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Bachelor Thesis

Feeding seven billion: A Bulgarian perspective

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Thesis title

Feeding seven billion: A Bulgarian perspective

Objectives of thesis

The objectives of the Bachelor's thesis are to spot one of the global major problems affecting the world in 21st century – hunger and poverty, and also suggesting ways to solve that. It focuses on finding out what is hunger and what is caused by hunger. Explanations of the terms organic food, "GMO" and the issues related to them are provided.

Methodology

It will figure out the factors affecting consumer's willingness to pay for organic food. It will be conducted an internet survey, the results will be subject to Data analysis and then applied to the problem.

The proposed extent of the thesis

40 pages

Keywords

hunger, world, malnutrition, organic food, GMO, consumer behaviour, market, demand and supply, survey

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Recommended information sources

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Declaration

I declare that I have worked on my bachelor thesis titled "Feeding seven billion: A Bulgarian perspective" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 15.03.2018 _____

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Feeding seven billion: A Bulgarian perspective

Abstract

The objective of this thesis is to provide evidence to support the concept that sustainable organic farming is a viable solution to fight one of the biggest problems in the 21st century - world hunger. The paper consists of three main parts: (1) defining the problem of world hunger and food insecurity (2) exploring organic farming and its effects on the issues associated with world hunger, (3) examining the implementation of organic farming in developing the rural areas, using Bulgaria as a case study.

The literature review addresses the problem of world hunger; it explores food security, poverty, and the role of agriculture. Then, it explores organic farming, trends and markets, and provides empirical evidence on how organic farming could be a used to achieve sustainability and fight hunger. Thirdly, it discusses the current state of organic farming in Bulgaria. The practical part of the thesis analyzes the potential of organic farming in Bulgaria by using two scenarios, designed through time series analysis to predict the organic crop area for the next 3 years. Then, it presents the results of a conducted online survey, providing insights into the attitudes of the Bulgarian consumers towards organic food. Finally, it concludes that organic farming can have a huge potential in Bulgaria and could be used as an important tool to reduce world hunger and poverty, while recommends further research on it.

Keywords: sustainability, agriculture, malnutrition, poverty, GMO, forecast, hunger, Bulgaria, organic farming, food security, forecast

Jak nasytit sedm milionů: Bulharská perspektiva

Abstrakt

Cílem této práce je prokázat, že udržitelné organické farmaření je životaschopným řešením boje proti největšímu problému 21. století - hladu ve světě. Práce má tři hlavní části: 1. definice problému hladu ve světě a potravinové nejistoty, 2. zjištění potenciálu organického farmaření a jeho vlivu na problémy související s hladem ve světě, 3. analýza implementace organického farmaření a jeho vlivu na rozvoj zemědělských oblastí, kdy se jmenovitě zkoumá situace v Bulharsku.

V literární rešerši jsou zpracovány literární prameny zabývající se hladem ve světě, zkoumá se potravinová nejistota, chudoba a role zemědělství. Další část se zabývá organickým farmařením, trendy a trhy a předkládá empirické důkazy o možnosti využití organického farmaření k dosažení udržitelnosti a v boji proti hladu. Za třetí popisuje současný stav organického farmaření v Bulharsku, kde sleduje dva scénáře vzniklé na základě analýzy časových řad s cílem predikovat velikost plochy, kde se pěstují organické plodiny, v následujících 3 letech. Dále prezentuje výsledky on-line průzkumu, který shrnuje postoje bulharských spotřebitelů k organickým potravinám. Tato práce dochází k závěru, že organické farmaření má v Bulharsku velký potenciál a může být využito jako důležitý nástroj v boji proti hladu a chudobě ve světě, přičemž doporučuje další výzkum v této oblasti.

Klíčová slova: udržitelnost, zemědělství, podvýživa, chudoba, GMO, výhled, hlad, Bulharsko, organické farmaření, potravinová nejistota

Table of content

List of figures

List of tables

List of abbreviations

GM - Genetically Modified

GMO - Genetically Modified Organisms

EU - European Union

WHO - World Health Organization

FAO - Food and Agriculture Organisation

IFOAM - International Federation of Organic Agriculture Movements

UAA – Utilized Agricultural Area

UNCTAD Nations Conference on Trade and Development

1. Introduction

After the Industrial Revolution in the 18th and 19th century, the world has changed dramatically. Industrialization brought many social and economic changes and had a huge impact on human development. Increased production resulted in increased number of people that moved from rural areas to cities, in search for better employment opportunities. This led to urbanization, which consequently created overcrowded urban areas and undeveloped rural areas. In the last decades, a rapid population growth has been observed.

With the increased global population growth, problems like hunger and poverty became even more extreme and food security has been questioned. Nowadays, one of the main concerns for the future is the global food supply. Many scientists believe that if the population continues to grow at a rapid pace, we might face food insecurity in the next couple of decades. Today, millions of people around the world are going to bed hungry as they simply don't have enough food, because they cannot afford it. In the last century, researchers have been looking for ways to eradicate hunger and poverty. There are many theories and concept of how this can be accomplished. One of the latest concepts that could have the potential to do that is the concept of sustainability. How to achieve sustainability? Can sustainability help fighting hunger and poverty?

This thesis introduces the concept of achieving sustainability and reducing hunger and poverty through organic farming. While it is argued that the solution is complex and multiple efforts, rather than a single one, should be combined to eradicate hunger and poverty, this study explores numerous papers that provide empirical evidence on the benefits of organic farming and the positive effects of organic farming. The scope of this work extends from explaining what are the effects of hunger and how organic farming could help resolve these issues, to the implementation of organic farming in emerging economies and how this could lead to sustainable future development.

2. Objectives and Methodology

2.1 Objectives

The research question of the thesis is whether organic farming could be a powerful tool for achieving sustainability and fighting world hunger or not. The initial assumption was that organic farming itself is not enough to achieve sustainability; however, a growing number of empirical evidence shows that organic agriculture might be a viable solution to help reducing poverty and hunger by achieving sustainability. The thesis examines and predicts the development of organic farming in the case study of Bulgaria and could be used as groundwork for a similar research for other emerging economies.

2.2 Methodology

The literature review was formulated by examining various books, research papers, articles, which were carefully studied to provide relevant information and support the theoretical framework of the research question. The first part of the thesis introduces the research topic – world hunger, the role of organic farming and the sustainable future development, as well as the current state of organic farming in Bulgaria.

In the practical part, a case study on Bulgaria that involves both qualitative and quantitative research methods was used to analyze the tendency of development of organic farming in the country. The first part of the study was based on 11 years of data - from 2006 to 2016 and the data represents the total organic utilized agricultural area (excluding kitchen gardens) of fully converted and under conversion to organic crops. UAA is measured in hectares and the data was obtained from EUROSTAT database. For the purpose of the study, 2 scenarios were designed to analyze the tendency of the development of the organic farming area and predict the growth of organic crop area in Bulgaria for 2017, 2018 and 2019. Both scenarios were analyzed through time series analysis, or particularly trend analysis. The first scenario was described through a linear trend, while the second scenario was described through an exponential trend.

Also, the results of the conducted online survey were presented, to provide an insight of the perceptions and attitudes of Bulgarians towards organic farming.

Each of the calculations, graphs, tables and statistical tests were done in Microsoft Excel 2016 program.

3. Literature Review

3.1 Hunger and food (in)security

Hunger is the physiological need for food that our bodies require to function properly. In a political or social view, hunger is a condition in which people are not able to have an adequate amount of food to meet their basic nutritional needs for a sustained period of time. Hunger on a global scale is an indicator of extreme poverty.

A total of 842 million people in 2011-13 were estimated to be suffering from chronic hunger, regularly not getting enough food to conduct an active life. This is about one in eight people in the world (The state of food insecurity in the world 2013, 2013). Undernourishment is the measure of hunger according to FAO. That refers to the proportion of the population that does not meet the minimum dietary energy consumption determined to be required for a healthy life, which is approximately 1800 kcal per day (FAO, 2011c). There are many reasons for it such as poverty and lack of access to food, but often this also comes as a result of environmental degradation, drought, and loss of biodiversity. In 2014-16 a progress was noted, according to the latest available estimates. The number of undernourished people around the world comes down to 795 million people, which is nearly one in nine people (FAO, 2015). However, this is still an enormous number of people.

What causes hunger and what is caused by hunger is tightly connected. Children born in poor families are undernourished, which leads to numerous health issues like stunning, wasting etc. Nutrition has a significant effect on cognitive and social development. Growing in poverty and not having access to nutritious food can contribute to children not reaching their developmental potential. Women that have an insufficient intake of proper nutrients are more likely to have complications in pregnancy and delivery, and fetal growth restrictions (Black et al., 2013).

This result in growing weaker adults that have decreased work capacity and productivity, which makes it harder for them to find a job, so they become trapped in poverty and therefore hunger.

What is interesting though, is the fact that almost 1/3 of the food produced is wasted or lost, which is approximately 1.3 billion ton per year (Gustavsson, 2011). The decrease of edible food amount within the supply chain is called food loss, which is measured only by the food that is intended for human consumption. Food losses refer to the loss of food throughout the production cycle, while food waste refers to the loss of food at the end of the supply chain that is ready for consumption (Parfitt, Barthel and Macnaughton, 2010). Food losses or waste can occur during the agricultural production, post-harvest handling, and storage, processing, distribution, and consumption. The shocking thing about this is that the developing countries waste as much food as the developed countries, however, the only difference is that in the developed countries more than 40% of the food waste occurs on a consumer level, while in the developing countries more than 40% of the food losses occur on the processing and post-harvest level (Gustavsson, 2011).

