

Czech University of Life Sciences Prague

**Faculty of Tropical AgriSciences
Department of Economic Development**



Master Thesis

**Increasing competitive strength and efficiency of
Moldavian small and medium-scale farmers, through
their orientation to high value crops growing in
Anenii-Noi district**

Student: Bc. Sergiu Cojucari

Supervisor: Ing. Alexander Kandakov, Ph.D.

2013

Declaration

I declare that I worked on my Master Thesis Increasing competitive strength and efficiency of Moldavian small and medium-scale farmers, through their orientation to high value crops growing in Anenii-Noi district by myself and I used only sources mentioned in the references.

25th of April 2013, Prague

.....

Bc. Sergiu Cojucari

Acknowledgement

First of all, I would like to express my sincere acknowledgement to my supervisor Ing. Alexander Kandakov, Ph.D. for continuous support of my Master study and research, for his patience, motivation, ability to help and immense knowledge. His advices helped me in all the time of research and writing of this thesis.

Besides my supervisor, I would like to thank all members of the Faculty of Tropical AgriSciences, and Czech University of Life Sciences, Prague for the knowledge they gave me, and good organization of studying process.

Last but not the least, I would like to thank my family: my parents and my brother for supporting me spiritually throughout my life and especially at the time of being abroad. A big thank to my grandparents, my uncle, aunt and cousin for their help, support and their encouragement.

Abstract

Farming is an important industry for Moldavian agriculture, in general and specifically for horticulture. Climate diversity, soils with high natural fertility and high skilled farmers, were and are the main factors that place our country on top in Europe and CIS countries by the quality of agricultural products. The thesis aims through its structure, is to foster inventiveness and scientific search and to put as much data as possible about the practical application of efficient technologies for growing tomatoes in Aneni-Noi district. There were studied methods of achieving a diversity of tomato cultivation technologies in the open field and in greenhouses. Thesis is meant to be a technical guide useful for gardening specialists working in both either companies or their own farm and like a guide for education, students and even teachers. Reading of this thesis can be useful for professionals from other fields, who found their specialty's contribution to the development of vegetables. Interests could also arise from observations of amateur farmer when it gets to know fascinating possibilities of growing and fructification of their production. I hope this work will be useful for the readers that will meet their needs and will also be good as frequent consultation guide. Further suggestions for improvements will be warmly received and carefully considered.

Key words: Moldova, Anenii Noi district, vegetable production, tomatoes, high value crops.

Table of content:

1. Introduction	10
2. Background	12
2.1 General and Geography information	12
2.1.1 Climate	14
2.1.2 Environment	15
2.2 Economy	15
2.2.1 Demography	15
2.2.2 Industry	16
2.2.3 Investments	17
2.3 Agriculture	18
2.3.1 Situation in agriculture before independence	19
2.3.2 Situation in agriculture after becoming independent state	19
2.4 Particularities and history of vegetables in the Republic of Moldova	20
2.5 High Value Crops orientation	21
2.6 Particularities of tomato crop in the Republic of Moldova	22
2.6.1 Consumer preferences	25
2.6.2 Market opportunities	26
2.6.3 Production overview	27
2.6.4 Distribution of tomato production	29
2.6.5 Value chain limitations	30
2.7 Czech Moldavian cooperation	31
3. Objectives	33
3.1. Main Objective	33
3.2. Specific Objectives	33
4. Methodology	34
4.1 Studied area	34
4.1.1 Puhaceni village	35
4.1.2 Delacau village	36
4.1.3 Serpeni village	37
4.2 Timeframe	39
4.3 Research design	39
4.4 Sample size	39
4.5 Data and data sources	40
4.6 Data collection methods	40
4.7 Pilot testing	41
4.8 Structured questionnaires	41
4.9 Data analysis	41
5. Results and Discussion	43
5.1 Descriptive part	43
5.2 Analytical part	53
6. Conclusions and Recommendations	58
6.1 Conclusions	58
6.2 Recommendations	59
7. References	60
8. Annexes	64

List of figures:

Figure 1 - Tomato production in Moldova (2007-2012)	23
Figure 2 - Moldova's import/export of fresh tomatoes, general trends (2007-2012)	24
Figure 3 - Moldova's per capita consumption of vegetables (2006-2012)	25
Figure 4 - Location of Anenii-Noi district	34
Figure 5 - Location of Puhaceni village in Anenii-Noi district	36
Figure 6 - Location of Delacau village in Anenii-Noi district	37
Figure 7 - Location of Serpeni village in Anenii-Noi district	38
Figure 8 - Respondents' gender distribution	43
Figure 9 - Respondents' age distribution	44
Figure 10 - Respondents' distribution by village	45
Figure 11 - Respondents' education	45
Figure 12 - Open field tomato market orientation in Anenii-Noi district	46
Figure 13 - Greenhouse tomato market orientation in Anenii-Noi district	47
Figure 14 - Anenii-Noi district tomatoes sold on local and international market	48
Figure 15 - Main local markets for tomatoes from Anenii-Noi district	49
Figure 16 - Main international markets for tomatoes from Anenii-Noi district	51
Figure 17 - SWOT analysis of tomato sector in Moldova	52

List of tables:

Table 1 – Turkish tomatoes compared with Moldavian tomatoes	25
Table 2 – Description of main tomatoes production areas in Moldova	28
Table 3 – Estimations of tomatoes in Moldova	28
Table 4 – Main problems, farmers are faced with during the process of growing tomatoes	48
Table 5 – Main problems of farmers while selling tomatoes on local market	50
Table 6 – Main requirements for Moldavian tomatoes on international market	51
Table 7 – Common problems with the export of tomatoes to foreign countries	52
Table 8 – Data set used for calculations of the model	54
Table 9 – Correlation Matrix	55
Table 10 – Ordinary Least Square Method, using observations 1998-2012	55
Table 11 - Breusch-Godfrey test for first-order autocorrelation	56

Abbreviations:

ACED	Project Agricultural Competitiveness Economic Development
°C	Celsius degree
CIS	Commonwealth of Independent States
CULS	Czech University of Life Sciences in Prague
CzDA	Czech Development Agency
DW-test	Durbin-Watson Test
EU	European Union
FAO	Food and Agricultural Organization
FDI	Foreign direct investment
GDP	Gross domestic product
GfK	Society for consumer research
Ha	Hectares
HDI	Human development index
Kg	Kilograms
Km	Kilometers
LPG	Liquefied petroleum gas
MIS	Marketing Information System
MSSR	Moldavian Soviet Socialist Republic
No.	Number
N	North
OLS	Ordinary Least Square Method
OECD	Organization for Economic Co-operation and Development
T	Tones
UN	United Nations
UN Com	United Nations Commodity Trade Statistics Database

UNDP	United Nations Development Fund
USAID	United States Agency International Development
USD	United States Dollar
USSR	Union of Soviet Socialist Republics
WB	World Bank

1. Introduction

After the Soviet Union collapsed and Moldova became independent, exports of fruits and vegetables in the country have been steadily diminishing. This was caused by higher energy costs, deteriorating infrastructure, loss of traditional markets, land redistribution and lack of production and marketing systems tailored to the market economy (Swinnen and Gow, 1999). Over the years, Moldova has gained a reputation as a provider of high quality fruits and vegetables.

