the usual agro markets. During the field work, the actual selling markets were revealed (the wholesale markets) and whom are the two persons involved in the transaction (the farmer and the trader);
- Another crucial stakeholder who could have given better insights into the situation is the government, represented in the agriculture sector by the Ministry of Agriculture and Rural Development (MADR). Moreover, due to time limitations, it was not possible to add an interview with a representative from MADR;
- 39 of the interviewed farmers were males, and only one female was interviewed;
- All participating farmers proved to be limited in terms of knowledge, technology and funds. It can be assumed that the agriculture sector also has farmers with a modern and business development thinking, but they were not found during this research;
- The farmers do not cater for the exact amount they harvest every 7-10 days. Hence, they have no idea what production they obtain at the end of a cultivation cycle. They only know the possible production according to the hybrid they cultivate. Most of the bell pepper hybrids have the production potential of 2 kg/plant;
- It was not possible to obtain the purchase bell pepper prices from the supermarkets because they consider this information confidential;
- Another limiting factor is represented by the lack of knowledge present in the bell pepper sub-sector in Romania. No studies were found related to the actual production obtained by the farmers every cultivation cycle. The only information known is the plant density and the production capacity of the bell pepper hybrids;
- The Carrefour supermarket was the only retailer willing to talk about the topic “supermarket requirements”. He talked about these requirements a lot during the interview, but he was

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

unwilling to share the document representing supermarket requirements with the researcher. Strangely, he was willing to talk about the requirements and not to share the document;

- The analysis had a vital gap regarding the reliability of Chi-Square tests. SPSS mentioned that the expected count is less than 5. This is because the sample size was too small. Although the research had 40 farmers surveyed, the number is too small to test for differences by using the Chi-Square test. If this information appeared earlier, for example, during the field work, I would have tried to increase respondents by contacting more farmers from the regions Olt and Dolj.

5.8. SWOT analysis

Table 19 summarises the strengths, weaknesses, opportunities and threats in the bell pepper sub-sector in the regions Olt and Dolj. The SWOT analysis was based on the research findings.

Table 19. SWOT analysis

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none">• In regions Olt and Dolj are approximatively 2,300 bell pepper farmers, cultivating in total 700 ha with an estimative production capacity of 50,000 tons of bell pepper per year;• The government is supporting the farmers with yearly subsidies, such as APIA;• The input suppliers have the needed knowledge to train the farmers in some ways (seedlings manufacturing, pests and diseases management).	<ul style="list-style-type: none">• The farmers do not trust each other;• The farmers apply fertilizers without a scientific base. Hence, important element can become unavailable for the plants;• Lack of willingness among farmers regarding producing niche bell pepper cultivars;• Lack of knowledge among farmers regarding pests and diseases management;• The bell pepper prices vary way a lot in the wholesaler markets;• The redundant use of chemical pesticides can also limit the bell pepper farmers in meeting supermarket requirements by exciding the maximum residue levels of pesticides in the bell pepper.
OPPORTUNITIES	THREATS
<ul style="list-style-type: none">• Farmers should start collaborating with each other and base local Cooperatives. In this way they could work with the supermarkets;• The niche bell pepper cultivars represent a good opportunity which the farmers should use to their advantage. The niche bell pepper cultivars are in the interest of the supermarkets.	<ul style="list-style-type: none">• The foreign suppliers of bell pepper from Jordan, Turkey or Spain have the advantage of knowing supermarket requirements, and they can regularly deliver the needed amount;• The excessive use of pesticides could cause high pesticides residues in the bell peppers, which is a risk for food safety.

Source: The Author, 2021

6. CONCLUSIONS

Based on the information obtained from the field work, it is clear that various problems affect the Romanian bell pepper farmers from regions Olt and Dolj in meeting supermarket requirements.

The supermarkets were proved to pay a reasonable and good price to the farmers (as presented in table 13). The study has revealed several factors that limit the Romanian bell pepper farmers in meeting supermarket requirements (sub-research question 1.1.). The only retailer who was willing to talk about the supermarket requirements was Daniel Lespezeanu from Carrefour. He mentioned the following requirements during the interview:

- Optimal and recommended storage conditions for every type of vegetable;
- Fresh harvested vegetables and not stored beyond the optimal period;
- The product should be graded, packaged accordingly and placed on a EUR pallet;
- The maximum residue levels must be below the recommended interval;
- The supplier needs to own a Global GAP certification;
- The supplier should be willing to accept the CAC (Carrefour Audit Control) two times per year/cultivation cycle;
- The label must represent a specific batch number. At a new harvest, the label should be changed accordingly;
- The products are delivered to supermarket's warehouses only with transport facilities equipped with a temperature control system. The temperature is registered during the delivery by a thermograph system which can provide the retailer with a thermo-diagram for the entire delivery time;
- The delivery truck must be directly accessed from the warehouses, so it needs to have the necessary equipment;
- The suppliers should also fill a production stream sheet (see Annex 9 for an example).

According to the data collected via farmers' survey, stakeholders' interview and scientific literature, the researcher can present the factors which limit the farmers in meeting the supermarket requirements (sub-research question 1.2.):

- Farmers by themselves do not have the needed quantity required to collaborate with a supermarket. They are smallholders, cultivating on a limited land with limited resources;
- The farmers use a significant number of pesticides on the crop, and the bell peppers may contain a high and dangerous level of pesticides residues above the imposed MRLs. In this situation, the output cannot be accepted by the supermarkets;
- Farmers do not grade, package and place their fresh harvested bell peppers on a EUR pallet;
- The bell pepper farmers do not have the necessary equipment to deliver at a supermarket, for example, a transport facility equipped with a temperature control system and a cold storage room for storing the output before delivery;

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

The data collected from all the stakeholders involved in the bell pepper sub-sector also revealed the farming factors influencing bell pepper quality and yield entailed by the farmers during a cultivation cycle (sub-research question 1.3.):

- The farmers entail problems with the following pests: Thrips, Aphids and the Sunn pest;
- The farmers also face two hard to control diseases: CMV and TSWV;
- The farmers are not willing to analyse the soil and the water, and hence they use fertilizer for the crops without a scientific base. In this case, important elements can be blocked up in the soil structure and become unavailable for the plants;
- The farmers choose to travel considerable distances to the wholesale markets, where they wait up to two days for the traders to step in and buy the products. In this time, the shelf life of the bell peppers is shortened, and pests and diseases attack the crop.

The above-mentioned limiting factors and the current cultivation and post-harvest practices make farmers are unable to meet supermarket requirements. For these reasons, the farmers cannot increase their income by selling their produce for a better price to the supermarkets.

The research also help found opportunities and constraints present in the bell pepper sub-sector regions in the Olt and Dolj (sub-research question 2.1.). The opportunities found from the field work are the following:

- In the regions Olt and Dolj, the farmers' number is very high, around 2,300 farmers cultivating in total over 700 ha of vegetables;
- An excellent opportunity for the bell pepper farmers would be to collaborate and trust each other and base local cooperatives. In this way, they could sell the required more considerable output volume to the supermarkets. By doing so, the farmers would receive a higher price than selling at the wholesale markets;
- Secondly, the niche bell pepper cultivars represent a good opportunity which the farmers should use to their advantage. Although the price for acquiring the inputs is high, the revenue obtained from selling the niche products is also high. Moreover, the supermarkets are interested in and offer a constant price for these niche cultivars.

The constraints found in the bell pepper are highlighted below:

- The smallholder farmers cannot collaborate with a supermarket (in terms of the needed volume), and they are not willing to cooperate with other farmers and to base a local cooperative;
- The farmers still use chemical insecticides to control pest infections. In this situation, the output may contain a high level of pesticides residues. The supermarkets are aware of this situation and are afraid to collaborate with the nearby farmers;
- The farmers apply fertilizers without a scientific base. They are unwilling to preliminary analyse the soil and the water, because it is an extra cost. By doing so, important elements become unavailable to the plants;
- The farmers do not have the necessary equipment to collaborate with a supermarket, such as: a cold storage room or a transport facility equipped with a temperature control system.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

The farmers argued the lack of funds was stopping them from acquiring the needed equipment;

- The prices obtained by the farmers in the wholesale market vary too much and many times, it is a low price (less than 1.5 lei/kg). The supermarkets offer a far better price, but the requirements must be met.

There are a few steps the farmers should follow to increase the income obtained from bell pepper production. The smallholder farmers should start trusting each other and understanding there is enough market for everyone. They should also base a local cooperative, cultivate the same hybrid or variety, analyse the soil and the water to receive a personalised fertilization scheme and start using IPM instead of chemical control. By doing so, the farmers could collaborate with the supermarkets, receive a reasonable and good price, and then their income could be considerably increased.

7. APPLIED RECOMMENDATIONS

7.1. Recommendations guided towards the farmers

The first entailed major problem the farmers entail is the lack of trust among each other. As mentioned earlier, in these two regions are more than 2,000 farmers. The farmers should learn that there is enough market for everyone and the only way they could collaborate with a supermarket is via a local based cooperative. This would be the main way through a big retailer such as Carrefour or Mega Image.

Afterwards, the cooperative could access funds from the EU, from the Government, or from the financial institutions (banks) and start building a cold storage room for the harvested bell peppers, transport facilities equipped with a temperature control system etc. Another argument is related to acquiring inputs. A cooperative can obtain important discounts from the input suppliers, equal to 10-20 %.

The cooperative will also bargain the farmers off the long distances they need to travel to sell the bell peppers at a wholesaler market. Furthermore, the farmers would be no more obligated to wait one or two days in the wholesale markets for the traders to step in and buy the output.

The farmers also mentioned problems with Aphids, Thrips and the Sunn pest. The first two pests can easily be controlled with IPM, the natural predators. Although it sounds easy, the farmers need to be very cautious when selecting the chemical sprayers with plant protective solutions, because there are chemical insecticides who also the predators' population.

The Sunn pest comes literally walking in the high tunnels, from the front door or from the lateral sides when ventilation needs to be realised. A possible solution for this pest is to spray the outside parts of the high tunnel with a strong insecticide. By doing so, the strong smell will keep the Sunn pest away from the high tunnel.

There are also problems with the diseases who devastate the bell pepper crops if are not controlled in time. The first one is the CMV, which is transmitted from one plant to another by the Aphids population. Hence, to get rid of the CMV, the farmers need to follow two crucial steps:

- The Aphids population needs to be controlled either by chemical spraying or by using IPM;
- The most affected plants from the crop needs to be removed completely from the inside of the high tunnel.

The TSWV is the second important diseases which has the abilities to decimate a bell pepper crop. TSWV is transmitted from one plant to another by the Thrips population or by the weed between the plants. To stop TSWV the farmers need to follow the following steps:

- The Thrips population needs to be controlled either by chemical spraying or by using IPM or the weeds between plants need to be removed or controlled with a herbicide;
- At least two chemical treatments with fungicides;
- The most affected plants from the crop needs to be removed completely from the inside of the high tunnel.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

7.2. Recommendations guided towards the commissioner (HFA)

Holland Farming Agro Ltd. owns a certified laboratory for soil and water samples. The company is advised to conduct regular meeting with the farmers from Olt and Dolj highlighting the importance of these analyses. Moreover, it is advised to give a 30 % discount from the initial price to the farmers willing to cooperate. Besides, it is advised to provide fertilization schemes by the laboratory at no extra charges. By doing so, HFA will enable farmers to observe the advantages to preliminary analyse the soil and the water and they will start requesting these analyses every year.

It is recommended HFA to provide to the farmers who use IPM the lists of chemical pesticides compatible with the natural predators.