Table 1 Number of undernourished (millions) and prevalence (%) of undernourishment

	1990-92		2000-02		2005-07		2010-12		2014-16*	
	No.	%	No.	%	No.	%	No.	%	No.	%
WORLD	1010,6	18,6	929,6	14,9	942,3	14,3	820,7	11,8	794,6	10,9
DEVELOPED REGIONS	20,0	<5,0	21,2	<5,0	15,4	<5,0	15,7	<5,0	14,7	<5,0
DEVELOPING REGIONS	990,7	23,3	908,4	18,2	926,9	17,3	805	14,1	779,9	12,9
Africa	181,7	27,6	210,2	25,4	213	22,7	218,5	20,7	232,5	20
Northern Africa	6,0	<5,0	6,6	<5,0	7,0	<5,0	5,1	<5,0	4,3	<5,0
Sub-Saharan Africa	175,7	33,2	203,6	30	206	26,5	205,7	24,1	220	23,2
Eastern Africa	103,9	47,2	121,6	43,1	122,5	37,8	118,7	33,7	124,2	31,5
Middle Africa	24,2	33,5	42,4	44,2	47,7	43	53	41,5	58,9	41,3
Southern Africa	3,1	7,2	3,7	7,1	3,5	6,2	3,6	6,1	3,2	5,2
Western Africa	44,6	24,2	35,9	15	32,3	11,8	30,4	9,7	33,7	9,6
Asia	741,9	23,6	636,5	17,6	665,5	17,3	546,9	13,5	511,7	12,1
Caucasus and Central Asia	9,6	14,1	10,9	15,3	8,4	11,3	7,1	8,9	5,8	7
Eastern Asia	295,4	23,2	221,7	16	217,6	15,2	174,7	11,8	145,1	9,6
South-Eastern Asia	137,5	30,6	117,6	22,3	103,2	18,3	72,5	12,1	60,5	9,6
Southern Asia	291,2	23,9	272,3	18,5	319,1	20,1	274,2	16,1	281,4	15,7
Western Asia	8,2	6,4	14	8,6	17,2	9,3	18,4	8,8	18,9	8,4
Latin America and the Caribbean	66,1	14,7	60,4	11,4	47,1	8,4	38,3	6,4	34,3	5,5
Caribbean	8,1	27,0	8,2	24,4	8,3	23,5	7,3	19,8	7,5	19,8
Latin America	58,0	13,9	52,1	10,5	38,8	7,3	31,0	5,5	26,8	<5,0
Central America	12,6	10,7	11,8	8,3	11,6	7,6	11,3	6,9	11,4	6,6
South America	45,4	15,1	40,3	11,4	27,2	7,2	ns	<5,0	ns	<5,0
Oceania	1,0	15,7	1,3	16,5	1,3	15,4	1,3	13,5	1,4	14,2
*Data for 2014-16 refer to provisional estimates.										

Source: FAO, 2013

According to Table 1, in the last two decades, the number of undernourished people in developed countries has declined from 20 million in 1990-92 to 15.7 million of people in 2010-12. Even though on a global scale there is progresses for the developing countries – around 185.7 million less were undernourished, the situation in Africa is still frightening. The number of people that have insufficient food there has increased from 181.7 in 1990-92 to 218.5 million in 2010-12. However, the prevalence of undernourishment has decreased by 7.6% from 1990-92 to 2010-12.

For many years people have been trying to find a way to eliminate world hunger. However, this search continues nowadays and as the world population grows, it becomes even harder to control it. Many ideas in terms of fighting hunger have been presented in the society. Nevertheless, one of the recent concepts – sustainable development seems to be gaining popularity and it has been discussed widely in many circles for the last couple of decades. The first definition of this concept has been presented in the Brundtland Report (1987) as: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Ever since then, the definition has evolved and today it can be seen as part of various programs on a global scale that implement it. One of the most famous programmes for such development is the Sustainable Development Goals (SDGs), which is a collection of 17 global goals set by the United Nations, that include dealing with poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, environment and social justice issues (UNDP, 2015).

3.1.1 **Malnutrition and hidden hunger**

One of the worst consequences of hunger is malnutrition. According to FAO, this refers to: “an abnormal physiological condition caused by inadequate, excessive or imbalanced intake of macronutrients - carbohydrates, protein, fats – and micronutrients”. (FAO, 2011c). The term refers to undernutrition, micronutrient deficiencies, overweight, and obesity. The consequences of the malnutrition are a global problem. (Bhutta et al., 2008)

Undernutrition is linked to a deficiency of proteins, carbohydrates, and fats, essential vitamins and minerals. The measure in adults is the body-mass index, which is used in the estimate of underweight, obesity, and overweight, and is calculated by the body weight in kilograms of an individual, divided by the height in meters squared. People with BMI 18.5 or lower are considered as underweight (Food systems for better nutrition, 2013).

There is more than one measure to spot undernourished children. One of them is underweight, which means being too thin for one’s age. It’s measured by comparing the weight-for-age of a malnourished child to the weight of a well-nourished child. Wasting, which is also an indicator of undernutrition, refers to being too thin for one’s height. It is measured by comparing weight-to-height of a child that is malnourished with a healthy child. It reflects a severe loss of weight due to starvation or disease. Another measure for undernutrition is stunting, which simply means being too short for one’s age. The measurement is done by comparing the height-for-age of undernourished child and a well-nourished one (FAO, 2011c). Malnourished children may have plenty of health problems, many of which may become chronic.

In 2013, globally, there were 99 million of children under age of five that were underweight. One-third of them lived in Africa and the rest lived in Asia. On the other hand, over the same period, 42 million under age of five were estimated to be overweight. The number of overweight children has increased drastically from 32 million in 2000 and it is still increasing. Again in 2013, 51 million children in the same age group were estimated to be wasted and 17 million were severely wasted. In the same year, there were 161 million under-five-year-olds that were stunted. About half of them lived in Asia and over one third in Africa. (UNICEF, WHO and The World Bank, 2013) Stunting is more likely to be caused by poor nutrition and infection rather than genetics. Many cross-sectional and longitudinal studies showed a relation between stunting and poor cognition and later school progress (Grantham-McGregor et al., 2007).

Good nutritional status of pregnant women is a key factor for the fetal growth and development. Nutrition in the first 2 years of life plays a key role in both undernutrition and obesity in childhood, and related diseases later in adulthood. Stunted, wasted and underweight children are imposed to a higher risk of death from infectious diseases like diarrhea, pneumonia, measles, and others (Black et al., 2013).

The long-term effects of undernutrition are devastating. In early life, it can affect the mental development, lead to permanent structural damages to the brain and limit intellectual development. Studies reported that malnourished children had lower scores on intelligence tests than those that had normal nourishment. (Brown and Pollitt, 1996) Malnutrition, in general, can harm human capital irreversibly, affecting future generations.

Hidden hunger, also known as micronutrient deficiencies affects more than 2 billion people around the world. It is a form of undernutrition that occurs when the intake of vitamins and minerals is too low to meet the minimum required to sustain good health and development in children and normal physical and mental function in adults. (Grebmer, Thompson and Sonntag, n.d.) Table 2 shows the deficiencies and what is the effect of them and who is affected.

Table 2 Micronutrient deficiencies and effects on people

Deficiency	Effect	Who is affected
vitamin A	impairs the normal functioning of the immune system	approximately 40% of the children under age of five, deaths of approximately 1 million young children each a year
	blindness and night blindness	pregnant women, 9.7 million women globally
iodine	impairment in mental development	mental impair of 18 million babies a year
iron	anaemia	death of more than 60 000 young women a year in pregnancy and childbirth
	lowering the energies and productivity of workforces	adults, resulting in estimated losses of up to 2% of GDP in the most affected countries
zinc	immunity and metabolic status, fetal growth restrictions	children, adults
calcium and vitamin D	preterm birth, miscarriage; low birth weight and can have adverse long-term effects on brain development, growth	pregnant women

Source: UNICEF & The Micronutrient Initiative, 2014; Black et al., 2013

The main cause of hidden hunger is a poor diet. Hidden hunger is closely linked to poverty; nevertheless, it can also affect people from developed countries. In fact, most of the cases there are no symptoms and it is hard to spot the problem. Women suffering from micronutrient deficiencies give birth to children that have a lack of those nutrients. This results in more people affected by hidden hunger and therefore decreased productivity, poor mental development, poor school performance, a decreased capability of work, poor health, and poverty. Hence, the mentioned above creates a wicked cycle of poor people suffering from hunger and hungry people trapped in poverty.

3.1.2 **Food (in)security**

According to Declaration of the World Summit on Food Security 2009 ‘food security exists when all people, at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’ (FAO, 2009). Food security has four dimensions: food availability, food access, food utilization and food stability. Providing the population with enough food supply plays a crucial role in ensuring access to food. Food availability per person has risen faster, because of the increased food supply in the past two decades. Dietary energy supplies have also risen fast and therefore the quality of diets has improved. According to FAO, there is a progress in the supply of average dietary energy in the developing regions. The level of energy adequacy has improved in Latin America from 118% in 1990-92 to 126% in 2008-10 and in the Caribbean from 101% to 112% in the same time frame. People living in both Northern and Sub-Saharan Africa have experienced just a small improvement. The situation is worse in Western Asia, where there is no progress at all, in contrary, the average dietary energy supply has decreased from 142% in 1990-92 to 134% in 2008-10 (FAO, 2013). The access of food refers to economic and physical access.