This reputation, however, is about to be lost along with traditional markets because Moldova has faced competition with higher quality products from Russia and other countries. Tightening global competition threatens Moldovan tomato production, which they can not cope with the global markets (Iosif, 2002). If there would not be introduced new varieties, production systems, means of production and storage conditions, distribution and marketing, export of tomatoes and other high-value agricultural products will continue to decline.

Despite the general regression in the field of agricultural production (GfK, 2005) exports of some fresh agricultural products yet experienced an increase. Among these, tomatoes show a potential to achieve export revenues by early varieties in conditions where growth will be enhanced by technologies, along with methods of harvesting, storage and packaging. Subsequently, there should be found ways to enter the market as early as possible to grab higher marketing margins. According to Soroceanu, (2000) manufacturers and exporters of tomatoes must find effective ways to increase economic production, establishing direct connections with importers in Russia and creating opportunities to increase profits at the beginning of the season, selling high quality products in large volumes.

This thesis has been prepared to bring first of all some information about The Republic of Moldova, to show economical situation (problems) Moldova is facing. Secondly it determines the situation of small scale, medium-scale farmers, their main activities, problems and future perspectives in farming activities. Finally in this thesis there would be analyzed three villages (Puhaceni, Delacau, Serpeni), all of them being part of Anenii-Noi district and the main goal is to find solutions how to increase competitive strength of farmers through their orientation on high value crops.

In the first part the author did an analysis of the current situation using some scientific sources in order to get some knowledge about studied problem and to reflect the main issues regarding that.

The second part is showing the results obtained by the author, due to the studies which were done in the field. Finally the results got by the author were compared with the information discussed before and in the end there are conclusions which show if the result of authors findings match to the main expectations.

2. Background

2.1 General and Geography information

Republic of Moldova is a small country located in Eastern Europe and has common features with other countries in Central and Eastern Europe, and yet preserving its unique character. Although it is a historical region of Romania, for a long time it was under Russian occupation, from 1812-1918 and from 1940-1991 was occupied by the USSR. (Matcu and Sochirca, 2002)

In the research presented by Gorton, (2001) after the collapse of Soviet Union in 1991 the Republic of Moldova was proclaimed independent and sovereign state (the republican form of government, with Parliament, President, Government, Judiciary and the Constitutional Court), becoming a member of the UN. Since that time, there were launched a range of reforms to demolish the old Soviet system and build a new one based on the rule of law. Special attention is given achievements of the global human rights standards. As a result, in 1997, Moldova ratified the European Convention on Human Rights.

Following the studies done by Matcu and Sochirca, (2002) Moldova is a relatively small country with an area of 33.700 square km, with a population of almost 4.5 million people. It is situated between Romania (a country that in 2008 obtained membership of the EU) and Ukraine (now independent state in Eastern Europe). Moldova has a population mainly of nationality Moldovan / Romanian (64.5%), with 13.8% Ukrainians, 13% Russians and representatives of other nationalities 8.7% (Gagauz, Jewish, Bulgarian, Polish and so on).

The same authors Matcu and Sochirca, (2002) stated that administratively, Moldova is divided into thirty-two districts, besides Chisinau and Balti municipalities and autonomous territorial unit of Gagauzia. These local governments are collectively referred to as administrative units. Republic of Moldova has a territory on the left side of the river Dniester (Transnistria), mostly inhabited by Moldavians (42%), and in relatively equal proportions of Russians and Ukrainians. In 1990, when the conflict in Transnistria started, authorities in Chisinau (capital of Moldova) lost control of that region, which declared independence as the Transnistrian Moldovan Republic.

Following the results of the Population Census, (2004) 60% of inhabitants of Moldova (without Transnistria) declared Moldovan language as their mother language and it is the language they speak often, 16.5% of state residents said they have Romanian as their mother

language and this is usually the language they speak. Most Russians, Ukrainians, Gagauz and Bulgarians have shown that their native one is Russian, Ukrainian, Gagauz and Bulgarian. Russian is considered the unofficial language of interethnic communication, and every second Ukrainian, every third Bulgarian and every fourth Gagauz said they usually speak Russian. Only 5% of Moldavians said they usually speak Russian. According to Population Census (2004) main religions in the Republic of Moldova are: Orthodox 93.34%, Protestantism of any current 1.98%, Old believers 0.15%, Catholicism 0.14%, other religions 0.88%, no religion (agnostics and atheists declared) 1.35% and Undeclared 2.24%.

Moldova is situated in the south-eastern Europe, bordering Romania to the west and Ukraine to the north, east and south. The total length of border is 1,389 km, 450 km with Romania and 939 km with Ukraine spreads 45 ° 28 'and 18 ° 28' N geographic longitude (about 350 km) and between 26 ° 40 'and 30 ° 6' is the geographic latitude (about 150 km). The country occupies an area of 33,843 square km, of which 472 square km is water. Arable areas occupy 53% of the surface of Moldova, for cereal culture - 14%, pastures - 13%, forests - 9%. Other areas, including productive land counts 11% of the whole territory of the state. Although Moldova is landlocked, there is just a small port situated on Danube River called Giurgiulesti which provide shipping. (Matcu and Sochirca, 2002)

Moldova's current landscape is fragmented, represented by a series of relatively low plateaus and plains. Overall it is tilted from northwest to southeast. The highest areas are the highlands of north-west and center (300-400 m), lower altitudes is in the south (100-200 m). The average altitude is 147 m, the maximum is 429 m at Balanesti Hill and the minimum – about 2 m in the Lower Dniester (Cazac et.al 2005).

The main minerals extracted from underground are used like raw material for the construction industry. In 2011 there were taken out about 400 deposits of useful solid minerals, industrial reserves of 400 million tons of gypsum, glass sand, diatomite, and other minerals. Also 1,500 million cubic meters of limestone, stone, gravel, clay etc. As Preasca (2012) stated, in the south have been identified modest hydrocarbon reserves: oil (Valeni, Cahul), natural gas (Victorovca, Cantemir) and brown coal (Etulia, Gagauzia). According to data from the Soviet Union there are estimates of available oil reserves approximately 2.1 million tons and natural gas 960 million cubic meters. However, there is assumption that exist other deposits at depths (Preasca, 2012).