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

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Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

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Thesis Research Project

8 September 2021

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Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

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Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

ANNEXES

Annex 1. Survey questions for the bell pepper farmers

Full Name: _____

1. **Sex**
 - a. Male
 - b. Female
2. **In which region do you activate as a farmer?**
 - a. Olt
 - b. Dolj
3. **What is your age?**
 - a. Please specify _____
4. **Do you take part in a Farmer's Association or Cooperative?**
 - a. Yes (Please specify _____)
 - b. No
5. **Have you ever considered taking part in a Farmer's Association or Cooperative?**
 - a. Yes
 - b. No
6. **Can you tell me the reason which stopped you taking part in a Farmer's Association or Cooperative?**
 - a. Too much bureaucracy
 - b. Lack of trust among other farmers
 - c. Lack of willpower
7. **During a year, are you cultivating only bell pepper in high tunnels?**
 - a. Yes
 - b. No
8. **If no, what other vegetable crops are you cultivating in high tunnels?**
 - a. Tomatoes
 - b. Eggplants
 - c. Cucumbers
 - d. Kapya pepper
9. **Do you apply to any subsidies from the Government?**
 - a. Yes
 - b. No
10. **If yes, to what subsidies are you applying yearly?**
 - a. APIA
 - b. LEGUME programme
 - c. SAPS
11. **Do you take loans from the bank used to develop the production?**
 - a. Yes
 - b. No
12. **Do you cultivate every year bell pepper in a high tunnel?**
 - a. Yes

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Thesis Research Project

8 September 2021

- b. No
- 13. What is your experience in years in bell pepper farming?**
 - a. Please specify _____
- 14. On what surface are you cultivating bell pepper?**
 - a. Less than 2,000 m²
 - b. 2,000 m² – 4,000 m²
 - c. More than 4,000 m²
- 15. From where do you buy the inputs needed (seeds, fertilisers etc.)?**
 - a. Directly from the importers
 - b. From the local distributors
 - c. From the online shops
- 16. What hybrid are you cultivating?**
 - a. Blancina F1
 - b. Barbie F1
 - c. Silverado F1
 - d. Bernita F1
- 17. Around what date have you planted this year?**
 - a. 22-28 March
 - b. 29 March – 4 April
- 18. Around what date have you started the harvest this year?**
 - a. 17-23 May
 - b. 24-30 May
- 19. What is the yield obtained from bell pepper cultivation?**
 - a. Please specify _____
- 20. What was the selling price of the bell peppers at the beginning of harvest (lei/kg)?**
 - a. Please specify _____
- 21. What is the actual selling price of the output?**
 - a. Please specify _____
- 22. What plant density are you using per hectare?**
 - a. 35.000 plants/ha
 - b. 50.000 plants/ha
- 23. Do you collaborate with a seedlings company?**
 - a. Yes
 - b. No
- 24. How do you deal with pests infections?**
 - a. Chemical control
 - b. IPM (Integrated Pests Management)
 - c. Both
- 25. How do you deal with the diseases infections affecting the crop?**
 - a. Organic plant protection solutions
 - b. Chemical plant protection solutions
- 26. Who is working in your high tunnels as labours?**

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Thesis Research Project

8 September 2021

- a. Family members
- b. Labours & Family members
- 27. What disease do you think is the most devastating one?**
 - a. CMV
 - b. TSWV
- 28. What pest do you think is the most devastating one?**
 - a. Thrips
 - b. Aphids
 - c. The Sunn pest
- 29. Where do you sell the bell peppers?**
 - a. Wholesaler market (Please specify _____)
 - b. Supermarket (Please specify _____)
- 30. In which city is located the wholesaler market where you sell the bell peppers?**
 - a. Please specify _____
- 31. What distance do you have to get through to the wholesaler market?**
 - a. Please specify _____
- 32. What is the average time you spend in your way to the wholesaler market?**
 - a. Please specify _____
- 33. At this period (middle of July) what quantity of bell pepper (in tons) do you sell per week?**
 - a. Please specify _____
- 34. In what do you pack the output?**
 - a. Carton boxes
 - b. Big plastic bags
 - c. Reusable plastic boxes
- 35. If you sell the bell peppers to the wholesaler markets, who is in charge of selling the output?**
 - a. Myself
 - b. Family member
 - c. Somebody else
- 36. Is the van used to carry the bell peppers to the wholesaler markets with a temperature control system?**
 - a. Yes
 - b. No
- 37. Have you ever considered investing in a temperature-controlled van?**
 - a. Yes
 - b. No
- 38. If yes, what was the biggest challenge faced?**
 - a. Lack of funds for acquiring a temperature-controlled van
 - b. Lack of time for checking the prices
- 39. Have you ever collaborated with a supermarket?**
 - a. Yes
 - b. No
- 40. What challenges have you faced when trying to work with the supermarket?**

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Thesis Research Project

8 September 2021

- a. Too many controls
 - b. Lack of necessary output
 - c. Many requirements
- 41. Are you aware of the local supermarket requirements?**
- a. Yes (Please specify _____)
 - b. No
- 42. After harvesting, do you grade the bell peppers?**
- a. Yes
 - b. No
- 43. Do you apply fertilisers or plant protection solutions to the crop?**
- a. Yes (Please specify _____)
 - b. No
- 44. If yes, before cultivating, do you analyse the soil and the water?**
- a. Yes
 - b. No
- 45. If no, why are you not analysing it?**
- a. I consider the analysis not useful enough
 - b. The analysis represents an extra cost and I am not willing to pay for it
- 46. How do you apply the quantities of fertilizer to the crop?**
- a. Without a scientific base
 - b. With the help of a mini-computer which calculates the needed amount per plant or per m²
- 47. What solution do you expect to find in the future in order to improve the production system?**
- a. Better linkages with the retailers, especially with the supermarkets
 - b. New and developed hybrids with resistances at the current diseases (TSWV, CMV etc.)
 - c. Fertilisation schemes realised by horticulture specialists
 - d. Accessing funds from the EU
- 48. Have you ever consider cultivating bell pepper niche products (California type, Dolce Italiano type, snack bell pepper)?**
- a. Yes
 - b. No
- 49. Can you tell me the main reason which stopped you from cultivating the specialities?**
- a. It is a new crop and I don't want to risk
 - b. Insecure for finding a market for the output
 - c. High costs for inputs (especially seeds)

Advising the Romanian bell pepper farmers in overcoming the limiting factors regarding meeting supermarket requirements. A case study of Olt and Dolj.

Thesis Research Project

8 September 2021

Annex 2. Interview questions with the supermarkets involved in the bell pepper sub-sector in the regions Olt and Dolj

Full name:

Company:

Position:

- Can you tell me more about the company you represent? I am interested in the bell pepper segment, so please elaborate on this area.
- From where do you buy the bell peppers?
- What requirements do you have from the current bell pepper supplier?
- At what price (lei/kg)?
- How many kg do you sell of bell pepper per month?
- In the bell pepper sector are you able to sell the bell pepper niche products (California type, Dolce Italiano type, snack bell pepper)?
- In the future you target yourself to sell more bell pepper packed in 1-2 kg bags rather than the loose packaged bell pepper?
- In the future will you ask your suppliers to use biodegradable packaging products?
- Under what circumstances do you apply some discounts on your retailed vegetables?
- What are your requirements (quality checks, weekly/monthly needed volumes etc.)?
- Can you provide me with a document where it is stated clear the requirements?
- Do you consider that the Romanian vegetables are preferred by the clients in the detriment of the imported ones?
- Are you aware of the cultivars (hybrids or varieties) used by the Romanian bell pepper farmers in this region? If yes, do you have any preference?
- Do you think the local bell pepper farmers have a future on the Romanian market?
- Have you ever considered working with the bell pepper farmers from nearby?
- What is stopping you from working with the bell pepper farmers from nearby?

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Thesis Research Project

8 September 2021

Annex 3. Interview questions with the input suppliers activate in the bell pepper sub-sector in the regions Olt and Dolj

Full name:

Company:

- What position do you have in this company?
- Can you tell me more about the company you represent? I am interested in the bell pepper sub-sector, so what are your inputs for this crop?
- From your experience, what are the most critical challenges bell pepper farmers face?
- What pests and diseases are very hard or almost impossible to deal with? Can you elaborate on these topics?
- What challenges do farmers face in the bell pepper sub-sector?
- What opportunities do you see in the bell pepper sub-sector?
- Do you think the local bell pepper farmers have any profit at the end of a cultivation cycle?

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Thesis Research Project

8 September 2021

Annex 4. Interview questions with bank representative

Full name:

Company:

Position:

- What position do you have in this company and for how long do you represent it?
- From the agriculture sector what types of companies can obtain a loan from your bank?
- Do the smallholder farmers come and try to obtain a loan used to develop the production system?
- What are the requirements for a farmer to obtain a loan from your bank?

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Thesis Research Project

8 September 2021

Annex 5. Interview questions with the sales agent from the regions Olt and Dolj

Full name:

Company:

Position:

- What is your position in this company and for how long do you represent it?
- What pests attack the bell pepper crops in this regions and what are the recommended tolls to control them?
- What diseases are very hard or almost impossible to deal with? How do the diseases spread between plants? How can the farmers stop the diseases infection?
- What challenges do farmers face in the bell pepper sub-sector?
- What opportunities do you see in the bell pepper sub-sector?

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Thesis Research Project

8 September 2021

Annex 6. List of all interviewed persons and their function

TYPE OF STAKEHOLDER	REGION	FULL NAME
Farmer	Olt	Delcea Alexandru
Farmer	Olt	Vaietus Madalin
Farmer	Olt	Codrie Florinel
Farmer	Olt	Stia Irinel
Farmer	Olt	Voinea Gelu Marius
Farmer	Olt	Terdel Ionut Mirel
Farmer	Olt	Streche Sica Sorin
Farmer	Olt	Tudor Victor Valentin
Farmer	Olt	Streche Marius
Farmer	Olt	Vita Nicolae
Farmer	Olt	Gulie Iancu
Farmer	Olt	Patacuia Stefan
Farmer	Olt	Buznicu Georgian Ciprian
Farmer	Olt	Cojoc Gheorghe
Farmer	Olt	Cule Gheorghita
Farmer	Olt	Musuroiu Ionut Cosmin
Farmer	Olt	Dinu Alexandru
Farmer	Olt	Patache Ionut
Farmer	Olt	Codrie Florea
Farmer	Olt	Vasile Laurentiu
Farmer	Olt	Marius Constantinesc
Farmer	Olt	Stefan Gojoc
Farmer	Olt	Catalin Cojocar
Farmer	Olt	Marian Doiunescu
Farmer	Olt	Catu Sorin
Farmer	Dolj	Petcu Ion
Farmer	Dolj	Nitroi Savu
Farmer	Dolj	Degeratu Ionut
Farmer	Dolj	Popa Viorel
Farmer	Dolj	Cojocar George
Farmer	Dolj	Iovan Lezonica
Farmer	Dolj	Ion Melea
Farmer	Dolj	Mustata Claudiu Ionut
Farmer	Dolj	Stefan Marin
Farmer	Dolj	Marian Babalca
Farmer	Dolj	Doina Virancescu
Farmer	Dolj	Marius Vagarescu
Farmer	Dolj	Ion Alexandru Sisu
Farmer	Dolj	Mihai Gheorghita
Farmer	Dolj	Adrian Vraicu
Input Supplier	Olt	Baetica Tomel

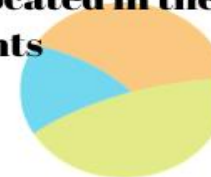
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Thesis Research Project

8 September 2021

Input Supplier	Olt	Petroi Floarea
Input Supplier	Dolj	Crusuveanu Mircea
Input Supplier	Dolj	Militaru Mirela
Importer (HFA)	Olt & Dolj	Sever Meleru
Bank	Olt & Dolj	Muruzuc Tudor
Supermarket (Carrefour)	Olt & Dolj	Daniel Lespezeanu
Supermarket (Mega Image)	Olt & Dolj	Diana Dobre

Limiting factors which affect the Romanian bell pepper farmers located in the regions Ilt and Dolj in meeting supermarket requirements