Economic access, which is linked to disposable income, food prices and social support, can have an effect on reducing the poverty rates. Similarly, physical access, which is determined by infrastructure development and installations that help the functioning of markets, can have a positive effect on declining undernourishment and poverty rates (FAO, 2013). Another important indicator of food security is food utilization, which refers to access to clean water and sanitation, storage of food and hygiene, health and a good nutritional status.

Utilization could cover a wide range of definitions but in general it's meaning are to raise awareness to any methods that avoid disease spreading and gives an understanding of what foods to select and how to store it. A proper utilization refers to be 'the ability of the human body to ingest and metabolize food'. (Gross, R. et al., 2000). Food stability should exist in availability, access, and utilization in order to achieve food security. There are two factors affecting food stability – vulnerability and shocks.

The vulnerability is highly related to the recent changes in climate, which affects the percentage of arable land that is equipped for irrigation. Natural disasters are occurring more often and that leads to losses in production and lower income in vulnerable areas.

It has been estimated that ensuring people to have an income of $1.25 per day, which is set to be the poverty line according to the World Bank, would lift people out of chronic hunger. (FAO, IFAD, and WFP, 2015).

3.1.3 **Poverty, Hunger and Sustainable Agriculture**

Agriculture is the cultivation and breeding of animals, plants, and fungi for the purpose of producing food, fiber, medicine, biofuels and many other products, which is an integral part of our lives and is crucial for our livelihood. The focus in this thesis is mainly on the cultivation of plants as referring to agriculture.

Theodore W. Schultz stated on his Noble lecture: "Most of the people in the world are poor, so if we knew the economics of being poor, we would know much of the economics that really matters. Most of the world's poor people earn their living from agriculture, so if we knew the economics of agriculture, we would know much of the economics of being poor."(Schultz, 1979). And indeed, there is so much to look for into agriculture, as there are so many poor people depending entirely on it.

Despite varying financial statuses and geographical locations, plant-based products make up the larger proportion of human food consumption globally (Mathers, 2006). Moreover, in some cultures, the plant-based diet constitutes almost one hundred percent of their nutrition intake.

According to the World Bank (2008), 3 out of 4 people in the developing countries live in rural areas and the majority of them are strongly dependent on agriculture in order to sustain their lives. Poverty, hunger, and agriculture are interconnected.

A huge assortment of research reports that the essential driver of food insecurity is low income (Gundersen, Kreider and Pepper, 2011).

One of the unavoidable results of economic progress is the declining share of agriculture in GDP and national employment (Timmer, 1988; Cervantes and Brooks, 2009). According to Bresciani and Valdés (2007) and their study, there are three key channels that link agricultural growth to reducing poverty - labor market, farm income and prices of food.

They give a hypothetical system to exploring the quantitative significance of those different channels and after that report discoveries from their investigations on case studies of six countries. They establish that when both the immediate and roundabout impacts of agricultural growth are considered, such development a bigger impact on reducing poverty than the growth in non-agricultural areas. They also articulate particularly that agriculture's commitment to poverty reduction is consistently more noteworthy than is agriculture' share of GDP. For their contextual investigation in the six countries, agriculture's contribution came predominantly through the labor market channel. They alert, though, that development strategies based on such discoveries may not be legitimate in conditions where the agriculture does not feature labor-intensive crops and livestock activity. Ligon and Sadoulet (2008) claim with their findings that agricultural sector growth is considerably more vital than non-agricultural sector growths for the poorer segments of the population and this growth is helping poor people. Also, Ravallion and Chen (2007) appraise that agricultural growth had four times more prominent effect on poverty reduction than growth in the secondary and tertiary sectors. Past research proposes that this is due to 1) the occurrence of poverty has a tendency to be higher in agriculture and rural populations than somewhere else, 2) the majority of the poor people live in rural areas and the livelihoods of most of them depend on agriculture. Moreover, findings from analysis of World Bank (World Bank, 2008b) demonstrate that migration from rural to urban areas represented around 20% of the reduction in rural poverty in the period from 1993 to 2002, while 80% originated from upgrades in economic conditions in provincial regions, including agriculture (Byerlee, de Janvry, and Sadoulet, 2009).

3.1.4 **Agriculture and food security**

After the Second World War, the conventional agriculture coming with Green Revolution increased the agricultural production worldwide, in particular in the developing countries and it has been credited with saving millions of people from starvation. This big increase in crop production is achieved by the use of high-yield crop varieties, artificial fertilizers, pesticides, and agro-chemicals, as well as new methods of cultivation and technologies (Farmer, 1986).

Many researchers argue that the Green Revolution contributes to food security, as it has transformed agriculture with strategies that focus on fighting starvation and indeed raised overall yields of cereal grains.

However, those strategies did not really give enough importance to nutritional quality. According to a research, high-yield cereal crops have low-quality proteins, are high in carbohydrates, with deficiencies of essential amino acids, lacking vitamins, minerals, and balanced essential fatty acids, and other quality factors (Sands et al., 2009).

Therefore, fewer people die from starvation, but many people are affected by malnutrition and hidden hunger. Also, the severe use of pesticides, encouraged by the Green Revolution is linked to health hazards. According to the estimations of WHO and UNEP in 1989, there were 1 million human pesticides poisoning annually and due to poor labeling, loose safety standards, and other factors, around 20 000 (mainly in the developing countries) ended in death (Primentel, 1996).

The use of biotechnology nowadays - ‘application of a wide range of scientific techniques to the modification and improvements of plants, animals, and microorganisms that are of economic importance’ (Persley and Siedow, 1999), has raised many questions in the last couple of decades. Biotechnology has been used for many years for brewing alcoholic beverages, baking bread, breeding food crops and domestic animals. However, the modern biotechnology is mainly associated with genetic engineering – the process of transferring or modifying genes between organism or an individual organism with intentions to remove or add a trait or characteristic (Keener, Hoban, and Balasubbramanian). Hence, an organism that has been exposed to genetic engineering is called genetically modified organism, or GMO. In the past few years, the usage of genetic engineering was widely spread around the world.

The reasons for implementing this biotechnology are various. In agriculture, it is used for improving the crops so that the need for pesticides input is decreasing, which is linked to a reduction in the cost of production, and therefore increased productivity. GM crops can be resistant to climate conditions, environment, diseases, insect, and herbicide resistant, and attribute to delayed fruit ripening (Persley and Siedow, 1999). However, creating GM crops and products has raised awareness among people. There are many debates linked to this topic. A lot of proponents claim that using GM crops have many benefits as increasing yield with fewer efforts, reducing the use of chemicals and increasing profits.

People that support genetic engineering believe that genetically modified plants are environmentally friendly, can provide more nutritious food and can help to achieve a sustainable agriculture, developing food security. They believe that could be a solution to end world hunger. In contrary, opponents propose many risks related to the use of modern biotechnology. Primarily, there is a lack of enough information and evidence on long-term effects on human health and environment. In 2013, 175.2 million hectares of biotechnology crops were grown around the world. The number of farmers who grew GM crops was 18 million and around 90% of them (16.5 million) were in developing countries, which produced more biotech crops than industrialized countries (Van Alfen, 2014).

3.2 **Organic farming**

Organic agriculture is defined as ‘a system for crops, livestock and fish farming that emphasizes environmental protection and the use of natural farming techniques’ (Morgera et al., 2012). The term does not refer only to end product but to the whole food supply chain – from production and processing, through quality control and certification to handling and delivery. Organic farming is excluding the use of certain external inputs such as pesticides, fertilizers, veterinary drugs, additives and as well as the use of GMOs. Furthermore, it uses natural methods of farming in order to preserve the ecosystems and biodiversity. By comparison with GM crop production, organic farming requires more manual labor, since it limits the usage of pesticides. Therefore, this can help developing rural areas by improving employment opportunities (Morgera et al., 2012). More and more people that are concerned with food quality, impact on health and environment are stimulating the demand of organic production.

Analysis of European farm economics in terms of yields, labor use, prices, costs and support payments showed that profits from organic farming were comparable to those on conventional farms. And this has attracted the interest of many researchers in looking for sustainable ways to fight hunger and poverty. According to the National Research Council (2010), in order to be sustainable, a farming system should fulfill all four components:

- provide an abundant production;
- protect and respect the environment
- be profitable
- commit to the well-being of farmers and rural communities

Organic farming have demonstrated to be effective, environmentally protective, energy efficient, steady and striving for sustainability in a longer term (Lotter, 2003).

It has been observed that price premiums are one of the most often-pointed reasons for converting to organic farming (Guthman, 2001). Organic premiums vary from premiums of 10-50% in Germany, between 20-30% in Austria, and 0-100% in the United States (Sligh and Christmann, 2003).

The organic agriculture sector is the fastest growing sector nowadays. It has taken a long time before the standards were adopted in national and supranational legislation and control systems. The total area of organic land in Europe and the United States has tripled in the period between 1995 and 2000 (Bruinsma, 2017). However, certified organic culture occupies less than 1 percent of land globally and 1-2% of food sales, which is a relatively low level (El-Hage Scialabba, 2002). In order to increase the supply, policy instruments in the European Union to stimulate organic farming are providing financial compensation for losses occurred during the conversion.

Moreover, the Council of Europe has adopted organic production as an element of the strategy for environmental integration and sustainable development in the Common Agricultural Policy.