According to National Bureau of Statistics, (2011) soil is the main natural resource of the country. The land of the Republic of Moldova on 1 January 2011 is 3.384 million hectares. Agricultural land occupies about 2 million hectares which is almost 74 percent including arable land - 1,820,500 ha which is 72.7 percent, planting fruit trees - 303.0 thousand ha in proportion

of 12.1 percent, grassland - 356 100 ha and it consist 14.2 percent. According to Andries (2012) the most fertile is chernozem characterized by dark and thick humus layer with a well pronounced structure, containing 3-7% of humus according to subtype.

2.1.1 Climate

Moldova is located in the temperate continental zone, influenced by the proximity of the Black Sea and interference of warm air from the Mediterranean, with lack of humidity, in result having a high frequency of droughts. For example, only in 1990-2010, the country has recorded nine droughts. (National Rapport of Human Development, 2009-2010)

The four seasons are well shown, the mild winter and hot summer. General movement of air masses in the atmosphere is mostly from the North-West and South-West. Average annual air temperature from north to south varies between 8.0 ° C (Briceni) and 10.0 ° C (Cahul) being a warm climate, (Cazac and Daradur, 2005) and soil between 10 ° C and 12 ° C. In Moldova there are approximately 2060-2360 hours of sunshine per year, positive temperature recorded in 165-200 days a year, rainfall varies between 370-560 mm / year and almost 10% falls as snow, which is melting several times a winter.

Also according to Cazac and Daradur, (2005) winter in Moldova is mild with average January temperature of -5 ° C - 3 ° C, some days it can go down to -15 ° C - 20 ° C, and by penetration of arctic air masses at even -35 ° C. It is unstable during the spring season when there increases the number of sunny days and average air temperature is increasing. In temperature gradation in May is established around 15 ° C and it favoring the situation and decreasing the risk of frosts. The summer is warm and long, with long periods of droughts. The average temperature in July is 19.5-22 ° C, but sometimes it can achieve the rate of 35-40 ° C. Summer rains are mostly short and heavy, sometimes causing local flooding. Autumn is warm and long. In November the average temperature drops to 3 -5° C and appear the first snowfalls and frosts.

Following the idea of Chirica et al., (2011) Hydrographical basin of Moldova is represented by 3621 rivers and streams with a total length of about 16,000 km, including 7 longer than 100 km, 247 - over 10 km, also Danube river flows on an area of 700 m. The longest rivers are the Dniester, Prut, Reut, Byk, Ichel, Cogîlnic and Ialpuș. The average density of river network is 0.48 km/km². Highest recorded river flow is on spring when snow melt. Transboundary water resources of the rivers Dniester and Prut is on average 90% of total water resources of the country.

2.1.2 Environment

As Vadineanu, (1999) wrote in his book that condition of the environment and sustainable use of natural resources affects economic growth conditions and the level and quality of life. Wasteful use of natural resources in recent years has reduced the efficiency of natural production and had a destructive impact on the environment, especially water resources, air, soil and biodiversity.

In Moldova there are 2 zones of vegetation, which are: steppe and forest steppe zone. Steppe zone occupies the southern regions located mainly at Codri plateau and the southern and eastern Tigheci Hills. These areas are particularly valued in agriculture and there are few areas where there is still such characteristic vegetation (Red Book of Moldova, 2002).

2.2 Economy

Following the idea of Csaki and Lerman, (2002) since 1990, in Moldova started a strong economic decline from which it recovered only in 2000. According to Gorton, (2001) largest share in economics belongs to agricultural sector. Moldovan main products are fruits, vegetables, wine and tobacco. Moldova imports oil, coal and natural gas, mainly from Russia. As part of ambitious economic liberalization in the early nineties, Moldova introduced a convertible currency exchange, liberalized prices, stopped providing soft loans to private companies and public companies, began the process of privatization, removed controls exports and has frozen interest rates. As Dries and Swinnen, (2004) stated, although many attempts are now being made to stimulate investment and economic development, the major role in economic growth is coming from outside of the country. World Bank data shows that a third of the country's GDP comes from Moldavians working abroad (about \$ 1.7 billion legal).

2.2.1 Demography

In the conclusion reported by Sirghi, (2009) the birth rate in Moldova has been in a steady decline until 2002 when it was 9.9 ‰, then there is a slight upward trend to 11.0 ‰ in 2011 argued National Bureau of Statistics (2012). Rate is higher in rural areas where it is 11.8‰ and 9.8 ‰ in urban areas. Of the total number of 39,182 newborns children, 51.5% were male, masculinity ratio is 106 boys to 100 girls. About 15-22% of children are born outside marriage.

In the last decade, 68-70% of mothers belong to the age group 20-29 years. In general, the average age of mothers increased from 25.5 (2001) years to 26.7 years (2009).

Also according to Cholamali, (2006) Moldova is among countries affected by migration processes. Migration occurs in two ways: internal (rural to urban) and external (for work, learning, business or tourism). According to official statistics there are registered nearly 370,000 migrants (unofficially about 800,000 people) went abroad only for the purpose of employment and remittances from migration reached considerable proportions of 33% -37% of GDP.

2.2.2 Industry

Due to the country's agricultural character stated Bostan et al., (2012), food industry is the most developed. In Moldova are produced annually about 550 to 600 thousand tones of milk, of which approximately 28% is purchased for processing. Milk processing industry is represented by 23 companies, only 12 companies are viable, most of which are in the northern part of the country.

At the same time according to Chislia, (2011) sugar industry in the last decade was marked by the arrival on the market of German Sudzucker acquiring controlling stakes in four sugar factories - Drochia, Falesti Donduseni and Alexandreni.

Regarding the problem of energy supply following the idea of Bostan et al., (2011) Moldova is ensured by 4-5% of their energy and fuel, the rest being imported. Major supplier of oil is the Russian Federation, followed by Ukraine and Romania (Preasca. 2012). As Duca, (2010) argued, natural gas is the main fuel in the energy balance of the country and today's share is 42% including LPG. Consumption of liquid fuel (example petrol, diesel, etc.) is 40% of total energy use and consumption of solid fuels (coal and wood) is less than 10%. At the same time in the research presented by Mihailescu, (2010) to improve the current situation in the energy sector Moldova joined the Energy Treaty Community in 2010 which provides integration of the electricity and natural gas to regional energy markets in Southeast Europe.