Thesis Research Project

Annex 7. Raw data obtained from SPSS Statistic Software

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ				
1	Sex	Region	Age	FAorCoop	ConsidereFAorCoop	ReasonFAorCoop	Subsidies	SpecifySubsidy	BankLoans	Area	Hybrid	HarvestingStart	Yield	SellingPriceAfterHarvest	ActualSellingPrice	PestsInfection	DiseaseInfection	ImportedDisease	ImportedPest	SellingLocation	NameSellingLoc	DistanceToMarket	TimeToMarket	PackingMaterial	SellingPerson	VanTempControl	ConsiderVTC	ChallengeVTC	SupermarketColab	SupermarketChallenge	Grading	ChemAnalysis	ReasonForNotAnal	QuantityFertiliser	NicheProducts	ReasonNicheProducts				
2	1	1	22	2	1	3	1	1	2	3	1	2	60	8.00	1.50	2	2	1	2	1	2	175	150	1	1	2	1	1	2	2	2	1	1	1	1	1	3			
3	1	1	31	1	-	-	1	1	2	2	2	2	25	6.00	4.50	2	2	1	3	2	-	-	3	3	1	-	-	1	1	2	2	2	1	1	1	3				
4	1	1	24	2	1	2	1	1	2	3	3	2	50	6.00	0.80	3	2	2	1	1	2	175	150	2	1	2	1	1	2	2	2	2	1	1	1	2				
5	1	1	30	2	1	1	1	1	2	3	4	1	50	8.00	0.80	2	2	1	2	1	1	30	15	2	1	2	-	-	2	1	2	2	2	2	1	1	3			
6	1	1	32	2	1	2	1	1	2	1	2	2	20	6.00	1.00	2	2	1	2	1	3	225	180	1	1	2	1	1	2	2	2	2	2	1	1	2	-			
7	1	1	20	2	1	1	1	1	2	2	4	2	25	7.00	1.20	2	2	1	3	1	3	225	180	1	1	2	1	1	2	3	2	2	2	2	1	1	2			
8	1	1	33	2	1	1	1	1	2	3	2	2	50	7.00	1.00	2	2	2	1	1	4	275	240	2	1	2	1	1	2	3	2	2	2	2	1	1	3			
9	1	1	31	2	1	2	1	1	2	3	3	2	75	6.00	1.20	2	2	2	2	1	5	375	270	1	1	2	1	1	2	1	2	1	1	1	1	3				
10	1	1	51	2	1	3	1	1	2	2	3	2	25	6.00	1.20	3	2	1	2	1	2	175	150	2	2	2	1	2	2	3	2	2	2	1	1	1	3			
11	1	1	49	2	1	2	1	1	2	2	1	2	30	6.00	1.50	2	2	1	3	1	2	175	150	2	1	2	1	1	2	3	2	2	2	2	1	1	3			
12	1	1	29	2	1	1	1	1	2	3	3	2	75	5.00	1.50	2	2	1	2	1	2	175	150	2	1	2	1	1	2	3	2	2	2	2	1	1	1			
13	1	1	60	2	1	3	1	1	2	3	2	2	60	6.00	1.75	2	2	2	2	1	1	30	15	1	1	2	1	1	2	2	2	2	2	2	1	1	3			
14	1	1	20	2	1	2	1	1	2	2	3	2	40	5.50	1.20	2	2	1	1	1	1	30	15	2	1	2	1	2	2	1	2	2	2	2	1	1	2			
15	1	1	55	2	1	1	1	1	2	1	3	2	20	5.00	1.00	2	2	1	2	1	5	375	270	2	1	2	1	1	2	2	2	2	2	2	2	1	1	3		
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17	1	1	43	2	1	2	1	1	2	1	3	2	20	8.00	0.80	2	2	2	1	1	3	225	180	2	1	2	1	2	2	3	2	2	2	2	2	1	1	2		
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19	1	1	48	2	1	2	1	1	2	2	3	2	40	5.00	1.00	2	2	2	2	1	2	175	150	2	1	2	1	1	2	1	2	2	2	2	1	1	3			
20	1	1	49	2	1	2	1	1	2	1	4	2	20	4.00	0.80	3	2	1	2	1	2	175	150	2	1	2	1	1	2	2	2	2	2	2	2	1	1	2		
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25	1	1	36	2	1	2	1	1	2	2	3	2	40	7.00	1.50	3	2	1	2	1	1	30	15	2	1	2	1	2	2	1	2	1	1	1	1	1				
26	1	1	63	2	1	2	1	1	2	2	2	2	40	6.00	1.00	2	2	1	2	1	3	225	180	2	1	2	1	1	2	3	2	2	2	2	2	1	1	1		
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28	1	2	57	2	1	1	1	1	2	2	2	2	40	6.50	0.80	3	2	1	2	1	2	175	150	1	1	2	1	1	2	1	2	2	2	2	2	1	1	1		
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34	1	2	50	2	1	3	1	1	2	1	3	2	20	7.00	0.80	1	2	1	2	1	2	175	150	2	1	2	1	1	2	1	2	2	2	2	2	2	2	1	1	2
35	1	2	40	2	1	2	1	1	2	2	2	2	40	6.00	1.20	1	2	1	2	1	2	175	150	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	1	2
36	1	2	51	2	1	1	1	1	2	1	1	2	20	7.00	1.50	2	2	2	3	1	6	475	360	2	1	2	1	1	2	1	2	2	2	2	2	2	2	1	1	3
37	1	2	39	2	1	2	1	1	2	2	3	2	40	5.50	1.00	1	2	1	2	1	1	30	15	2	1	2	1	1	2	3	2	2	1	1	1	1	2			
38	1	2	52	2	1	2	1	1	2	1	2	2	20	6.00	1.50	3	2	2	1	1	1	30	15	1	1	2	1	1	2	1	2	2	2	2	2	1	1	1		
39	1	2	49	2	1	1	1	1	2	2	3	2	40	6.50	1.00	1	2	2	3	1	1	30	15	1	1	2	1	2	2	3	2	2	2	2	2	2	1	1	3	
40	1	2	39	2	1	2	1	1	2	1	4	2	20	6.00	0.80	2	2	1	2	1	3	225	180	2	1	2	1	1	2	3	2	2	2	2	2	2	2	1	1	2
41	1	2	37	2	1	2	1	1	2	2	4	2	40	6.50	1.50	1	2	1	2	1	5	375	270	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	1	2

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

Thesis Research Project

Annex 8. SPSS Statistic Software output

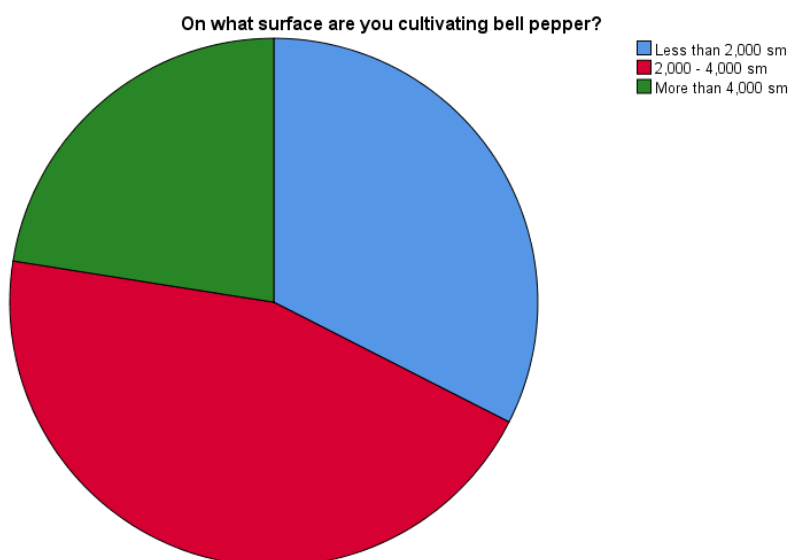
1. Frequency statistic for farmers' age

Statistics		
What is your age?		
N	Valid	40
	Missing	0
Mean		42.03
Median		41.00
Std. Deviation		12.438
Range		46
Minimum		20
Maximum		66

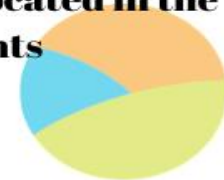
2. Farm size

On what surface are you cultivating bell pepper?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 2,000 m ²	13	32.5	32.5	32.5
	2,000 - 4,000 m ²	18	45.0	45.0	77.5
	More than 4,000 m ²	9	22.5	22.5	100.0
	Total	40	100.0	100.0	



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

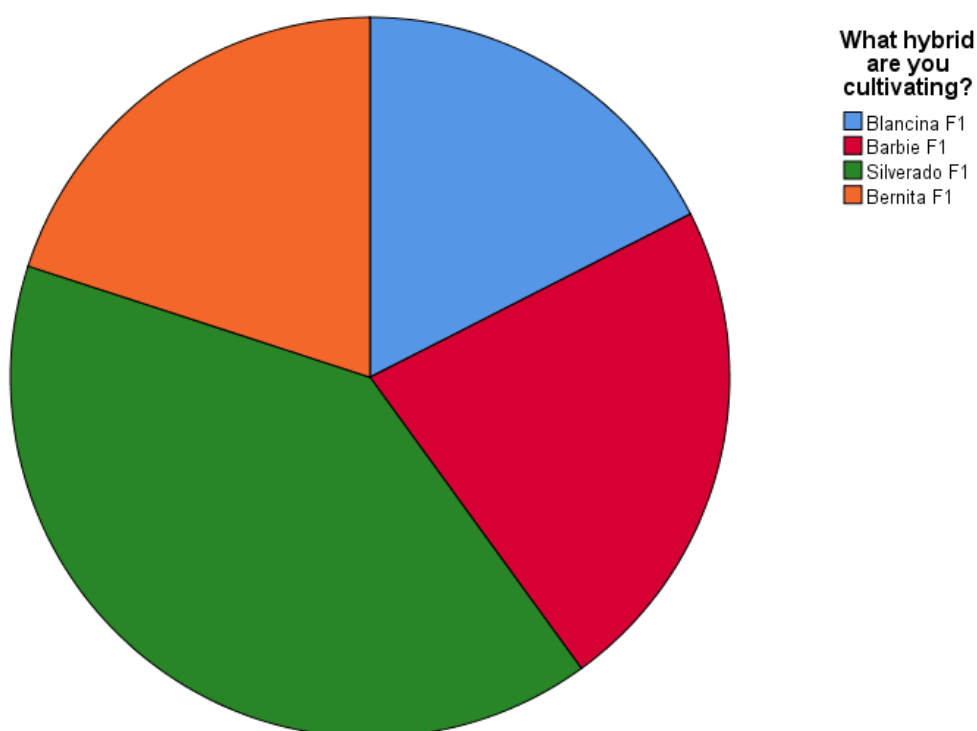


Thesis Research Project

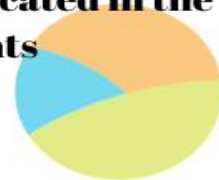
3. The most cultivated bell pepper hybrid in the regions Olt and Dolj

What hybrid are you cultivating?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Blancina F1	7	17.5	17.5	17.5
	Barbie F1	9	22.5	22.5	40.0
	Silverado F1	16	40.0	40.0	80.0
	Bernita F1	8	20.0	20.0	100.0
	Total	40	100.0	100.0	



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

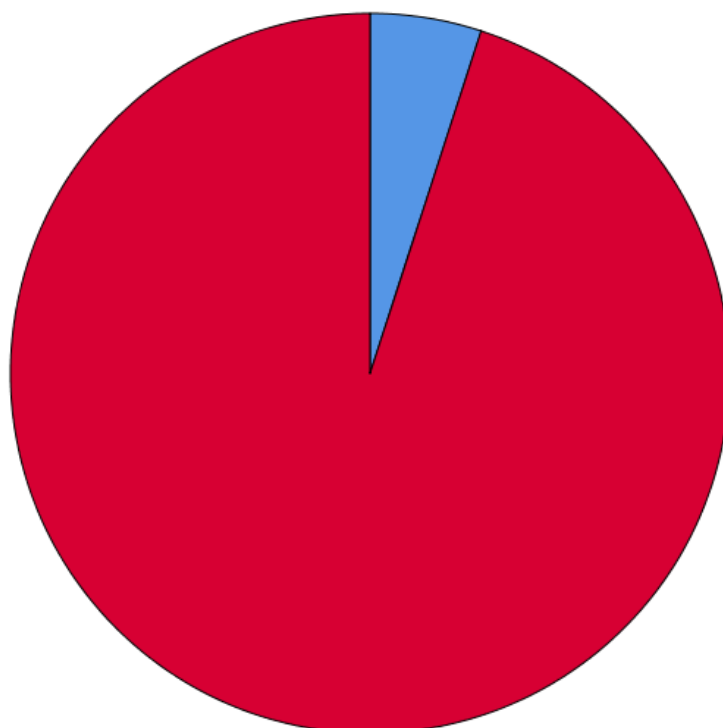


Thesis Research Project

4. Farmer's Associations or Cooperatives

Do you take part in a Farmer's Association or Cooperative?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	5.0	5.0	5.0
	No	38	95.0	95.0	100.0
	Total	40	100.0	100.0	



Do you take part in a Farmer's Association or Cooperative?