The EU drew up the document "A European Action Plan for Organic Food and Farming" (2004), which focuses on:

• the development of organic food markets

• support for organic agriculture on the basis of rural development measures;

• Harmonizing and implementing standards for organic production and trade;

• development of an effective regulatory framework for the production of bio products and their designation;

• introducing bio-production rules based on the EU Commission's regulation package on organic farming, agricultural ecology and biodiversity;

• Implementation of the EU Sustainable Agriculture Concept, which includes measures for the economic, social and environmental development of agriculture and preservation of biodiversity;

• establishing an effective control system and biological certification;

• a clear position on GMOs and their place in modern agriculture.

The objectives of organic farming can be achieved by following the basic principles and practices of this mode of production, namely:

• Comprehensive, systemic approach to the production unit and striving for minimal human intervention in the regulatory mechanisms of nature;

• Stabilization of agro-ecosystems based on diversification, biodiversity and integration;

• Diversification of the production system;

• Diversification of plant protection;

• Adequacy of approaches, methods and means of pest control; an alternative plant protection system;

• Carrying out basic plant protection measures according to the standards for organic farming and the experience in our country;

• Alternative methods and means of combating weeds.

3.2.1 **Organic food market and trends**

According to a recent research of the Research Institute of Organic Agriculture (FiBL) from 2015, the total organic farmland is 50.9 million hectares, which has increased by 14.7% from 2014. There are 179 countries with organic farming and the top 3 countries are Australia (22.7 million hectares), Argentina (3.1 million hectares) and USA (2.0 million hectares).

Also, the number of organic producers is 2.4 million and keeps increasing, with an increase of 7.2% from 2014. The 3 top countries ranked by number of organic producers are India (585 000), followed by Ethiopia (203 602) and Mexico (200 039). It has been estimated that the global organic food market is approximately 75 billion euros in 2015 and continues to grow, while the consumer demand is also increasing. The top 3 markets are USA (35.8 billion euros), Germany (8.6 billion euros) and France (5.5 billion euros). In Europe, some countries like Belgium, Bulgaria, Cyprus, Denmark, Germany or Greece, seem to give a higher relevance supporting organic farming under the new RDPs than countries like Estonia, Finland, Portugal, Slovenia, Slovakia and the UK (Meredith and Willer, 2016).

Since the mid-1980s, the total area of farmland under organic production has increased steadily to 10.3 million hectares (as of 2014) in the European Union (EU) alone. The total value of the EU organic retail market has a significant growth from € 11.1 billion in 2005 to €24 billion in 2014. However, there is still considerable imbalance between the current supply of organic production and the growing demand for organic food (Dimitrov and Ivanova, 2017). Land area under organic farming had been consistently increasing in Europe since the 1980's (Willer and Yussefi 2000), and has been extending worldwide since the 1990's. Growth in organic area in North America has lingered behind that of Europe, and still remains considerably less in proportion.

In spite of growing domestic production of organic food, these nations have been depending progressively on imported products. For example, in 2003 Germany imported 50% of the organic food and the UK imported 65% (Sligh and Christmann, 2003).

Increasing interest in organic food in Europe and North America has made a demand for more sorts of organic products, including tropical and out-of season foods, which opened the market for exporting organic foods from Africa, Latin America, and Oceania (Aschemann et al., 2007). Around 90% of Latin America's organic production is being exported to the north of the equator (Garibay abd Ugas, 2010). Also, most of the organic food produced in Africa is destined for Europe (Bouagnimbeck, 2010).

3.2.2 **Organic farming and sustainable development**

Is it possible to feed the world with organic farming? This debate has been discussed in the last decades and there are many controversial theories on it. Many researchers are looking to find a way to prove that this is not entirely impossible. Agriculture is the main source of income for people in rural areas. Industrial agriculture, using the implementation of machines and equipment, has reduced the need for manual labor. However, organic agriculture could help rural development by creating employment, improving working conditions and providing fair wages. Thus, this can improve the income of poor people.

Organic farms provide more than 30% more employment opportunities, than non-organic farms (Scialabba, 2007). Although being limited in scope, some studies suggest that organic farming could show signs of contributing 'substantially to the global food supply' (Badgley et al., 2007). Other studies are concerned not only with the problems in food distribution, but also point out that there are bigger environmental issues related to non-organic farming in comparison to organic (Halberg et al., 2006). Agricultural biocides and synthetic fertilizers that are used in non-organic farming are destroying the environment (Daily et al., 1997). A study from Rodale Institute, that has been running over 20 years, shows that organic farming gives almost the same yield and uses less energy, while it is environmental friendly (Pimentel et al, 2005). However, to fight world hunger the increased yield itself is not sufficient, as the nutritional value of the food must be considered as well. As discussed earlier, a proper nutrition is crucial for the human body. Surprisingly or not, a research on organic farming in Ethiopia showed that organic systems can provide more nutritionally diverse and drought-resistant crops to local people (Araya and Edwards, 2006). Most of the opponents of organic farming are concerned with the yield of such farming practices. A study, which compares the relative yield performance of conventional and organic agriculture from 66 past yield studies, demonstrates that organic yields are by 25% smaller than conventional ones. The outcomes of the investigation were between 5% to 34% smaller yields for organic produce, depending on the conditions (Seufert et al, 2012:229).

According to FAO, while in the industrial countries the organic farming systems tend to decrease the yield - depending on how intensive was the external input before conversion, in Green Revolution areas the conversion to organic usually leads to nearly identical yields. Moreover, in traditional rain-fed agriculture organic farming has the potential to increase yields. There is a considerable amount of findings that organic farming has a favourable effect on soils, by increasing soil fertility and diversifying the biological activity (Gomiero et.al., 2011). Even though, weed management could be challenging, this could be managed better by introducing crop rotations(Letourneau and van Bruggen, 2006). Organic crops seem to be more drought-resistant and can still compete to conventional agriculture in yields. Table 3 below summarizes some of the studies, comparing organic agriculture to conventional agriculture.

Table 3 Studies on the effects of organic farming

Effect on	Study
soil	maintain soils with high organic matter, fertility in a longer term, diversity of the soil, minimize loss due to errosion and nutrient runoff
	organically managed soils showed a greater biological activity and a better floral and faunal diversity
	fertility does not depend on inorganic fertilizers
biodiversity	many farms keep hedgerows and other semiwild areas that serve as habitat for insects, larger animals, and soil biota
	biological controls include introducing or promoting natural predators, parasites, or competitors that keep pest and pathogen populations below injurious levels.
	increasing biological diversity in flora, fauna, and soil microbiology may increase the stability of the system, reducing outbreaks of pests and diseases
chemical and energy inputs	reduce chemical and energy inputs and minimize losses; the application of plant-based herbicides, are used occasionally as a last resort
weeds	weeds can be especially challenging during periods of conversion to organic practices, during which weed populations are changing
lack of excess nitrogen	the lack of excess nitrogen in organic systems and the consequently low foliar nitrogen of crop plants, has been correlated with reduced disease and pest incidence in organic crops compared with conventional crops
drought	organic yields outperform conventional crop yields during years of drought
	during the drought years of 1988-1998, the organic crop yields were 22 percent higher than conventional yields in the trial
yield	during the first few years of the transition there was a decline in yields for the organic crops. Later on the organic yield levels saw a rebound and today the yield levels match, or in some cases even surpasses the conventional crop yields
	indicates that organic farming systems in Europe would see cereal crop yields that are on an average 20 percent lower than their conventional counterparts. But at the same time the nutrient input for the organic systems were 34-51 percent lower

Source: Gomiero et.al., 2011; Mäder et al, 2002:1695; Welbaum et al., 2004; Letourneau and van Bruggen, 2006; Shennan, 2008; Ngouajio and McGiffen, 2002; Lang, 2005

As mentioned earlier, the majority of the world's poor and hungry people live in rural areas. The population of the developing countries living in rural areas grew by 1.5 billion people - from 1.6 billion people in 1960's to 3.1 billion in 2015. In 1960, 22% of the developing world's population lived in urban areas, but 55 years later, by 2015 that number reached 49% (FAO, 2017).

Many young people in the developing countries are moving to urban areas in hope for escaping the poverty in rural areas, however, many of them become trapped in urban poverty.

Since the growing urban population demands more food on the market, there is a huge potential for economic growth and development of the rural areas in terms of food production.

According to FAO and their latest report – The State of Food and agriculture 2017, the transformations of the rural economies have been helping rural people to escape the poverty trap since the 1990's and since then, around 750 million rural people now have incomes above the moderate poverty line of USD $3.10 per person per day. The report also states that the share of urban consumers in the purchased food market in East and Southern Africa is 52%, while the prediction is that by 2040 it will reach 67%. Moreover, the value of urban food markets in sub-Saharan Africa will probably increase by four times between 2010 and 2030, from USD $313 billion to the US $1 trillion.

Agriculture is still the most important sector of the economy in the developing countries and provides the biggest proportion of employment (Båge, 2005).

3.3 Organic farming in Bulgaria

3.3.1 Country background

Bulgaria is a country in south-eastern Europe, with a population of 7 101 859 million people and 110 994 square kilometers total area (Penin, 2007). The country has suffered a long and harsh transition to a market-based economy since 1990's and joined the European Union in 2007. The data of NSI show that the GDP in 2015 reached 45 286 million euros in nominal terms, which increased by 3.6 % in real numbers.