In the conclusion presented in the report about light industry of the Republic of Moldova an important component of the manufacturing sector in Moldova is light industry. This industry includes: textiles clothing, production of leather, footwear (including manufacture of luggage and leather goods) (King, 1999). Light industry operates about 330 companies with domestic capital, foreign or mixed. In total, light industry enterprises operate more than 26,000 employees.

2.2.3 Investments

In a research presented by Gow and Swinnen, (2001) Moldova enjoys a favorable geographical location, the exceptional quality of the soil, a highly qualified workforce and potentially important scientific and ethnic factors that are favorable for making substantial investments in Moldavian economy. Moldavian authorities constantly strive to improve the investment climate in Moldova, promote a favorable tax policy for foreign investors, and at the same time Constitution guarantees the inviolability of investments made in Moldova by physical agents and companies, including foreign businesses. According to Baghinschi, (1979) the most important constitutional principles of the Republic of Moldova are:

- Rule of law
- Market economy
- Private Ownership
- Provisions against expropriation of property
- Separation of powers

Laws about Foreign Investment, regulates the activity of foreign investors in Moldova. This law provides for the repatriation of profits and protects foreign investment. In all sectors of the national economy, foreign investments are treated in the same way. Current legislation of the Republic of Moldova is based on non-discrimination between domestic and foreign investors (Chayanov 1966). Moldova enjoys a favorable business climate and transparency. Anti-monopoly policies are governed by the Laws about Monopoly Activity and Competition Development. These laws establish the fundamental principles based on EU standards regulating monopolistic activity and competition ventures development.

According to National Bank of Moldova, (2010) which states that the geographic distribution of FDI shows that investors from the European Union get major share (53.3%), which increased in 2010 due to investments in Romania (banking), Cyprus and the Netherlands are other major investors in other sectors. CIS investors have recovered 11.7% of the stock of FDI in capital and investors from other countries - 35.0%.

As Macours and Swinnen, (2002) stated that during the transition to a market economy that crosses Moldova, investment plays a very important role in terms of economic recovery, unlock production of goods, reviving exports, creating new working places and more. A weak economy in period of transition requires foreign financial allocations. Government is trying to overcome the economic crisis and socio-economic environment difficulties by implementing structural reforms.

In the conclusion done by the Ministry of Economy of the Republic of Moldova, (2005) in Moldova there is a contradictory attitude on foreign investments. On one hand, foreign investment are seen as a threat to the economic security of the country, danger resulting from opening the Moldovan economy with low competition, unfair competition from foreign manufacturers and so on, which can result in seizure of the internal market by the manufacturers abroad. On the other hand, as Brooks and Nash, (2002) argued in their analysis that there is a tendency toward "deregulation" of the economy, providing free entry on Moldavian market, creating a system of facilities for foreign capital activity. Both views have the right to existence and objective arguments, one of which is direct dependence between economic growth and investment.

2.3 Agriculture

Being a very important source of material production, agriculture occupies an important place in the Moldavian economy. Csaki, (2000) argued that vegetable culture like a part of agriculture and farming and through food it provides positive effects on the economy and economic situation of producers.

In conclusion presented by Lerman, (2004) its special importance can be summarized in the following:

- Farming is one of the most intensive forms of land use;
- Compared with other crops, production of vegetables provides better use of agricultural land by executing large areas of crops associated particularly in successive way;
- In the vegetable production, products resulted are much bigger compared to other cultures;
- Vegetables production provides conditions for achieving high income and staged throughout the year;
- Provide conditions for rational use of labor throughout the year;

Folowing the idea of Dumitrashko, (2003) Moldova has always been famous for its traditional soil fertility so agriculture formed the basis of the economy, contributing to the welfare of the country. The results and outcomes from riches Moldovan lands, including food, were one of the advantages of Moldovan exports. Most country towns emerged and developed at the crossroads of trade routes or where fairs were located. This fact explains the special role which belongs to agro-industrial complex (agriculture, agricultural product processing technology, industries that provide equipment and services) economy throughout Moldova.

Csaki and Lerman, (2002) argued that in not too distant past, agriculture was characterized by increased concentration and intensity of production.

2.3.1 Situation in agriculture before independence

In the research presented by Csaki and Lerman, (2002) during Soviet Union times most Intersectional structures of agro industrial complex of the Republic of Moldova (viticulture, wine, fruits, vegetables, sugar, vegetable oils, tobacco, etc..) were focused in the firstly to Union market where internal food production exceeded twice the domestic demand. Production volume was assured and considerable technical and financial assistance provided by the center.

Statistic Bureau of Moldova, (2002) stated that in 1990, the Parliament (Supreme Soviet of MSSR) adopted the concept of transition to market economy, and a year later, the transition program to a market economy in the MSSR. According to that concept, difficult path of transition to market should be done in a very short time, approximately 1.5 - 2 years. Moldova as an independent state formation decided to initiate fundamental reform of the economic system. In the conclusion of Gutu, (1999) emphatic ideas across national resources and possibilities of the new state formed extremely high degree of underestimation of economic integration, and dependence on the USSR created the illusion that the rapid restructuring of the economy and that, economic growth is feasible.

2.3.2 Situation in agriculture after becoming independent state

Following the idea of Tkach, (1999) in 1992 was launched major reorganization of collective farms, farmers expected a stop of kolkhozes and sovkhoses activity. They got some land and property and in result there were registered first farms. State property (in 1989 it represented 86% of the reserve funds of the country) and the cooperatives and collective farms remained without owners. Due to dishonest consent of the state, land started to be stolen. Land reform which saw an extension, in result it went to degradation of the agricultural sector. As Rizov, (2008) stated in his review, despite massive budget inflows, agriculture became unprofitable, towards in 1996 many households liabilities exceeded the cost of their property. Simulation of reforms prolonged the agony of unprofitable households, threatening not only agro-industrial complex, but the entire economy.

Finally, in 1997 the first signs of agrarian reform appeared. There were reorganized 70 collective farms and about 70 thousand farmers received land ownership documents. According

to Orlova, (1998) later, in 1998, due to critical debts and production which almost disappeared and a ruined industrial relations system, there was launched national program "Land". This happened without any advertising support or assistance from the Ministry of Agriculture, but the involvement and financial support of donors. Most agricultural enterprises, gaining economic independence were involved in entrepreneurial activity, focusing on the changing status and forms of operation. Formed the agricultural business core in a rapidly for 3-4 years (Orlova, 1998).