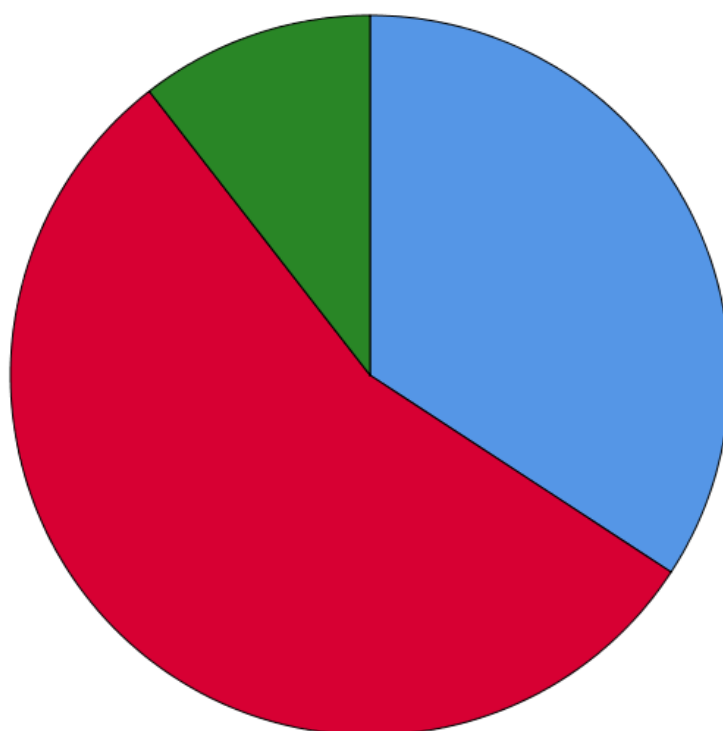
Yes
No

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

Thesis Research Project

Can you tell me the reason which stopped you taking part in a Farmer's Association or Cooperative?

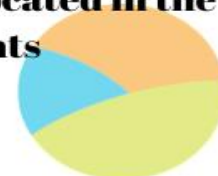
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Too much bureaucracy	13	32.5	34.2	34.2
	Lack of trust among other farmers	21	52.5	55.3	89.5
	Lack of willpower	4	10.0	10.5	100.0
	Total	38	95.0	100.0	
Missing	System	2	5.0		
Total		40	100.0		



Can you tell me the reason which stopped you taking part in a Farmer's Association or Cooperative?

- Too much bureaucracy
- Lack of trust among other farmers
- Lack of willpower

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

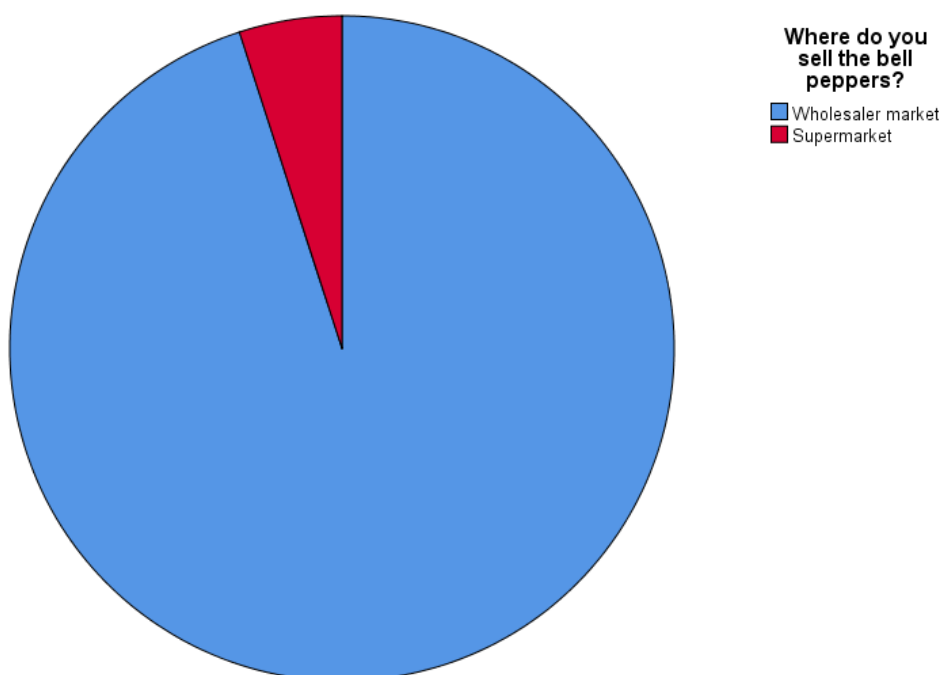


Thesis Research Project

5. Selling location

Where do you sell the bell peppers?

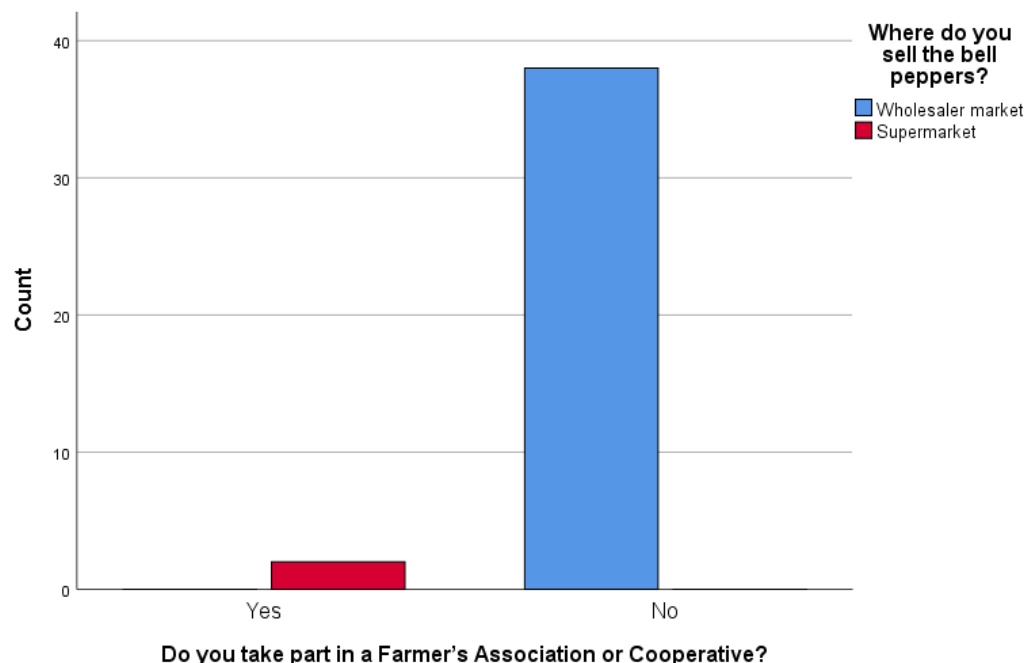
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Wholesaler market	38	95.0	95.0	95.0
	Supermarket	2	5.0	5.0	100.0
	Total	40	100.0	100.0	



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

Thesis Research Project

6. Relation between farmers being part of a cooperative and the selling channel



Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	40.000 ^a	1	.000		
Continuity Correction ^b	21.717	1	.000		
Likelihood Ratio	15.881	1	.000		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	39.000	1	.000		
N of Valid Cases	40				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .10.

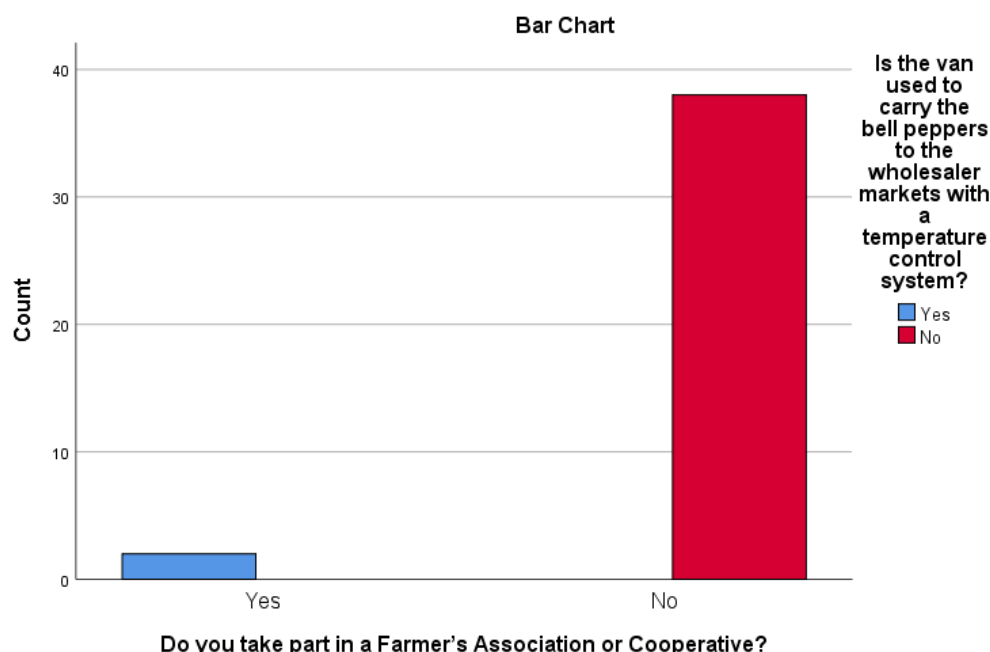
b. Computed only for a 2x2 table

- H_0 : There is no difference in selling channel between farmers participating in a cooperative and does who don't.
- H_1 : There is a difference in selling channel between farmers participating in a cooperative and does who don't.
- The SPSS output highlights that the p value is 0.001, less than $\alpha = 5\% = 0.05$. The null hypothesis (H_0) is rejected, there is a difference in selling channel between farmers participating in a cooperative and does who don't.

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

Thesis Research Project

7. Relation between farmers being part of a cooperative and the usage of a temperature control van



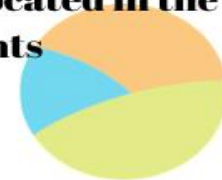
Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	40.000 ^a	1	.000		
Continuity Correction ^b	21.717	1	.000		
Likelihood Ratio	15.881	1	.000		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	39.000	1	.000		
N of Valid Cases	40				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .10.

b. Computed only for a 2x2 table

- H_0 : There is no difference in the usage of a temperature control van between farmers participating in a cooperative and does who don't.
- H_1 : There is a difference in the usage of a temperature control van between farmers participating in a cooperative and does who don't.
- The SPSS output highlights that the p value is 0.001, less than $\alpha = 5\% = 0.05$. The null hypothesis (H_0) is rejected, there is a difference in the usage of a temperature control van between farmers participating in a cooperative and does who don't.