The GDP per capita was estimated to be 6 136 euros, which makes it the country with the lowest GDP in the EU – 51% below the EU average. Furthermore, according to the International Monetary Fund, Bulgaria is classified as a country of an emerging and developing economy (IMF, 2011). According to NSI, the unemployment rate for people over 15 years old in 2016 was estimated to be 7.6%, or 247.2 thousand unemployed people, 160.5 thousand of which were in urban areas and 86.8 thousand in rural areas. The employment rate for the same group of the population was 49.3% or 3016.8 thousand, 2403.1 thousand of which were in urban areas and 613.7 thousand in rural areas.

Furthermore, it was concluded that 203.7 thousands of the total employed people were in involved in Agriculture, Forestry and Fisheries economic activities, however only 104.9 thousand are skilled agricultural, forestry and fishery workers. In Bulgaria, 41.3% of the total population is at risk of poverty or social exclusion in 2015, which is the highest rate in EU-28. The amount of people at this risk has increased by 72 000 people from 2014 to 2015. A big concern is the percentage of children living in households at risk of poverty, which is 43.7 %. The percentage of elderly people at risk of poverty or social exclusion is 51.8%, which is nearly 3 times more, compared to the average of 17.4 % in the EU. The EU statistics on income and living conditions (EU-SILC) developed an indicator called material deprivation rate, which is defined by the inability to afford some basic, necessary or desirable item to live a sufficient life. The indicator makes a distinction between people not having the ability to afford an item and not having a desire or need for it.

While the percentage of the total population in the EU-28 facing material deprivation was 17% in 2015, in Bulgaria it was recorded the highest rate of material deprivation – 49.1% of the total population. In terms of severe material deprivation, 8.1% of the total EU population were severely materially deprived, while in Bulgaria the rate was 34.2%. Despite in the EU the severe deprivation rate between 2014 and 2015 decreased by 0.8 percentage points, the situation in Bulgaria worsened and the rate increased by 1.1 percentage points (EUROSTAT, 2015).

In contrast to the global trend of increased population growth, the Bulgarian population is declining, with a negative change due to deaths outnumbering births and migration.

In Bulgaria, rural areas are defined as municipalities if there are no settlements with more than 30,000 people. According to this definition, 231 municipalities are classified as rural. They make up 81% of the territory and 42% of the area the population of the country. Rural areas in Bulgaria are characterized by backwardness in economic, social and cultural aspects, an aging population and low living standards of life, degraded infrastructure, etc. This is the result of objectively occurred processes, but also from neglecting and underestimating the consequences of this unfavourable development (Popov et al., 2007).

At the same time, these areas have a significant natural, human, economic and cultural potential, and their development should be taken into big consideration.

3.3.2 **Agriculture and organic farming**

Due to the favorable soil and climatic conditions in the country, agriculture in Bulgaria has been and continues to be one of the most important sectors of the country. While in 2015, the area designed for agriculture amounts 5 202 752 ha, which is nearly 47% of the territory of the country, the UAA is 5 011 494 ha or around 45%. Uncultivated lands were 191 258 ha, which includes both abandoned perennial crops and arable land not used for agricultural production for more than two years, but the operational recovery is possible with minimal resources.

Organic farming, coupled with other agro-environmental practices, could contribute to the sustainability of the rural development in Bulgaria. This might lead to stabilization of ecosystems, preservation, and restoration of natural resources, prevention of land abandonment. In spite of the fact that only a small part of the agricultural land in Bulgaria is contaminated in the past and that no new pollution occurred in the last 7-8 years, there is a serious problem with soil erosion as three-fourths of the territory of the country suffers this process (Agrarian Report, 2016).

Organic farming is an important priority in the policy for the development of agriculture in Bulgaria and one of the priorities of the Common Agricultural Policy 2014-2020.

Encouraging farmers to convert to or maintain organic farming contributes simultaneously to: environmental protection - strengthens agro-ecosystems, preserves biodiversity and enables future generations to benefit from preserved nature; producing healthy food as this form of farming meets the needs of the growing number of consumers as it uses safe and transparent production methods; social effect - creates employment in rural areas and more opens more jobs than conventional farming in the country.

Apart from the European legislation, Bulgaria has developed a separate measure: 11 "Organic Farming" within the new programming period of the Rural Development Programme 2014-2020. Two sub-measures shall be implemented under this measure:

- Sub-measure 11.1 Payments for the transition to organic farming for hectare UAA;
- Sub-measure 11.2 Payments for support of organic farming for hectare UAA.

The measure is expected to have a positive effect and contribution to the sustainable development of rural areas, by contributing to the environment and mitigation of the consequences of climate change and support of small and medium farms, most of which are family farms (Agrarian Report, 2016).

Information regarding the status of organic production in Bulgaria for 2015 is based on data from the annual reports of controlling entities for organic farming, officially approved by the Minister of Agriculture and Food: "Balkan Biocert" OOD, "Q Certification" AD, "CEREC – Certification of Ecological Standards" OOD, "Lakon — Private institute for quality assessment and organic certification of food" OOD, "Kiva BTSS Eco-Garanti" OOD, Company "Control Union Certifications", "SGS Bulgaria" EOOD, "Ecogrupo Italy" OOD with branch "Ecogrupo Italy – branch Bulgaria, "Bioagricert Italy Bulgaria" EOOD, "Austria Bio Garantie" GmbH via branch of a foreign trader "AUSTRIA BIO GARANTIE BRANCH BULGARIA", "Bulgarkontrola" AD and the Organic Certifying Agency EOOD.

3.3.3 **Organic food market in Bulgaria**

The main problem and obstacle to the development of organic production in Bulgaria continues to be the severely limited domestic market. There is no official data on the value of organic food and drink sales in the country. In 2005, the market share of organic products in Bulgaria is estimated at € 800 000, representing 0.023% of the total market for food. Compared to this, there is a significant increase, as the latest estimates in 2014 are for nearly 1 euro per person per year or organic retail sales are 7 million EUR (Meredith and Willer, 2016). This value is still insignificant in the face of demand in the EU, even assuming that in the coming years it will increase many times. Another issue is that the growth in the income of the population in Bulgaria does not imply such a drastic change. The low incomes of the majority of households and the high share of food and non-alcoholic beverages in their consumer spending make them highly sensitive to price levels. While they are eager to consume more organic products, the majority of consumers are not able to pay the high price premium that would give market sustainability to producers. The interest in organic production among farmers is increasing at a higher pace than the incomes and respectively the market for such type of production in the country.

This discrepancy between supply and demand puts pressure on the price premium and forces a large proportion of farmers to realize their production as conventional. In this way, the rapid development of the sector, otherwise beneficial for consumers, "eats" the main advantage of its own business model and makes the producers dependent on public support. It, on the other hand, provokes an additional interest in the market niche, putting it in enchanted circle of farmers.

A study by the consulting company Dikon Group confirmed that in the period 2005/2006, 95% of the organic products were exported - the exporters were mainly bigger firms which could produce sufficient quantities for the foreign markets or organizations which accumulated the quantities from numerous small producers; very often the latter group of exporters marketed primarily sorted and packaged raw materials on the international markets, including wild fruits and berries, mushrooms, herbs or medicinal plants. A study carried out by BIOSELENA in February 2009 revealed that the number of organic items marketed in Bulgaria was 733; 657 of them were foodstuffs, and the remaining were cosmetic products or products for cleaning and hygiene.

Only 54 of them were locally produced (7% of all marketed products). The overall turnover | 85 Development in agriculture and rural areas of Bulgaria of marketed organic products was estimated at approximately at EUR 4.5 million (including the sales estimate of traders who did not participate in the study).

4. Practical Part

The following chapter explores the practical part of the research. For the purpose of the study, the author used a case study that involves both qualitative and quantitative research methods. As it was discussed in the literature review, empirical evidence showed that organic farming has a potential to help reducing poverty and world hunger, protect the environment and could boost economies.

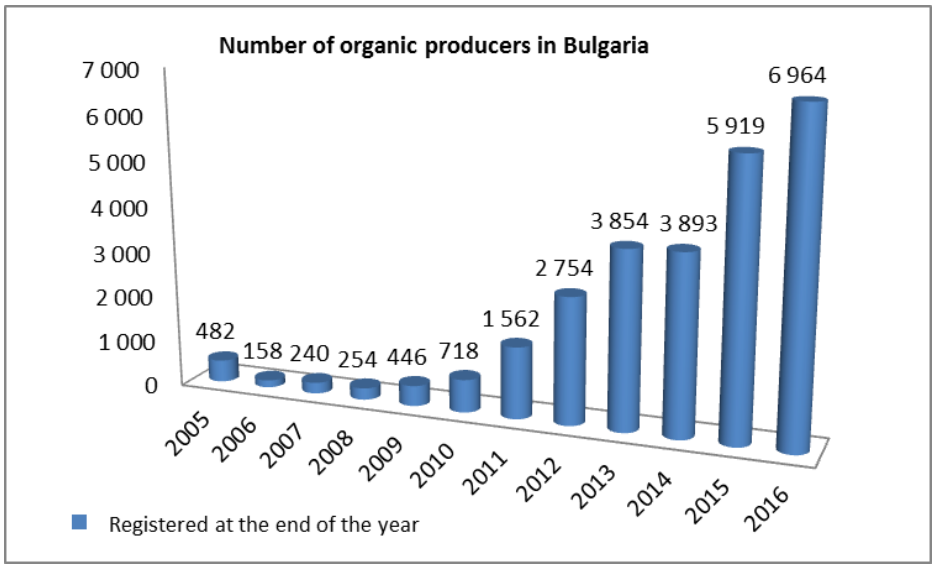
In this chapter, the focus is on the tendency in the development of organic farming in Bulgaria. The reason why Bulgaria is chosen as a case study is that it has the lowest GDP in the European Union and has the highest rate of material deprivation, also it is considered to be an emerging and developing economy. Also, the geography, climate and soil conditions are favorable but the agricultural, and particularly the organic potential of Bulgaria is not fully fulfilled.