Despite the obvious change of the ownership and types of farming systems of Moldova's agricultural sector, the issues of stability and efficiency of the new management system remain unsolved (Schmitt 1991). In conclusion reported by Rizov, (2008) problems remain the same, ranging from Concept 1991 to Concept 2008: financial resources for modernization of agriculture, land use and preservation of fertility awareness, fight pest and crop diseases, ensuring increased marketable (export oriented) competitiveness, renewal of equipment and advanced technologies, agricultural technical service development, social development of the village and so on.

Experience of Moldova proves that the introduction and effective right use of private ownership of land and recognition as a product needs to be strengthened through the creation of unique procedures, including mechanisms of cadastral unique system protection and transfer of agricultural land to other categories of use. In research presented by Rizov, (2008) over time there have been registered some changes in Moldova in terms of land use categories, both in structure and in the territory, under the impulse of economic factors. In the current economic transition to a market economy, the problems agriculture is facing with are complex. (OECD, 1997) A solution should be found regarding territorial location of agricultural production and enhanced problem marked by big changes that occurred in the Moldavian economy. According to Hartia, (1969) this solution means review of the concept of territorial distribution of agricultural production.

2.4 Particularities and history of vegetables in the Republic of Moldova.

Rational nutrition requirements which are always growing require farmer's orientation on getting fresh vegetables throughout the year. According to Matcu and Sochirca, (2002) climatic specifics of Moldova provide the market with fresh produce only a limited period of time during the year. Hence, appear the need to establish large areas as of forced and protected crops. The

first data on forced culture dates back to antiquity, when the plants imported from warmer lands were cultivated in heated rooms (ARA, 1998).

Also Matcu and Sochirca, (2002) stated that in the second half of the nineteenth century, when urban population growth and the role of vitamins in human life was discovered, farming grows rapidly, while implying an increase in the area occupied by greenhouses. So, after 1900 the first complex of greenhouses and plastics are used to protect crops. In Moldova plastic sheds and greenhouses covered with glass appear later in comparison with other countries. In the period 1934 - 1938 warmer areas were occupied by greenhouses on a territory of 4 ha, and in 1960 there were 10 ha. Growth rooms are raised around 1880, they were brought to Moldova by Bulgarians. According to Alecu, (2011) using of greenhouses has increased every year and reached 1300 ha in 1980, and in 1985 to 1700 hectares. In a short time, Moldova has built many industrial type of greenhouses using modern technologies and national potential in terms of energy, climate, soil, industrial progress and, especially, human material which is professionals and skilled people.

As Iosif, (2002) stated, after 1990 Moldova lost the entire organizational and experience potential, production and economic output decreased sharply. The worst thing is that the imports of horticultural products increased and mostly it affected vegetable and flower import.

According to estimates done by Stanciu, (2006) in recent years have been discontinued over 1000 ha of industrial type of greenhouses including large production of edible mushrooms. Other important areas of the remaining greenhouses, were not heated and suffered significant damage and were about to be destroyed.

European and national statistics shows that tomatoes occupy the first places in both the open field crops and forced culture in protected area. In Moldova, the area under tomato increased between 1938-1980, about three times. Dumitrescu, (2001) argued that in a period of three years between 1998 and 2001, in Moldova decreases large areas of tomato crops.

2.5 High Value Crops orientation.

In Moldova it is necessary readjustment of agriculture to high value crops. This opinion belongs to the Ministry of Agriculture, (2012) suggesting farmers to establish plantations of berry crops such as blueberries, strawberries, blackberries, gooseberries, currants, raspberries and other crops like tomatoes, eggplants apricots and other crops which have a higher value. According to Ministry of Agriculture, a long period of time, the country has not promoted the growth of crops that can bring higher profits and sales. For example, if a hectare of cereals make

a profit of about three hundred USD per hectare, a hectare of berry sales reach thirty thousand. Each square meter of land must make a high profit and a significant financial turnover, additional benefits for people, and creating more jobs and application of advanced technologies. State on his turn initiate supports for entrepreneurs in the field of subsidies.

According to Alecu et al., (2011) a modern sector of fresh fruit and vegetables based on advanced technologies vegetables and market oriented, is currently at an incipient stage of development in Moldova, but has good opportunities for growth. Presently Moldovan fresh products are generally positioned on the lower end of their target markets. But anyway there are positive signs of quality changes. The fruit and vegetable industry is a traditional industry in Moldova that is highly traditional industry in Moldova that is highly export oriented and currently struggling for export oriented and currently struggling for the diversification of products and markets the diversification of products and markets (Dudwick and Youssef, 1998). Fruit and vegetable processing enterprises are widely and evenly distributed across the country, with most of the plants located in country and in small towns. At the same time as Alecu et al., (2011) argued there is a big possibility to extend the production of high value crops in order to get higher income for farmers. Of course some problems always appear due to the changing from one time of production to another one. So according to Soroceanu, (2000) the problems which appear could be the following:

- Scarce of skilled labor force due to a high migration rate
- Need of long term finance
- Hard transfer of innovations
- Last but not least, highly needed of foreign investments

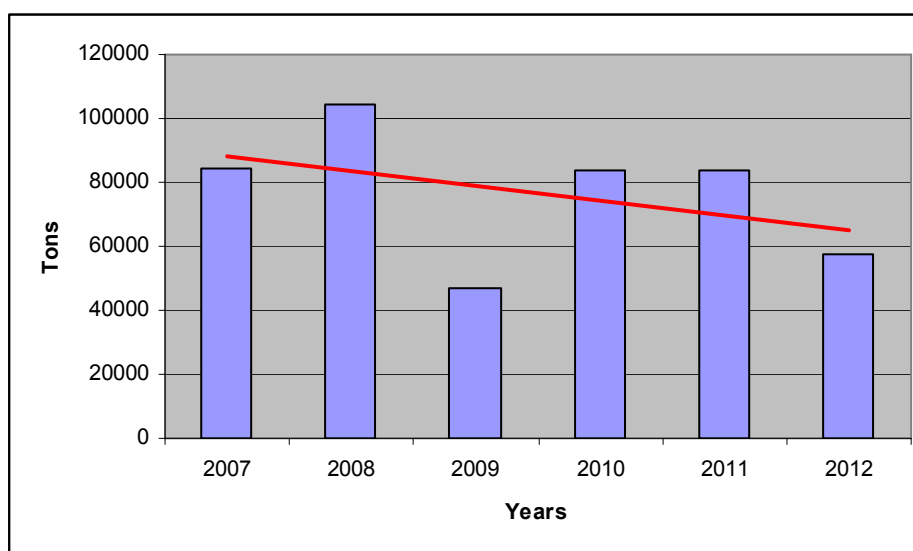
In the research presented by USAID, (2012) for this moment the best crop which is supposed to be extended is a tomato. As we analyzed before the selling price is high especially at the beginning of the season and even at the end. So farmers are trying to improve some technologies of growing this crop in order to get earlier results and try to compete with foreign production which is coming to Moldavian market earlier.