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



Thesis Research Project

8. The favoured wholesaler markets by the farmers

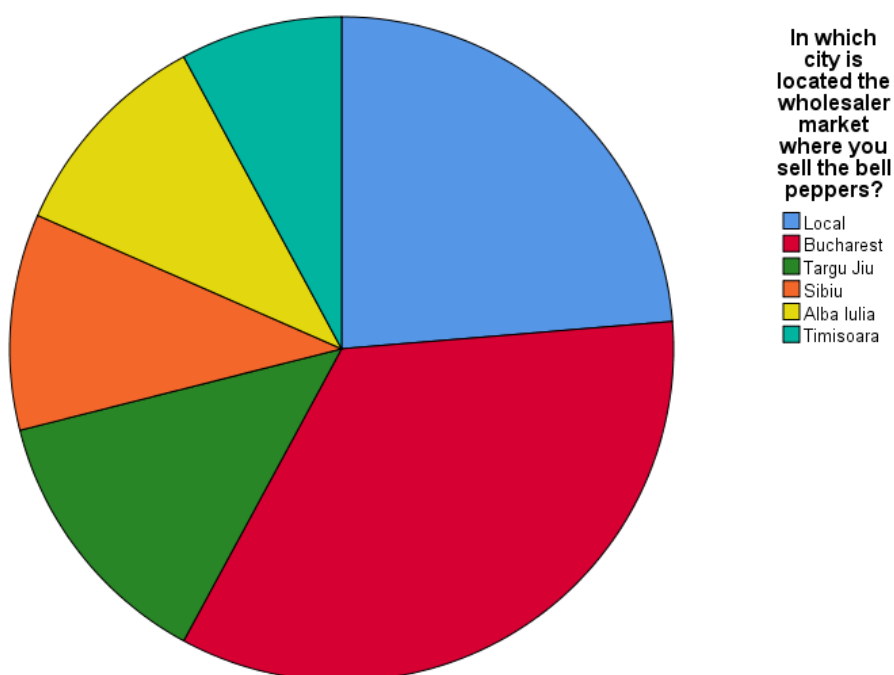
Statistics

In which city is located the wholesaler market where you sell the bell peppers?

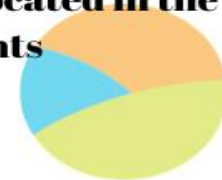
N	Valid	Missing
	38	2
Mode	2	
Minimum	1	
Maximum	6	

In which city is located the wholesaler market where you sell the bell peppers?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Local	9	22.5	23.7	23.7
	Bucharest	13	32.5	34.2	57.9
	Targu Jiu	5	12.5	13.2	71.1
	Sibiu	4	10.0	10.5	81.6
	Alba Iulia	4	10.0	10.5	92.1
	Timisoara	3	7.5	7.9	100.0
	Total	38	95.0	100.0	
Missing	System	2	5.0		
Total		40	100.0		



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



Thesis Research Project

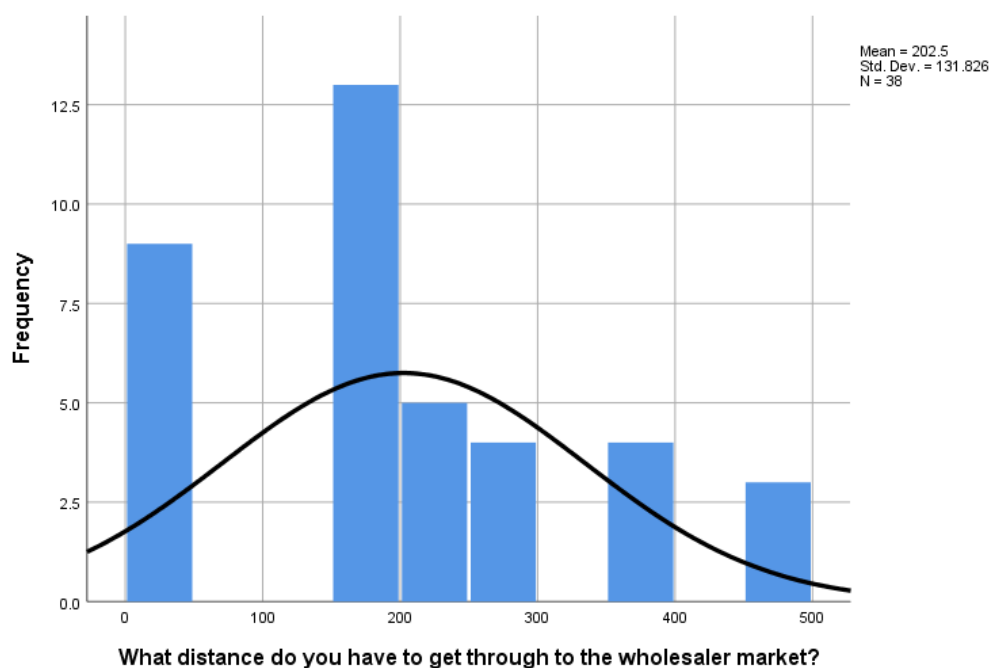
Statistics

What distance do you have to get through to the wholesaler market?

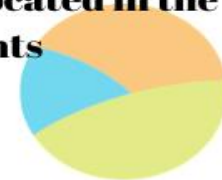
N	Valid	38
	Missing	2
Mean		202.50
Minimum		30
Maximum		475

What distance do you have to get through to the wholesaler market?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30	9	22.5	23.7	23.7
	175	13	32.5	34.2	57.9
	225	5	12.5	13.2	71.1
	275	4	10.0	10.5	81.6
	375	4	10.0	10.5	92.1
	475	3	7.5	7.9	100.0
	Total	38	95.0	100.0	
Missing	System	2	5.0		
Total		40	100.0		



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



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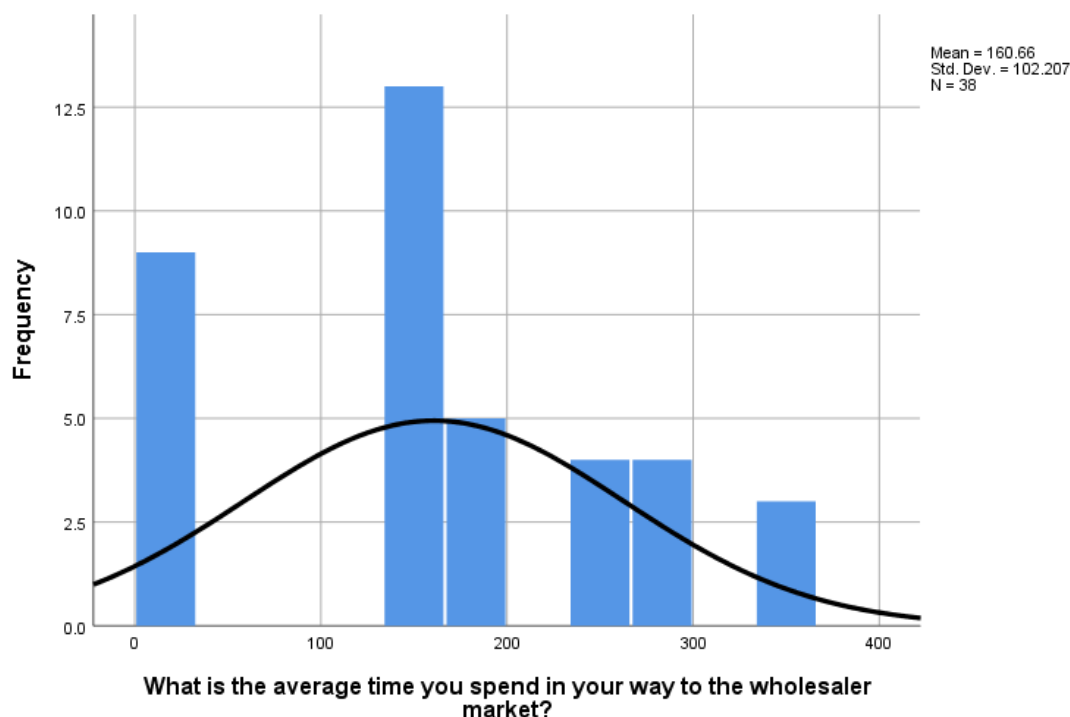
Statistics

What is the average time you spend in your way to the wholesaler market?

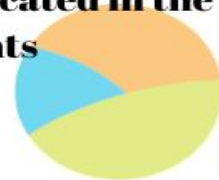
N	Valid	38
	Missing	2
Mean		160.66
Minimum		15
Maximum		360

What is the average time you spend in your way to the wholesaler market?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15	9	22.5	23.7	23.7
	150	13	32.5	34.2	57.9
	180	5	12.5	13.2	71.1
	240	4	10.0	10.5	81.6
	270	4	10.0	10.5	92.1
	360	3	7.5	7.9	100.0
	Total	38	95.0	100.0	
Missing	System	2	5.0		
Total		40	100.0		



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

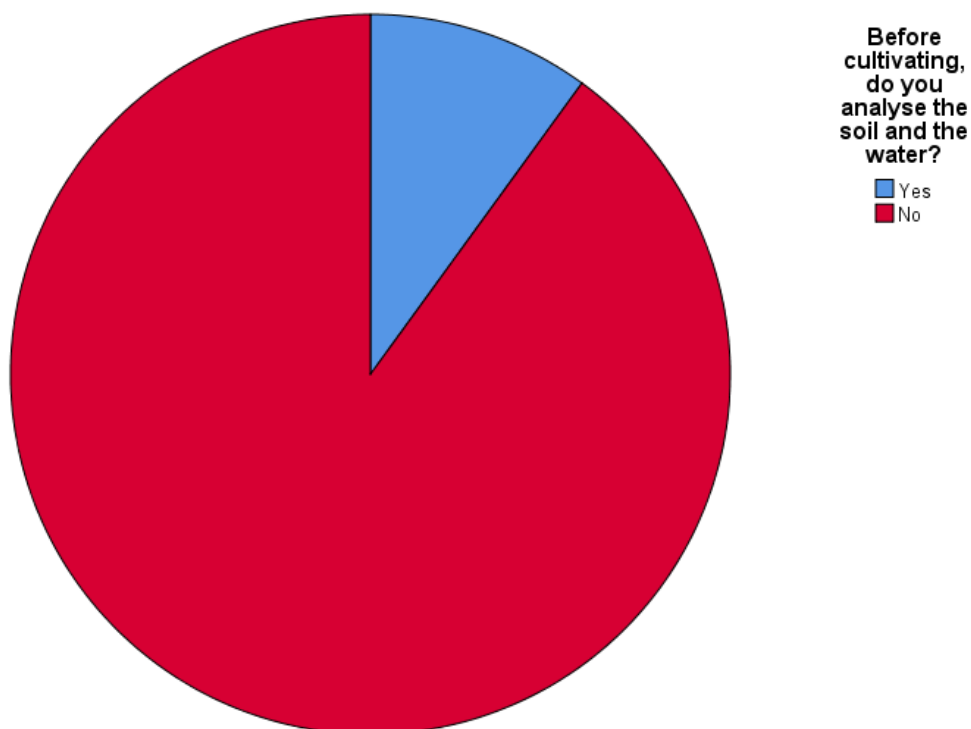


Thesis Research Project

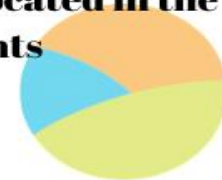
9. Chemical analysis of the soil and water

Before cultivating, do you analyse the soil and the water?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	10.0	10.0	10.0
	No	36	90.0	90.0	100.0
	Total	40	100.0	100.0	



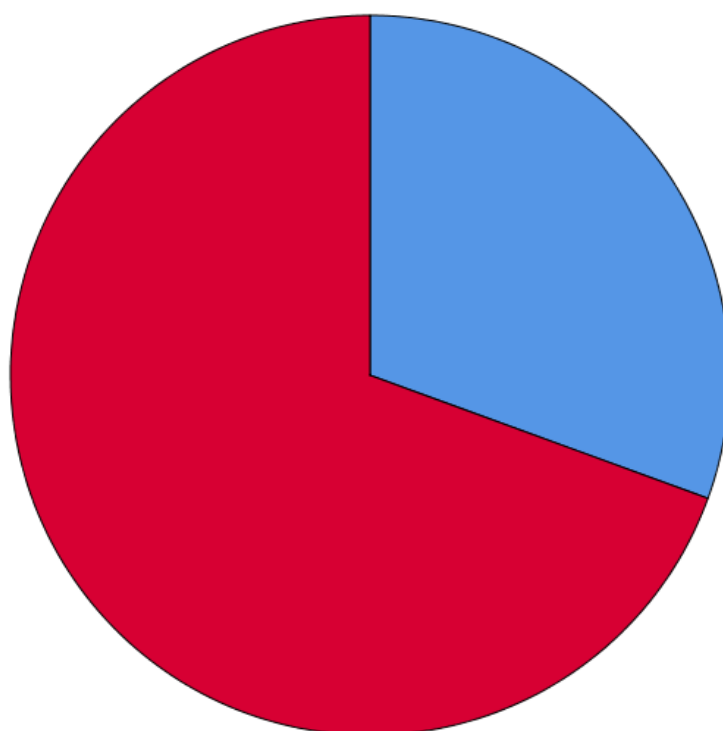
Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



Thesis Research Project

If no, why are you not analysing it?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I consider the analysis not useful enough	11	27.5	30.6	30.6
	The analysis represents an extra cost and I am not willing to pay for it	25	62.5	69.4	100.0
	Total	36	90.0	100.0	
Missing	System	4	10.0		
Total		40	100.0		



If no, why are you not analysing it?