According to experts, the organic share of Bulgaria on the global and domestic market is expected to continue to grow. In this chapter, this will be analyzed. In order to make the findings as robust as possible, the data here triangulates from multiple sources (Yin, 2004). Therefore the practical part of the thesis and is formed of three components. The first part consists of two scenarios, created through time series analysis to analyze the trend and make a forecast on the future development of the organic farming area in the country. Then, the study explores the attitudes and perceptions of Bulgarians towards organic food and presents the results of the survey conducted online. Finally, it constructs a SWOT analysis, to identify the strengths, weaknesses, opportunities, and threats of organic farming in Bulgaria. The case study is important because there is not enough research done on the tendency in the development of organic farming in Bulgaria. The more crop area is being managed organically, the bigger would be supplied and therefore the stronger would be the position of Bulgaria on the market.

4.1 Executive summary

According to Eurostat, the number of registered organic producers at the end of 2015 is nearly 6000 and it increased over five times in the period from 2011-2015, with a growth of 17% on average in the EU (Figure 1). This trend is most intense in 2012 when the number of farmers has doubled. Then the pace slowed down and in early 2015 it remained almost at the level of the previous year.

Figure 1 Organic producers in Bulgaria from 2005 - 2016



Source: EUROSTAT

Certified organic areas or in transition to organic farming Bulgaria is growing almost four times between 2009 and 2014. The most intense was the growth in 2010 (the areas are doubled), 2012 (by 56%) and 2013 (by 44%) when they reach their peak of over 56,000 hectares. The increase for the period is the strongest among the 28 Member States of the European Union and more than 14 times faster than the EU average. Bulgaria also has the strongest growth in terms of the share of bio-production from total agricultural land used. Despite the dynamic development, the country remains among the least widely spread organic farming in the EU, both in absolute terms and relative terms. Only 1% of agricultural land is used in this area. Bulgaria is also the country with the highest share of transition from the total bio-generation among the member states - over 2/3, at 10% on average for the EU.

This is a prerequisite for the supply of products in this market niche to grow ever more intensively. However, a more detailed look at the structure of the country's territory reveals a tendency to question the sustainable development of organic farming. The increase in the area after 2009 is almost entirely due to the transition, while the certified ones remain relatively stable - between 9 and 15 thousand hectares.

This is indicative of the fact that only a small part of the areas for which the procedure is started reach a stage of production of organic production and part of the already certified areas are dropped. Similar to the dynamics of the areas used and the number of farmers, signs of instability are found. Between one fifth and one-quarter of the registered organic producers in the country at the beginning of the year are dropping to the end.

4.2 **Forecast scenarios**

As discussed it the theoretical part of the thesis, the organic market in Bulgaria is relatively new and small, however it continues to grow. To assess the future development of organic farming in Bulgaria, the paper looks into the historical data of organic crop area in the country. The only data for the total area under organic farming and area under conversion that was on disposal was from 2006 to 2016 and it was taken from EUROSTAT database. In order to see the trend, a time series analysis, or more specifically a trend analysis was conducted.

For the purpose of the study, to predict the future growth of organically managed land in Bulgaria in the next 3 years, two scenarios were designed to answer the research questions:

1. What would be the area of organically managed land in Bulgaria in the next 3 years if the trend continues to grow steadily?
2. What would be the area of organically managed land in Bulgaria in the next 3 years, if the trend continues to grow on a rapid pace?

Table 4 UAA of totally converted and area under conversion to organic in hectares

2006	2007	2008	2009	2010	2011	2012	2013	2014
4 691	13 646	16 663	12 321	25 648	25 022	39 138	56 287	47 914

Source: EUROSTAT

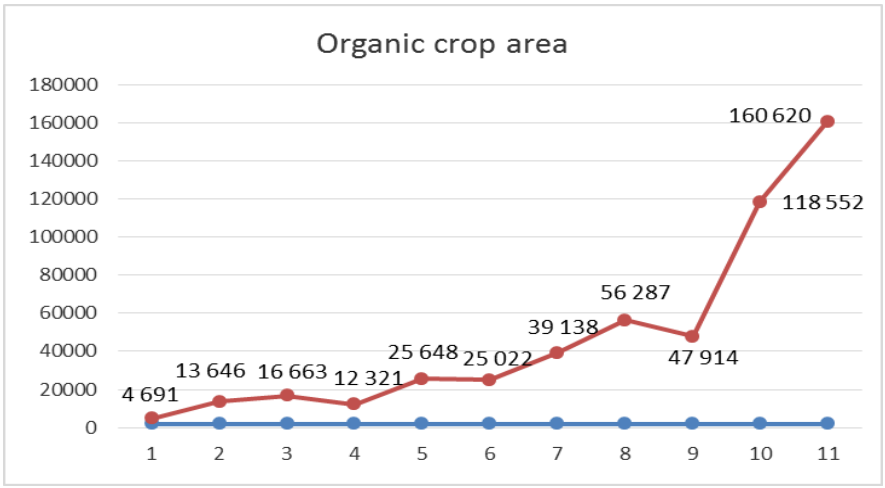
To analyse the tendency in the development of organic farming in Bulgaria was used the trend model (Hlavsa, 2016):

$$y_t' = T_t + \varepsilon_t \quad \textbf{(1)}$$

Since the data is annual, the seasonal component is not taken into consideration. In the context of this study, the irregular component of time series is not being examined.

Figure 2 below represents the trend of the development of crop area under organic farming. As it can be observed, the trend is increasing. The time index is in expressed as t, where: t=1 is the oldest time series value, or 2006, and n=11 is the latest time series value – 2016.

Figure 2 Trend of organic farming area 2006-2016



Source: EUROSTAT, own interpretation

4.2.1 **Scenario 1**

This scenario assumes that the organic farming area will continue on a steady rate. Using the historical data and making time series analysis was predicted what would be the annual increase and forecasts for the next 3 years. In order to predict the area of organic farming with a steady growth for 2017, 2018 and 2019, the linear trend model was constructed.

A linear model is one in which all the parameters appear linearly.

The analytical smoothing by the trend function for the linear trend equation is (Hlavsa, 2016):

$$\mathbf{Tt = a+b \cdot t} \qquad \mathbf{(2)}$$

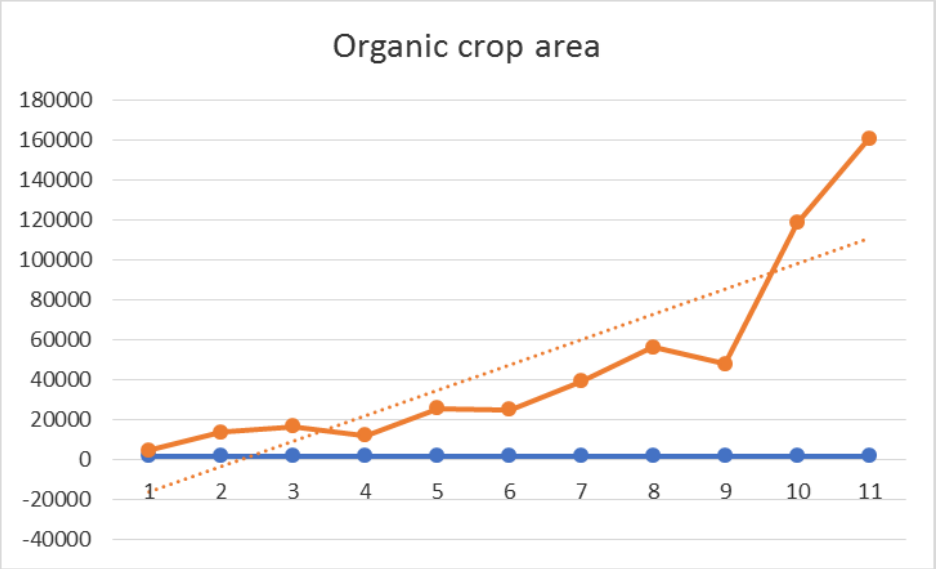
Where:
Tt= linear trend forecast in period t

a = intercept

b = the slope of the linear trend line

t = time period

Figure 3 Linear trend projection



Source: EUROSTAT

4.2.2 **Scenario 2**

This scenario assumes that the organic crop area will continue to grow on increasingly higher rates. Using the same data set, the exponential trend was analyzed and the prediction of the organic area for 2017, 2018 and 2019 was calculated. The analytical smoothing by trend function for the exponential trend is constructed as follows (Hlavsa, 2016):

$$Tt = a \cdot bt \qquad (3)$$

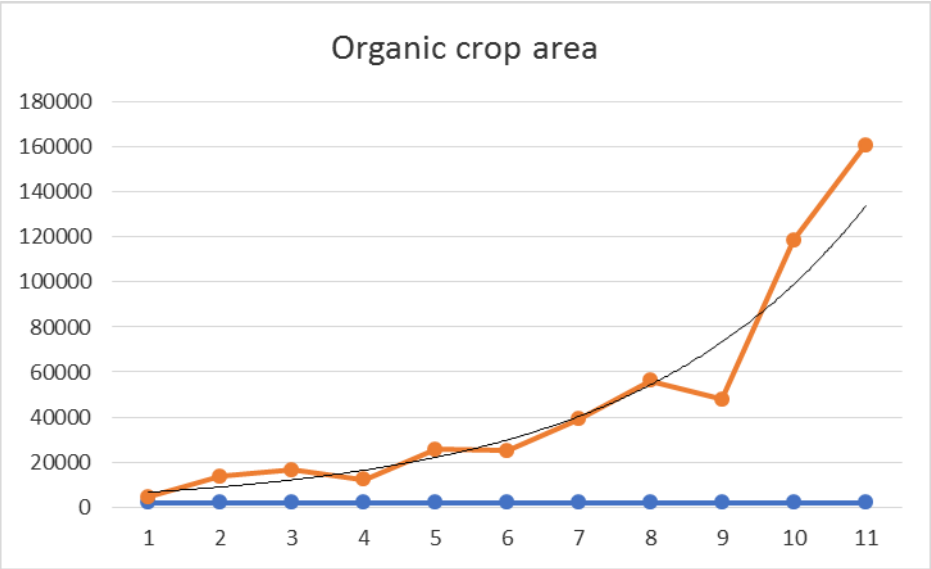
Where,

Tt= linear trend forecast in period t,

And “a” and “b” are constraints, as the trend model is transformed by using natural logarithm (ln).