2.6 Particularities of tomato crop in the Republic of Moldova.

USAID, (2012) reported that in the Republic of Moldova tomatoes are main crop grown for exports and domestic consumption. In 2012 in Moldova there were produced 57,230 tons of tomatoes on the total area of 6,000 ha under production of both greenhouse and open field tomatoes. During 2007-2012, production of tomatoes fluctuated, with the downward trend in

world production, as shown in Figure 1 (the production trends in red). Due to lack of irrigation in 2007 and a drought season, tomato yields suffered a bad period of time. If we take a look on volumes of production of tomatoes from 2007 to 2009 we can see an increase in production but from 2011 to 2012 a reduction. This fluctuation appears from season to season and sometimes it shows us the market capacity of the last year. Anyway, this fluctuation in production is not a long term indicator and we can not make any decisions regarding that.

Figure 1. Tomato production in Moldova (2007-2012), tons



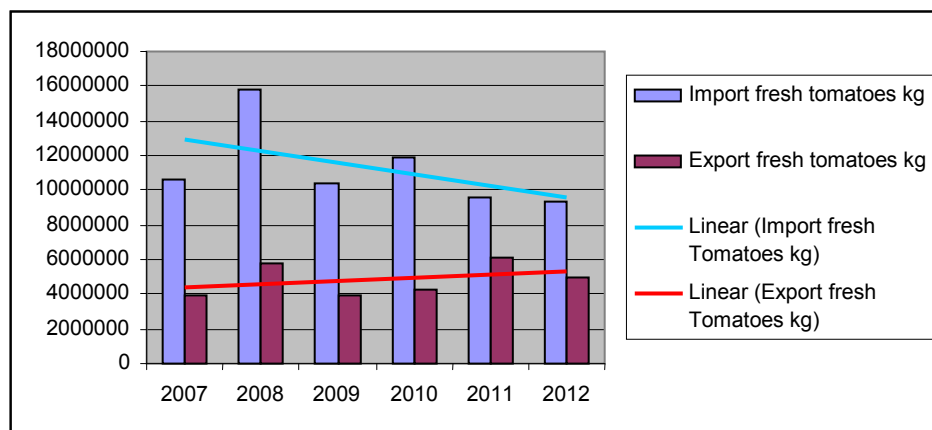
Source: Ministry of Agriculture and Food Industry, 2012

According to studies done by USAID, (2012) total production of tomatoes in 2012 was 59499 tons. Like fresh productions there were sold 93% of total production and other 7% were processed. The main exporter of processed tomatoes is Orhei Vit Company which exported 90% of canned products. So in result we can find out that just 10% of whole processed tomatoes are sold on local market. Even though a big part of tomatoes has a domestic use anyway tomatoes production is not enough, but just 14% are exported. According to the results from year 2012 we can see that Moldova imported 8743 tones of fresh tomatoes and 3052 tones of processed tomatoes. So, following to this analysis we can say that Moldavian production of fresh tomatoes is under domestic market demand. The most important reason is that almost every year local farmers meet the same problems regarding their ability to produce tomatoes outside of high season. Compilation between Moldavian import and export of tomatoes can be found in Annex 1.

In the graph presented by USAID, (2012) which we analyzed above, since 2007 to 2012 import of tomatoes declined over the years, export increased slightly, see Figure 2. Normally the

main market for Moldavian tomatoes market should be the local Moldavian market which is growing from year to year. Farmers can offer good quality tomatoes and at the same time make growing season by making it longer. Unfortunately tomatoes brought from Turkey set the price trend due to their domination at Supermarkets. Turkish tomatoes can be sold at the price of 1USD per Kg and Moldavian tomatoes can be sold at the price of 0.8 USD per Kg.

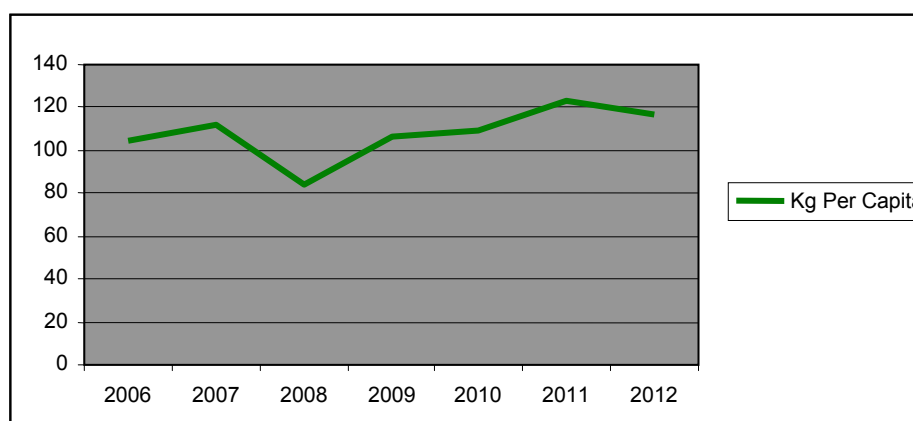
Figure 2. Moldova’s export/import of fresh tomatoes: general trends 2007-2012



Source: UN Comtrade, 2012

As conclusion reported by Moldova’s Ministry of Agriculture and Food Industry, (2012) annual fresh tomato consumption in Moldova is around 15 kg per capita. In average around 40% of total expenses of Moldavian population is spent on food, and around 12% of these expenses are spent on vegetables. It is obvious that consumption of healthy products is increasing due to a healthy life trend. Taking into consideration this fact we can agree that consumption of tomatoes will increase as well, even more consumer will chose fresh tomatoes rather than processed ones. Also Moldova’s Ministry of Agriculture and Food Industry, (2012) argued that tomatoes continue to account around 50% of vegetables produced in Moldova. Consumption of vegetables can be analyzed in the Figure 3.

Figure 3. Moldova's Per Capita Consumption of Vegetables, kg per year



Source: Ministry of Agriculture and Food Industry, 2012

Taking a view on consumer's preferences we can say that Moldavian tomatoes can not compete in terms of quality with Turkish tomatoes. Second one mentioned has a better look and a longer life due to being sprayed with different chemicals. Anyway such factors like look and shelf life does not play a very important role because the most important role is dedicated to the price due to a high price sensitivity of Moldavian citizens. In this case Moldavian tomatoes could be considered like being more competitive. Differences between Moldavian and Turkish tomatoes trough orientation on the most important factors that could make one or another type more competitive are analyzed in the table bellow (USAID, 2012).