- I consider the analysis not useful enough
- The analysis represents an extra cost and I am not willing to pay for it

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

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10. How the farmers apply the quantities of fertilizers to the crop

How do you apply the quantities of fertilizer to the crop?

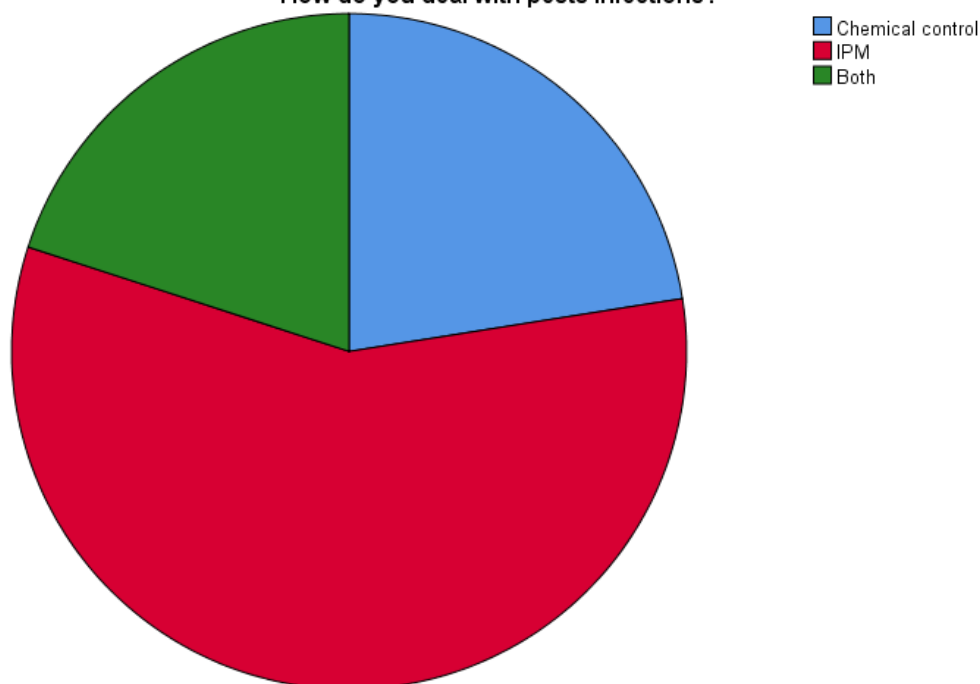
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Without a scientific base	40	100.0	100.0	100.0

11. Pest infection and management

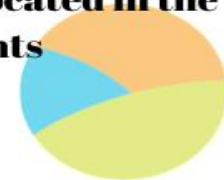
How do you deal with pests infections?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chemical control	9	22.5	22.5	22.5
	IPM	23	57.5	57.5	80.0
	Both	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

How do you deal with pests infections?



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

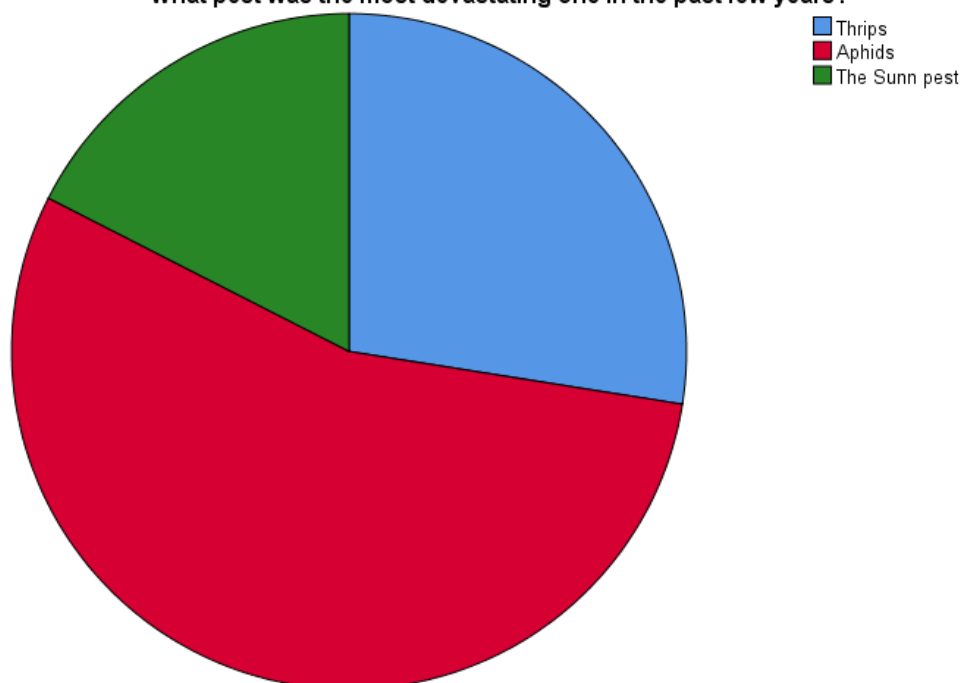


Thesis Research Project

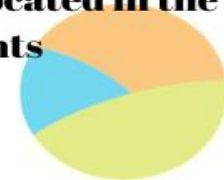
What pest was the most devastating one in the past few years?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Thrips	11	27.5	27.5	27.5
	Aphids	22	55.0	55.0	82.5
	The Sunn pest	7	17.5	17.5	100.0
	Total	40	100.0	100.0	

What pest was the most devastating one in the past few years?



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



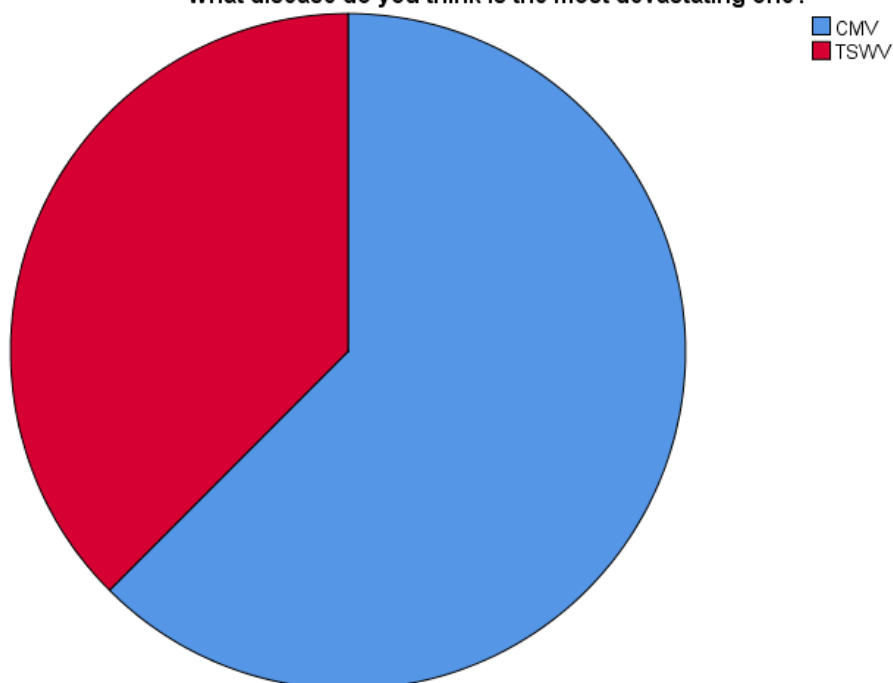
Thesis Research Project

12. Disease infection and management

What disease do you think is the most devastating one?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CMV	25	62.5	62.5	62.5
	TSWV	15	37.5	37.5	100.0
	Total	40	100.0	100.0	

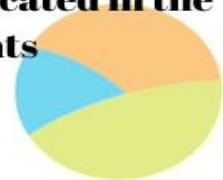
What disease do you think is the most devastating one?



How do you deal with the diseases infections affecting the crop?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chemical plant protection solutions	40	100.0	100.0	100.0

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



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13. Average selling price of the bell peppers in the regions Olt and Dolj

Statistics

What was the selling price of the bell peppers at the beginning of harvest (lei/kg)?

What is the actual selling price of the output?

N	Valid	40	40
	Missing	0	0
Mean		6.2000	1.4050
Std. Deviation		.95273	.89154
Minimum		4.00	.80
Maximum		8.00	5.00

What was the selling price of the bell peppers at the beginning of harvest

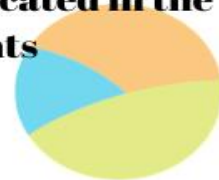
(lei/kg)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4.00	2	5.0	5.0	5.0
	5.00	4	10.0	10.0	15.0
	5.50	3	7.5	7.5	22.5
	6.00	15	37.5	37.5	60.0
	6.50	5	12.5	12.5	72.5
	7.00	7	17.5	17.5	90.0
	8.00	4	10.0	10.0	100.0
	Total	40	100.0	100.0	