In the graph below (Figure 4) the exponential trend is displayed.

Figure 4 Exponential trend projection



Source: EUROSTAT

4.3 **Survey**

A self-administered survey was conducted for the purpose of the study, in order to explore the perceptions and attitudes of Bulgarians in terms of organic products consumption and awareness. The anonymous questionnaire was distributed in various groups on Facebook that were joined only by Bulgarians from different areas of the country and it was posted on a Bulgarian news website. Also, people were informed about the purpose of the study and knew this is an anonymous and voluntary participation. The survey consisted of 15 questions in total. It started with a few introductory questions linked to demographic characteristics and continued with questions concerning the awareness of GM foods and organic food, as well as the perceptions and attitudes towards them. The survey was done in the period between 21st November 2016 and 9th January 2017. The questionnaire was filled by 455 Bulgarians.

5. Results and Discussion

5.1 Results of Scenario 1

Scenario 1 predicts the organic crop area in Bulgaria for the next 3 years with a steady rate. After the analytical smoothing of the trend function was established, the constants ‘a’ and ‘b’ were estimated by applying the OLS method. The table below shows the results of the Regression analysis.

Table 5 Regression results of Scenario 1

Regression Statistics								
Multiple R	0,855703528							
R Square	0,732228527							
Adjusted R Square	0,702476141							
Standard Error	26800,46394							
Observations	11							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	1	17677036992	1,77E+10	24,61075	0,000779538			
Residual	9	6464383806	7,18E+08					
Total	10	24141420799						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-28742,21818	17331,05041	-1,65842	0,131607	-67947,778	10463,342	-67947,778	10463,3416
ti	12676,76364	2555,323974	4,960922	0,00078	6896,219205	18457,308	6896,21921	18457,3081

From the conducted linear trend analysis it was found that the value of the intercept ‘a’ is – 28 742, while the value of the slope of the trend ‘b’ is 12 677. Therefore, the linear trend equation is as follows (Hlavsa, 2016):

$$Tt = 12\,677 \cdot t - 28\,742 \qquad (4)$$

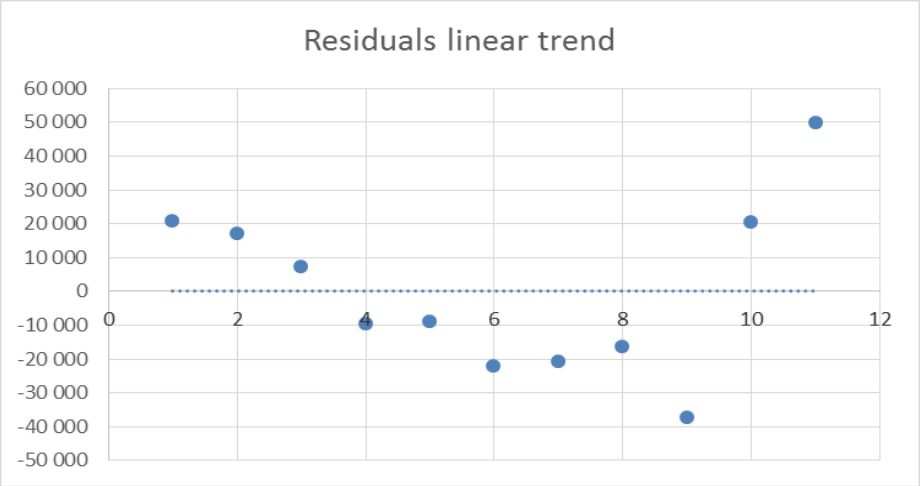
Since this means that there would be an annual change of 12 677 ha, the predicted values for the next 3 years were calculated from the above equation. Hence the total fully converted organic crop area and area under conversion to organic would be:

- 123 379 ha in 2017
- 136 056 ha in 2018
- 148 732 ha in 2019

To measure the goodness of fit i.e. how close the data is to the fitted regression line, the coefficient of determination - R2 has been calculated and it could be seen in the Summary output above.

Considering the fact that R2 takes values between 0 and 1, and the closer to 1 is the data, the better the fit is, the summary output shows that the goodness of fit is 0.7322 what seems to be relatively good. In other words, 73.22% of the data could be explained by the linear model. However, since R2 might not always necessarily mean that the model is a good fit, the residual plot pattern should be studied as well. As it can be seen on the scatter plot below, the residuals do not display a random pattern, rather than that, a U- shaped pattern can be observed. Therefore, this kind of pattern does not support a linear model and suggests that a non-linear model might be a better fit.

Figure 5 Residuals plot of Scenario 1



In spite of the fact that according to the residuals the data set does not fit the linear model, to finish the analysis the accuracy of the forecast will be calculated. For this purpose, a pseudo forecast is being created, excluding the last actual value and the new model has been analysed.

Then the accuracy of the forecast has been tested by the relative error of the forecast in percentage by subtracting the last actual value from the last predicted value and dividing that on the actual value (Hlavsa, 2016):

$$r = \left| \frac{P - A}{A} \right| \cdot 100 \quad (\%) \tag{5}$$

Hence, r = 45.58%, which also indicates that the forecast accuracy of this model is bad, since an excellent forecast would take relative error values of less than 10%. (Hlavsa, 2016). Therefore this prediction is not reliable and the results should not be considered.

5.2 **Results of Scenario 2**

Scenario 2 predicts the organic crop area in Bulgaria for the next 3 years on increasingly higher rates. Similarly, this scenario has been analysed by trend function but this time, instead of linear, the trend is exponential. The only difference here is that the trend needs to be transformed with the use of ln (natural logarithm) in order to do the linearization. The table below shows the results of the Regression analysis. From the calculations have been concluded that after the linearization, the function would look like (Hlavsa, 2016):

$$\ln y = \ln a + \ln b \cdot x \tag{6}$$

Or,

$$Y = 8.5080 + 0.2995.t \tag{7}$$

Then, the values were transformed again and the equation finally looks as follows:

$$Y = 4954.2447 .1.3491t \quad (8)$$

Table 6 Regression results of Scenario 2

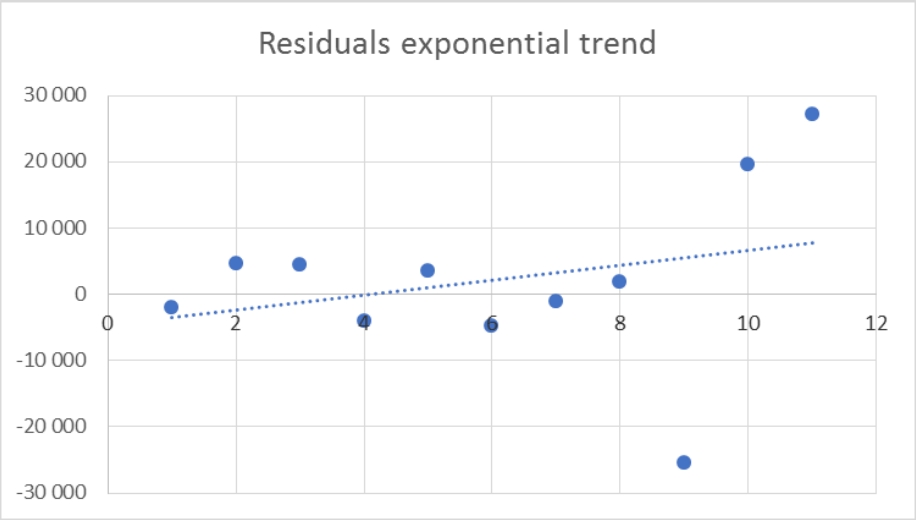
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0,962608128							
R Square	0,926614407							
Adjusted R	0,918460452							
Standard E	0,294657285							
Observatio	11							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regressior	1	9,866545355	9,866545	113,6399	2,09651E-06			
Residual	9	0,78140624	0,086823					
Total	10	10,64795159						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	8,507996209	0,190545965	44,65062	7,09E-12	8,07695129	8,9390411	8,07695129	8,93904113
ti	0,299492682	0,02809447	10,6602	2,1E-06	0,235938576	0,3630468	0,23593858	0,36304679

From here, it has been calculated that the total fully converted organic crop area and area under conversion to organic in Bulgaria for the next 3 years would be:

- 180 097 ha for 2017
- 242 969 ha for 2018
- 327 790 ha for 2019

Again, the coefficient of determination has been calculated in order to determine the goodness of fit. In this case, R2 = 0.9266, which means that 92.66% of the data is explained by the exponential function, which is meant to be a very good fit. Once more, the residuals are observed to see whether they would also fit the model. As it can be seen on the scatter plot, the residual pattern is random, which fits the transformed model.