Table 1. Turkish Tomatoes compared to Moldavian Tomatoes

Price	Taste	Shape	Color	Consistency
During the period of 10-7 days before the season, local tomatoes are 10-20% more expensive comparing to Turkish tomatoes, but after this period they become lower than imported.	In consumers view imported tomatoes has no taste which is a big advantage for local production	Imported tomatoes are round and have same size. Anyway it does not play a important role in consumer choice.	Imported tomatoes are pale red and no other color tomatoes are imported.	The biggest advantage of imported tomatoes is great firmness, in result it increase shelf life of product

Source: USAID, 2012

2.6.1 Consumer preferences

Following the idea of Miroiu and Carmen, (2008) consumer demand is not very hard to define because the biggest role is played by the price that is the only one factor which can attract

the consumers to buy one or another type of vegetables. A big advantage for Moldavian tomatoes is the fact that people know that local production is more qualitative and has a better taste, comparing to Turkish production of tomatoes which in opinion of consumers has no taste. Some special types of tomatoes like cherry are basically sold in supermarkets and do not present concurrence for local production. Some farmers are working on idea of introducing some new types with other colors like: yellow, black, heirloom tomatoes etc. But in conclusion presented by Moldova's Ministry of Agriculture and Food Industry, (2012) before introducing some new types of tomatoes, producers are discussing the problem of distribution of such kind of products in supermarkets where will be a bigger demand for such kind of products. It is obvious that if we compare tomatoes grown in open field and tomatoes from greenhouses of course consumers will prefer those from open field. Often farmers are trying to sell the products from greenhouses like products from open fields, but regarding the quality of these products we can say that there is not such a big difference. Also in the research presented by Miroiu and Carmen, (2008) people got used to buy small and medium size tomatoes especially if these products are used for processing in home made cuisine. Finally consumers chose open field tomatoes because these one in their opinion has less pesticides, fertilizers and are healthier. To understand which tomatoes are better qualities, consumers smell the tomatoes and the richer is the flavor the better is the product. This technology is defined through the years stated (Miroiu and Carmen, 2008).

2.6.2 Market opportunities

Scientists Alecu et al., (2011) have found few opportunities in order to give some advantages to Moldavian farmer which is focused on production of tomatoes. First of all there should be found some open air retail markets and some supermarkets like selling place for production. Secondly if we are speaking about production process we can highlight some new technologies which are not so expensive, for example to introduce some efficient energy heating. In result trading season will be longer, almost 7 month, so it will be a good technique how to compete with Turkish producer.

If we are talking about the competition on the local market we can find out that competition is based on price (Stanciu, 2006). The requirements about product uniformity visual appear and life of product is not so important. Usually transactions are done on the market without any invoice and there is a market without barriers.

According to USAID, (2012) analyzing the situation on supermarket channel we can say that it is another way around and qualitative aspect is very important and it became an important

goal for producers. In order to get better quality there is necessity of using some chemicals which in final result will increase the price. Also the delivery should be done on time including formal invoice and finally life of product should be extended to as long as possible because if we take into consideration delivering to the supermarkets and time until this product will be sold, it could take a long period of time.

According to USAID, (2012) the requirements of supermarkets include:

1. Longer product life
2. Ability to deliver just in time
3. Transactions followed by invoice
4. Post-payment possibility
5. Certification of quality
6. Accordance to sanitary and phytosanitary standards

2.6.3 Production overview

In 2012 area of planted tomatoes was 6000ha. Totally the volume of production was 57.230 tons and the productivity of 9.53tones per hectare and there were used two methods of production, greenhouses and open fields. Tomatoes from greenhouses are produced from May until June and those from open fields, from June until October but, year to year it depends on the weather. Producers are trying o extend their production year and produce tomatoes as long as possible. Just cause for that is higher price at the beginning or at the end of growing season. (USAID, 2012)

In research presented by Alecu et al., (2011) in the Republic of Moldova there are produced many types of tomatoes and these type are differentiated by color and shape. The most popular kinds of tomatoes are round shaped and plum tomatoes. Such types like cherry and vine tomatoes are produced in a very small amount. As we discussed before, consumers in their turn also prefer plum tomatoes which are mostly used in industrial and domestic consumption. If we take a look on production of tomatoes in greenhouses we can find out that round tomatoes account 90% and other popular type called plum tomatoes counts only 10%. From the point of view of color we can find out that most tomatoes are red and just a small quantities are orange, yellow and rose tomatoes which are mostly sold in supermarkets or sold to restaurants. According to USAID, (2012) from point of view of location of production we can realize that it is mostly concerned in central region of republic and also eastern part along to Dniester River, and there exist many farmers which are the leaders in tomatoes production. For a better view of geographical location we can analyze the Table 2.

Table 2. Description of main tomatoes production areas in Moldova

Location	Number of producers	Total covered area, ha	Estimated quantity produced, tons	Varieties
Dubasarii Vechi, CR	3600	150	13500	Cristal, Tolstoi, Izmir, Fantazio, Ivet, Abbelius
Speia commune, AN	31	37	4400	Cristal, Izmir, Ivet, Abbelius
Pirita commune, DB	600	19	1825	Abbelius, Izmir, Ivet
Toxobeni commune FL	127	14	1050	Zagadka, Sanika
Gura Bicului, DB	69	13	975	Beriliu, Abelius, Lilius

Source: USAID, 2012

Trying to analyze the main differences and particularities of tomatoes which are growing in open field and those in greenhouses we can say next:

According to Moldova's Ministry of Agriculture and Food Industry, (2012) area of open field tomato is almost 5800 ha and statistics show that farmers which have more than 10 ha are using in totally 1100ha. These open field tomatoes are usually used for industrial processing, and the size and type does not play a very important role. These tomatoes are used for juice, ketchup and paste. Greenhouses are used in Moldova by almost 8000 farmers on a territory of 290ha of protected area. The best greenhouses are the one made from glass but just a small number of farmers use this type of greenhouses. Other farmers use plastic covered ones. Many farmers affirm that it is possible to get from 200 up to 250 tons per hectare. Estimations are shown in the Table 3 (USAID, 2012)

Table 3. Estimations of tomatoes in Moldova 2012

2012 Data	Greenhouse Tomatoes	Open Field Tomatoes
Number of Farmers	7986	n/a
Hectares Planted	289 ha	5711 ha
Volume Produced	57800 tons	28300 tons
Yield per hectare	200 tons	30 tons
Production Season	May-November	June-October
Number of crops per season	1-3 crops	1 crop