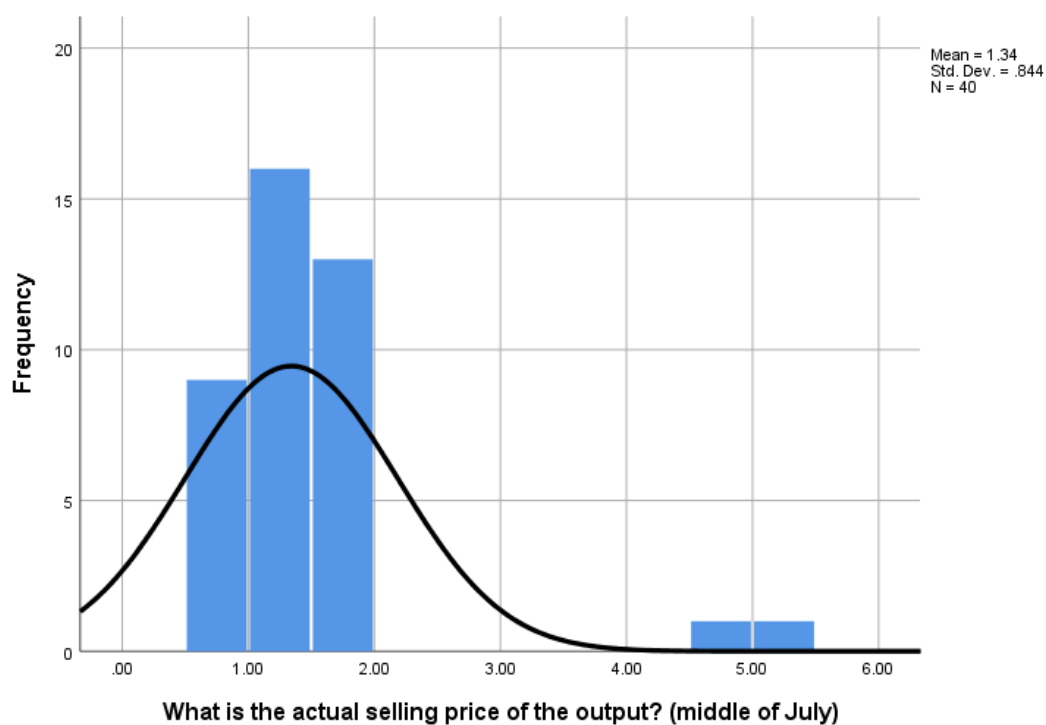
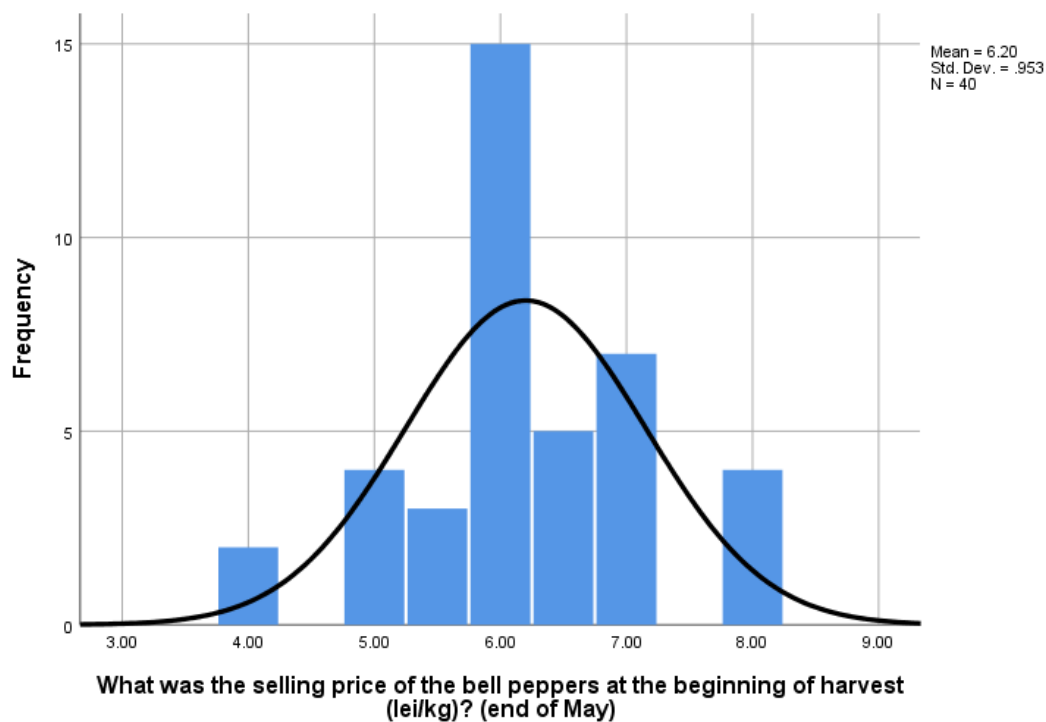
What is the actual selling price of the output?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.80	9	22.5	22.5	22.5
	1.00	10	25.0	25.0	47.5
	1.20	6	15.0	15.0	62.5
	1.50	12	30.0	30.0	92.5
	1.75	1	2.5	2.5	95.0
	4.50	1	2.5	2.5	97.5
	5.00	1	2.5	2.5	100.0
	Total	40	100.0	100.0	

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



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Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



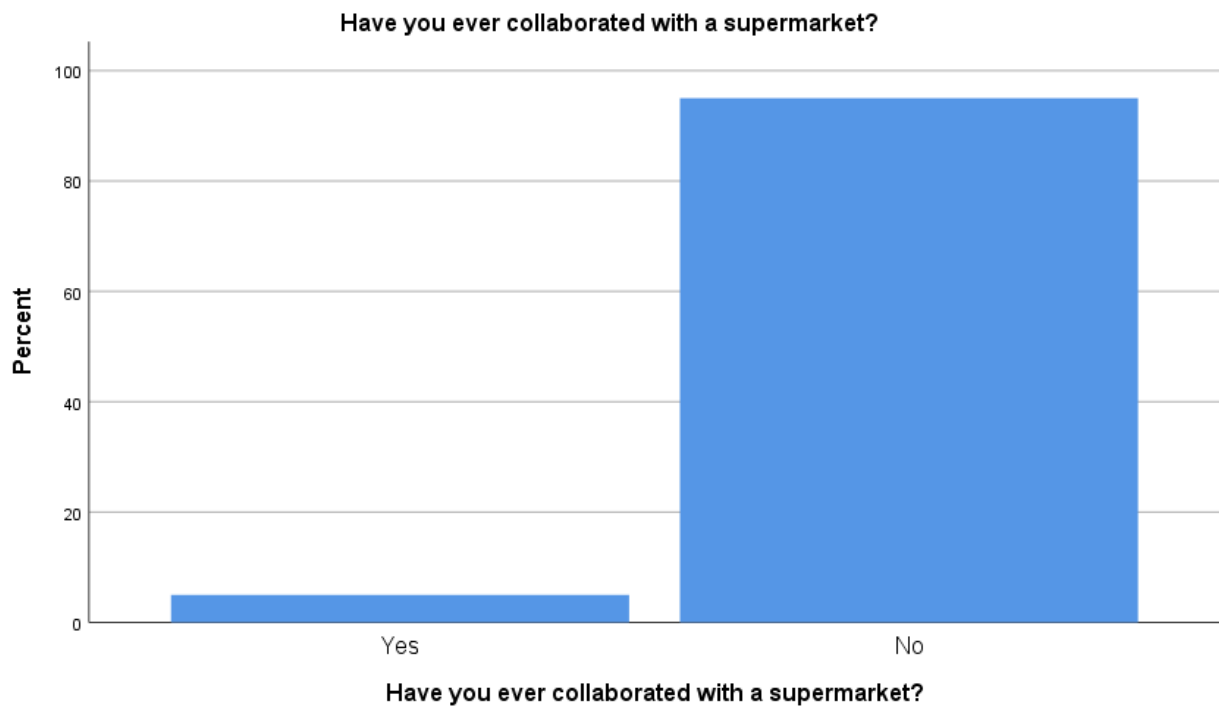
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14. Collaboration with the supermarkets

Statistics

Have you ever collaborated with a supermarket?

N	Valid	40
	Missing	0
Mode		2



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

Thesis Research Project

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
What is the actual selling price of the output? (middle of July)	Equal variances assumed	.005	.946	-16.803	38	.000	-3.58816	.21354	-4.02044	-3.15588
	Equal variances not assumed			-14.101	1.073	.038	-3.58816	.25447	-6.34335	-.83296

H_0 : There is no difference in the actual selling price between farmers who collaborate with a supermarket and farmers selling in the wholesaler markets.

H_1 : There is a difference in the actual selling price between farmers who collaborate with a supermarket and farmers selling in the wholesaler markets.

The SPSS output highlights that the p value is 0.000, less than $\alpha = 5\% = 0.05$. The null hypothesis (H_0) is rejected, so it is a difference in the actual selling price between farmers who are collaborating with a supermarket and the ones who don't.

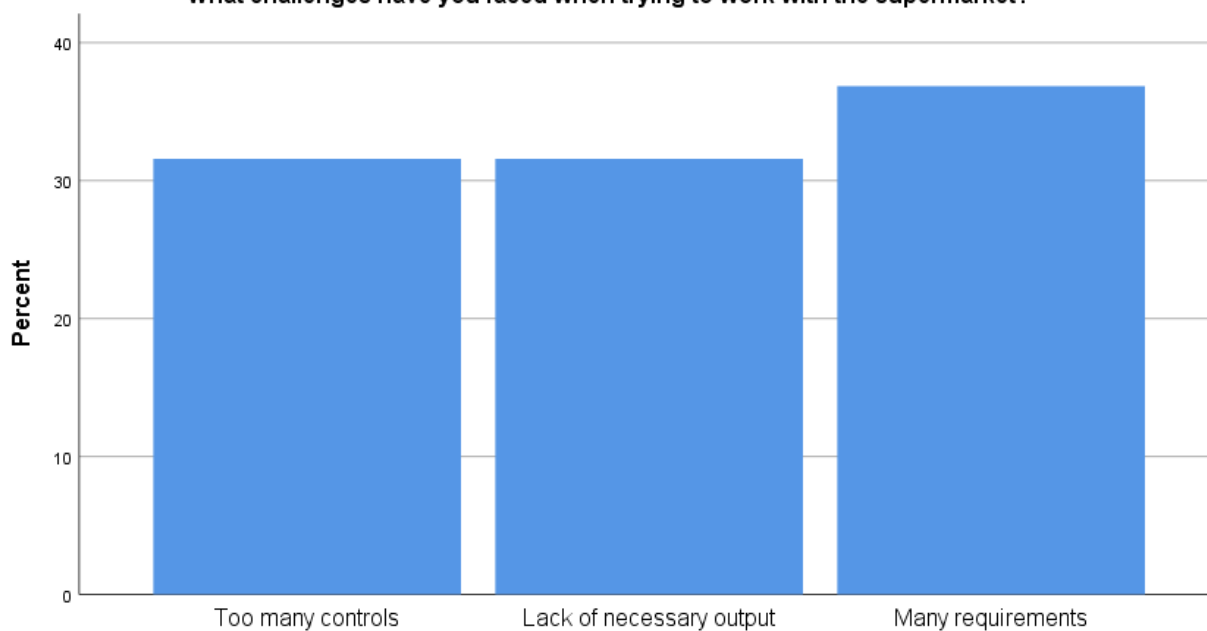
Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

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What challenges have you faced when trying to work with the supermarket?

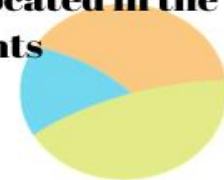
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Too many controls	12	30.0	31.6	31.6
	Lack of necessary output	12	30.0	31.6	63.2
	Many requirements	14	35.0	36.8	100.0
	Total	38	95.0	100.0	
Missing	System	2	5.0		
Total		40	100.0		

What challenges have you faced when trying to work with the supermarket?



What challenges have you faced when trying to work with the supermarket?