Figure 6 Residuals plot for Scenario 2



To test the accuracy of the forecast, again with the help of the pseudo forecast, the relative error of the forecast has been calculated. In this scenario, the value of r = 23.69%, which is not considered to be a good value or accurate but nevertheless it is much better than the relative error of the forecast in the first scenario. As we can never be if a forecast would be 100% accurate, we cannot rely entirely on the predictions for future development of organic farming in Bulgaria but we might take the results into consideration.

5.3 Survey Results

From the total number of respondents that voluntarily took part in the research, 72% or 327 people were women and 28% or 127 of them were men.

The results showed that 30% of the surveyed were between 35-45 years old, 27% were between 25-34, 20% were between 45-54, 17% were between 18-24, 5% were between 55-64 and only 1% were over 65 years old.

At the time people were answering the questions 269 of the people or 59% indicated that they were employed full-time at the moment, 14% were employed but working part-time, 10% were students, 9% were not employed and they were looking for a job, while 6% were not employed but they were not looking for a job, 1% were retired and 1% were disabled or not able to work.

The last demographic question was concerned with the highest degree in education of the respondents and showed that 40% of them had a high school degree or equivalent, 20% had some college but not a degree, also 20% had a master's degree, 18% had a bachelor's, 1% had a doctorate and 1% replied less than high school.

The questions examining the attitude towards food consumption in Bulgaria started with identifying what is the most common place that people go for food shopping. The results displayed that 72% of the surveyed usually use the large/corporate food stores to shop for food, 21% prefer small/locally owned food stores, 4% use the local farmer's market or open-air markets and just 3% usually shop from 'natural' or specialty food stores.

The evaluation of the survey showed that 64% read the label on food products sometimes, while 26% always read the labels and 10% never read them.

The questions concerned with GMO understanding showed that 85% of the respondents knew what GMO is, 13% claim that they have heard of it, but they are not familiar with it and 2% replied that they don't know what GMO is.

Another interesting finding was that 71% of the surveyed do not consider GM-food to be safe, 23% is not sure of it and 6% believe it is safe.

The question concerned with consumers' awareness demonstrated that while 74% of the people believe that there is no enough information available in Bulgarian language about GM foods, 14% are not sure and 12% believe there is enough information.

Undoubtedly, 96% of the people participating in the research think that genetically modified foods should require labeling, 2% are not sure about that and other 2% believe that libeling should not be required. In other words, the majority of people, or precisely 438 out of 455 people, agree that the labeling of GMOs is a must.

Moreover, the survey shows that 60% of the participants believe that organic products are 'healthier', 25% are unsure about this statement and 15% do not believe that organic means necessarily 'healthier'.

People were asked how many times did they purchase organic food in the last month and the results showed that 36% from the respondents bought organic food 0-1 times, 29% purchased 2-4 times, 20% indicated more than 5 times as a reply and 15% were not sure how many times.

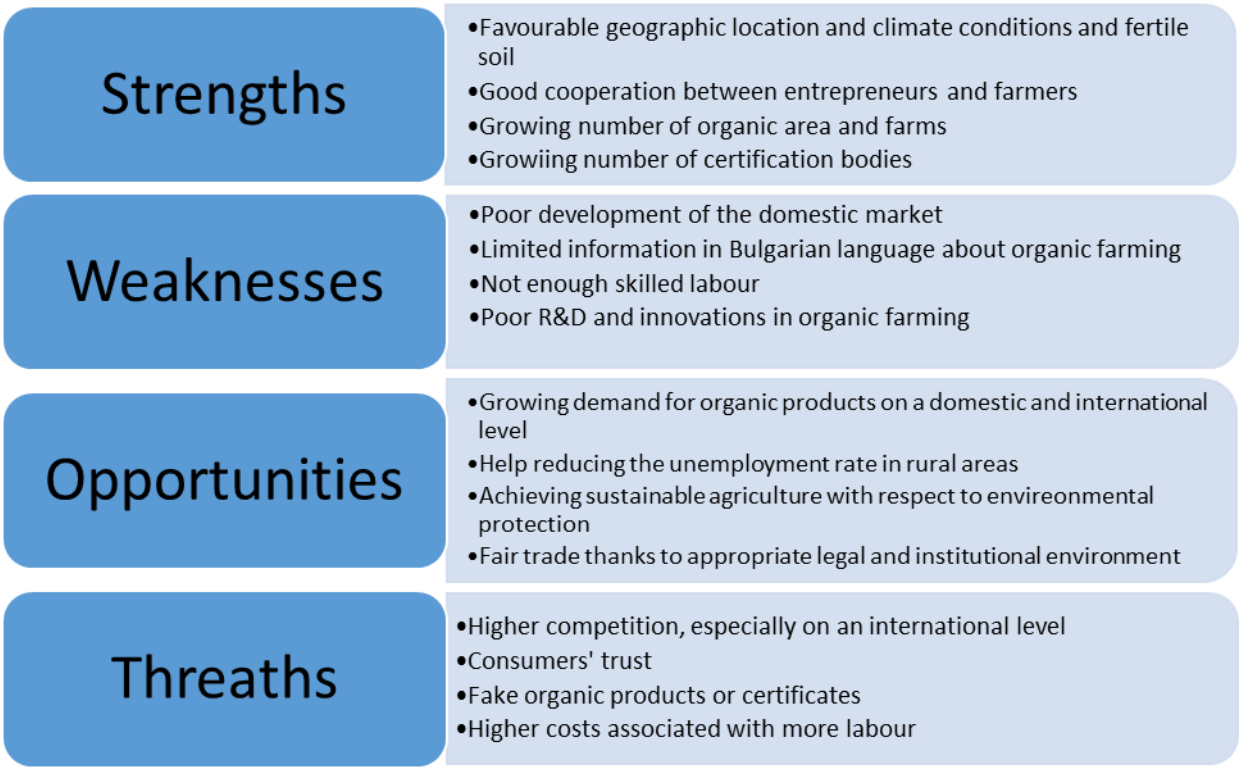
Next, people were asked whether they would buy organic food more often, if it was sold at a lower price. Clearly, 87% were positive that they would definitely buy organic products more often if the price was lower and only 13% claimed that they would not buy organic food more often, even if it was sold at a lower price.

Finally, the last question was concerned with food waste and asked how often they throw away food in a week. The results showed that only 33% of the respondents never throw away food, while 67% of people throw away food, from which 10% throw away food more than 3 times a week and the remaining 57% throw away food at least once a week.

5.4 **SWOT analysis**

The following SWOT analysis was constructed after the theoretical and practical part of the thesis was carefully examined. The analysis demonstrates the strengths, weaknesses, opportunities and threats for organic farming in Bulgaria. It was observed that the conditions for the development of organic farming are present but problems like not enough skilled labour, the lack of trust in organic products amongst Bulgarians, the limited information in Bulgarian language on both organic farming and GMO are some of the constraints that the organic market in Bulgaria is facing. Also, the possibilities of faking organic products or certificates on the Bulgarian market are some one of the main threats for the development of an expansive market and this is one of the reasons why many people cannot commit to produce or buy organic products.

Figure 7 SWOT analysis of organic farming in Bulgaria



Notes: Own interpretations

6. Conclusion

The thesis examined the dimensions of world hunger, explored some of the causes of it and tried to propose a way to reduce it. The literature review looked into the current state of the organic food market, explored the various benefits of implementing organic farming and linked this to future sustainable development. After the analysis of the literature sources it could be concluded that organic farming offers socially and environmentally sound ways to improve the conditions in the developing areas in poorer countries.

Using fewer inputs, which help to increase profits, organic farming has the potential to produce similar yields to those of conventional agriculture if applied correctly. It promotes biodiversity and natural mechanisms to fight pests, treat the environment with respect and support the well-being of the farmers and rural communities.

The practical part explored the development of organic farming in the context of the emerging economy of Bulgaria and provides grounds for a future research in the country.

Bulgarian organic food market is relatively new and small, compared to the majority of European countries. Against this background, it is unlikely that competitiveness will be achieved massively for now, however there is a big potential in the development of organic farming in Bulgaria. Based on the development trends in the country and Europe, the possible path to successful organic production in Bulgaria is formulated by:

- Achieving high standards for quality and quantity
- Concentrating efforts towards export – both for fresh consumption and raw materials, as agriculture in Bulgaria has huge potential;
- Establishment and development of small–scale organic farms in the undeveloped rural areas;
- High degree of co-operation, not only between the small ones, but also between the big manufacturers to complete the first two objectives;
- Implement the most up-to-date sustainable agrarian practices;
- Investments in education;

The market environment provides a slightly more favourable position for the development of organic farming, especially with the implementation of the various policies in the European Union. Even though there are number of national policies, it would be recommended to invest more in R&D, restructuring and offer even bigger support for the rural development in Bulgaria.

The author of the thesis recommends further research on organic farming and its potential as a powerful tool to achieve sustainability and help reducing hunger and poverty around the world.

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