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

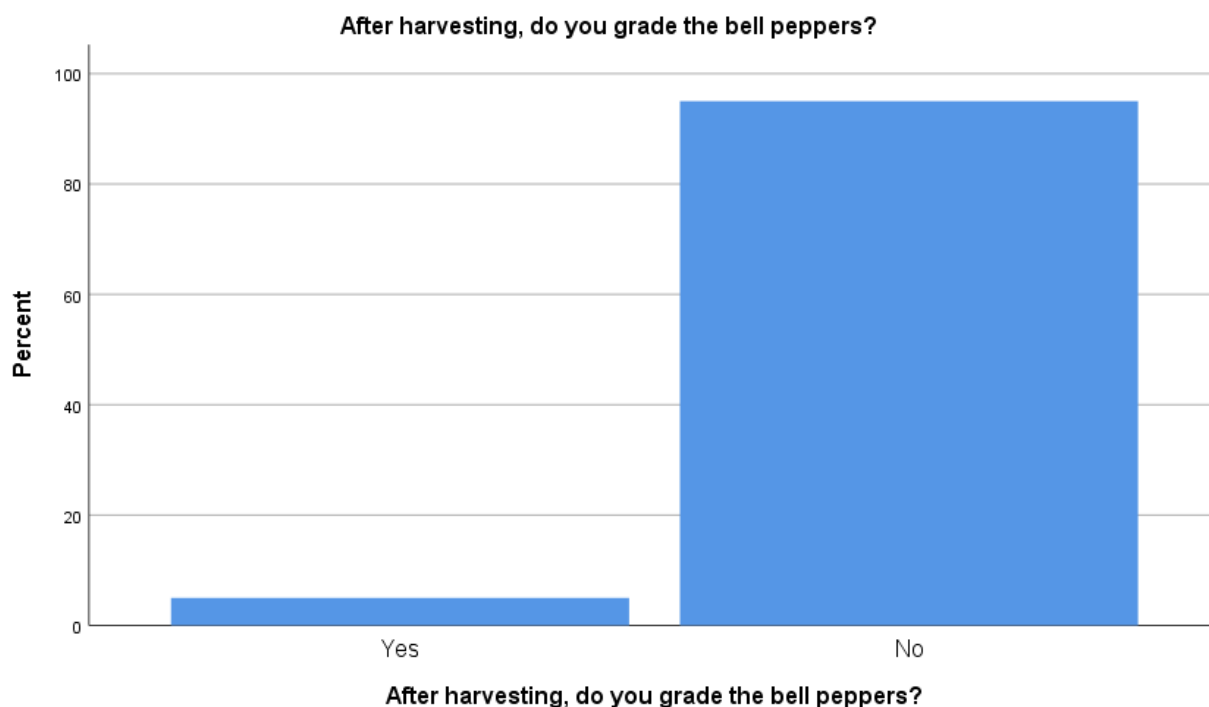


Thesis Research Project

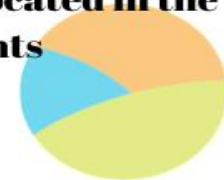
15. Grading and packaging

After harvesting, do you grade the bell peppers?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	5.0	5.0	5.0
	No	38	95.0	95.0	100.0
	Total	40	100.0	100.0	



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

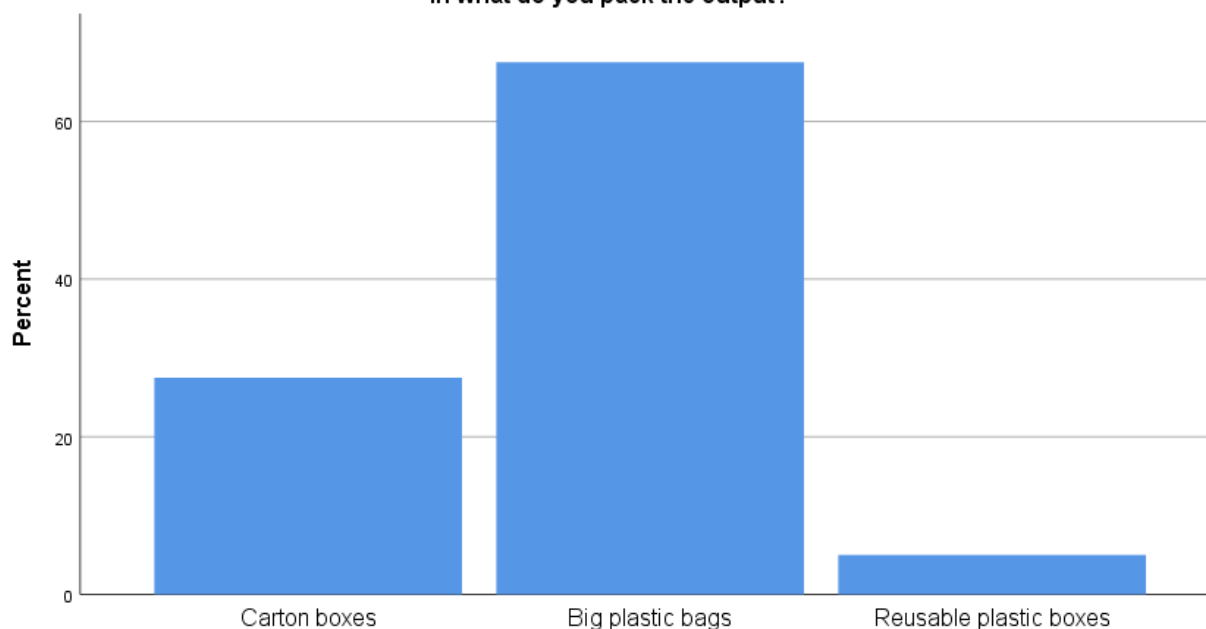


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In what do you pack the output?

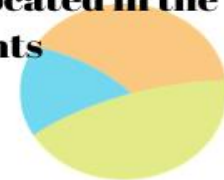
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Carton boxes	11	27.5	27.5	27.5
	Big plastic bags	27	67.5	67.5	95.0
	Reusable plastic boxes	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

In what do you pack the output?



In what do you pack the output?

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



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16. Subsidies

Do you apply to any subsidies from the Government?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	40	100.0	100.0	100.0

To what subsidies are you applying yearly?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	APIA	40	100.0	100.0	100.0

17. Bank loans

Do you take loans from the bank used to develop the production?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	40	100.0	100.0	100.0

Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



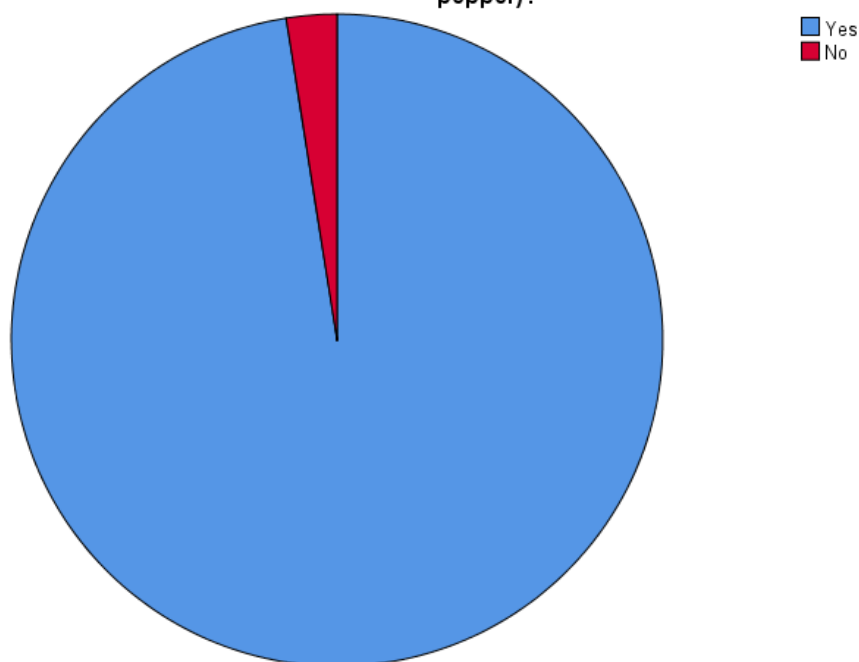
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18. Niche bell pepper products

Have you ever consider cultivating bell pepper niche products (California type, Dolce Italiano type, snack bell pepper)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	39	97.5	97.5	97.5
	No	1	2.5	2.5	100.0
	Total	40	100.0	100.0	

Have you ever consider cultivating bell pepper niche products (California type, Dolce Italiano type, snack bell pepper)?



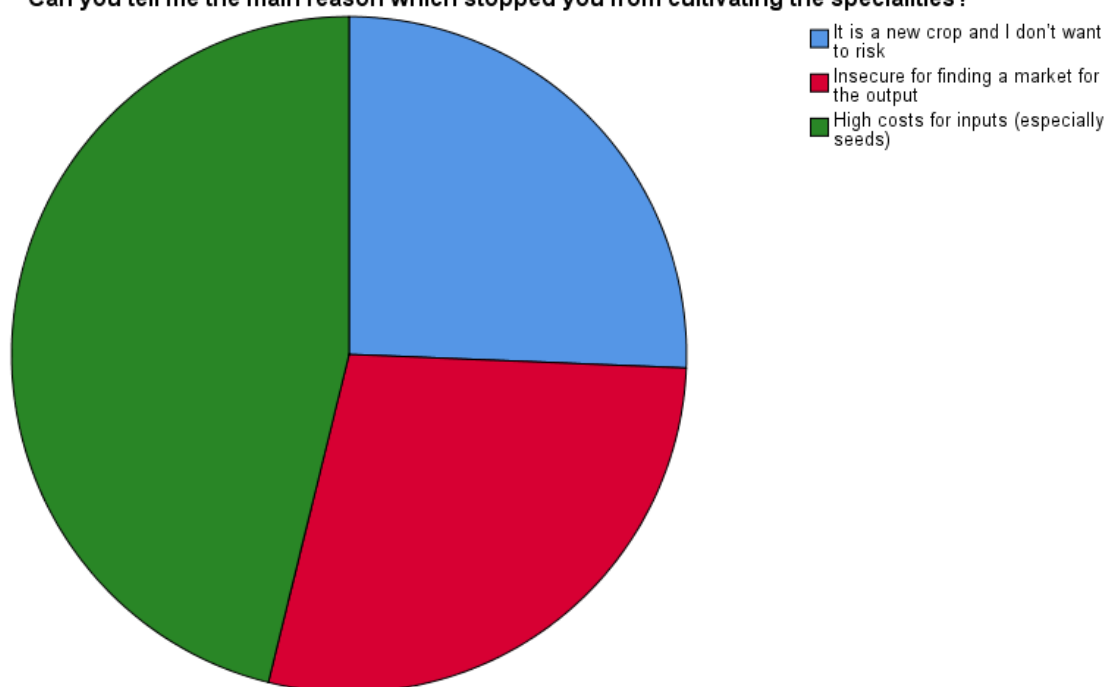
Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements

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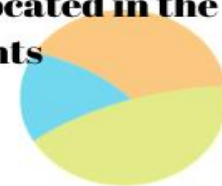
Can you tell me the main reason which stopped you from cultivating the specialties?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	It is a new crop and I don't want to risk	10	25.0	25.6	25.6
	Insecure for finding a market for the output	11	27.5	28.2	53.8
	High costs for inputs (especially seeds)	18	45.0	46.2	100.0
	Total	39	97.5	100.0	
Missing	System	1	2.5		
Total		40	100.0		

Can you tell me the main reason which stopped you from cultivating the specialties?



Limiting factors which affect the Romanian bell pepper farmers located in the regions Olt and Dolj in meeting supermarket requirements



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Annex 9. Production stream sheet

Production stream steps	Realised operations
Harvesting and handling the before the packaging of the California bell peppers	<p>The fresh harvested products are placed in plastic clean boxes and are carried to the grading and storing area.</p> <p>The plastic boxes are well fixed on the transport equipment not to damage the bell peppers.</p> <p>On the way from the greenhouse production area to the grading and storing area the California bell peppers are maintained at the ambient temperature.</p> <p>The California bell peppers are weighed and pre-stored in the cold storage room.</p>
Weighing, packaging and labelling	<p>The grading is realised by hand to take out the inconsistent fruits with various faults (off-grade colour or calibre etc.).</p> <p>After grading the California bell peppers are packaged by a flow-pack equipment in a perforated plastic film suitable for this product.</p> <p>The final trio of bell peppers are labelled with the logo and the name "Mix Bell Pepper".</p>
Net weight control packaged product	<p>The net weight control of the product is based a survey. There are weighed with an accuracy weighting machine a sample of 100 packages from a batch of 1,000 packages focusing on keeping in good parameters the net weight.</p>
Packaging the final product being ready to delivery	<p>The mixt California bell pepper trio is re-packaged in a secondary packaging, the reusable plastic boxes IFCO LL 6416. Every reusable plastic box contains 10 pieces of 500 g each.</p>
Storing in the cold storage room	<p>After the processes of grading, packaging, labelling and re-packaging, the final product is stored in the cold storage room at a temperature of 8-10 °C.</p> <p>The storage in the cold storage room is realised for short periods of time.</p>
Delivery to supermarket's warehouses	<p>The products are delivered to supermarket's warehouses only with transport facilities equipped with a temperature control system. The optimum temperature interval for delivery is 8-10 °C.</p> <p>The temperature is registered during the delivery by a thermograph system which can provide the retailer a thermo-diagram for the entire delivery time.</p> <p>In order to prevent the depreciation of the transported products, through infections of foreign odours, the means of transport are cleaned, washed and disinfected before and after the transport.</p>