Source: MAFI Official Statistics, 2012

2.6.4 Distribution of tomato production.

Tomatoes produced in Moldova can reach the consumer by different channels which depend of different factors. In research presented by USAID, (2012) basically processed tomato products are exported but fresh tomatoes are mostly sold on local market. (See Annex 2) Distribution on domestic and export markets are organized in the same way that is why export channel is presented as one due to a small size. Main export countries are: Russia, Belarus and Romania. Now we will try to make a detailed analyze of market channels in order to understand the real and detailed situation of distribution of Moldavian tomatoes. So, as USAID, (2012) stated in the report about tomato chain study we can classify market channels as follow:

First channel is open air retail market which actually is dominating the distribution of fresh tomatoes from point of view of volume. Almost 80% of total production of Moldavian tomatoes is sold through this channel. Even though this percentage seems to be very high and a big amount of tomatoes are sold through this channel, anyway this percentage is decreasing every year due to the increasing of consumers shopping from supermarkets. Annually this trend is increasing by 3-5%, and consumers prefer more and more modern supermarkets. At the local markets in the villages, farmers sell their production directly but in district or city markets especially in Chisinau products are supplied by traders who buy products from the farmers and sell them for a higher price. Unfortunately farmers have a limited access to open air market first of all because transport cost a lot and they spend a lot of time and money for that. So, from this point of view for farmers it is easier to sell it on the local market.

Second channel is supermarket channel. Main supermarket chains in the Republic of Moldova are Furchette, Green Hills, Nr.1, Fidesco, Metro, Linella and Cvin. Usually in Moldavian supermarket fruits and vegetables occupy just around 5% of space. Nowadays around 15-25% of citizens buy their groceries in supermarkets which sell both local and imported tomatoes or tomato processed products. Supermarkets are counted to be the main channel for processed tomato products and finally in supermarket could be found around 70% of imported tomatoes against only 30% of local production. Biz Gates, (2010) stated that this channel has higher requirements for quality and this is the reason why the price is higher and supermarkets bet for imported tomatoes which has a longer life period.

The third channel is small grocery stores which sell smaller quantities and offer a good price which is 10% higher than in open retail market. These kinds of shops are popular for consumers who want to purchase a mix of different food in appropriate location, and production which is fresh and has a good price. Totally there are around 1000 such shops in Moldova and

according to some calculations around 18-35% of households are purchasing fruits and vegetables in these stores due to their convenient location.

Fourth channel of tomato distribution is export market. Just a small percentage (about 1) of fresh tomatoes is exported abroad. Anyway 90% of tomato processed products are exported and just 10% of these products are sold on Moldavian market. Traders are exporting the products abroad using transportation services and special companies that offer custom services. Then after passing sanitary and phytosanitary requirements they are allowed to sell their products on wholesale markets in Romania, Russia or Belarus.

2.6.5 Value chain limitations

This chapter is meant to show the main limitations, constraints and ability of Moldavian tomatoes to fulfill the requirements in order to be competitive at international market. As Moldova's Ministry of Agriculture and Food Industry, (2012) presented in the research, these limitations are:

1. Limitations regarding market requirements for quality:
 - Short shelf life of products as result of lack of using some chemicals and such procedures like: pre-cooling and refrigeration, also transporting different or wrong varieties of tomatoes to long destinations.
 - Bad look of production as result of lack of calibration which is done manually. Different size tomatoes are mixed.
 - Visible small defects of production.
 - Poor accordance with sanitary and phytosanitary requirements as result of unbalanced usage of fertilizers and stimulators.
 - Supplying of insufficient volume of production.
 - Limited investment in new technologies like cooling equipments and cold storage or improving of greenhouses which in result would increase the production.
 - Inability of harvesting for a long period of time and need of planting new varieties that will make harvesting season longer.
 - Short term planning which limits small and medium scale farmers with their access to higher value markets.
 - High production costs which results in environmental constraints.
2. Limitations regarding environmental and health requirements according to USAID, (2012):
 - Limitation of using crop rotation.

- Farmers are not following the instruction about safe using of pesticides or other chemicals.
- Limited knowledge of farmers about effective crop production.

2.7 Czech Moldavian cooperation.

Following the idea presented by CzDA, (2012) Republic of Moldova is one of the priority countries receiving aid from the Czech Republic. Cooperation between Czech Republic and Republic of Moldova is basically focused on environment, educational, social and agricultural sector. A significant shift in Czech Moldavian cooperation was in 2012 especially in social sector. Czech Republic and some other partners take part in project called “Support to the South Regional Development Agency and Regional Development Council with the Updating of Regional Development Strategy”, and in result Moldavian partners joint to that projects which consist in supporting regional development in Moldova. In the sector of agriculture the projects are mainly focused on supporting small and medium scale farmers and promoting ecological agriculture. In next chapter there will be a brief description of some agricultural project which were implemented in the Republic of Moldova.

„Development of ecological agriculture in Moldova”

The project is focused on the support of organic agriculture in Moldova through increasing the capacity of farmers, their partners and service providers. In result access of farmers to investments will be increased and demand for organic products in Moldova stimulated. Within the project there will be demonstrated the benefits of organic agriculture and in result awareness of the public and state officials will be raised. This will bring the idea of formulation of national action plan on the development of organic agriculture (CzDA, 2012).

“Support of organic agriculture in Moldova”

The project’s development aim is to strengthen competitive ability and efficiency of Moldovan small and medium scale farmers. The project aims are to promote organic farming sector in Moldova and integration into the European trade in organic products. It aims to support small and medium scale farmers in the transition to organic farming. Farmers involved in the project will be provided with trainings in order to enhance their professional skills, efficiency and competitiveness on domestic and European market for organic agricultural products. These trainings will cover not only the agriculture techniques according to the principles of organic farming, but also the creation of marketing strategies and business plans. The project foresees the establishments of demonstration farms as illustration of the principles of organic agriculture (CzDA, 2012).

“Increasing Competitive Strength and Efficiency of Moldovan Small and Medium-Scale Farmers through their Orientation to High Value Crops Growing at Selected Target Groups in Districts of Cahul, Anenii noi, Ungheni.”

The project professionally promotes vegetable and fruit growing at six selected farmers groups (two farmer groups in each district), which are the project direct target groups. The cooperating vegetable and fruit growers are trained in progressive growing technologies - strategic plans of commercial growing are set up for them. They are supported with deliveries of horticulture mini-machinery, greenhouses, irrigation equipment and other agricultural inputs.

Adaptation of the Marketing Information System (MIS) and its modification to cope with needs of vegetable and fruit growers has also been envisaged. The conferences are also held to attract the final target groups (small- and medium scale farmers, traders, and administrations in Moldovan Republic) to the project (CzDA, 2012).

3. Objectives

3.1. Main Objective

The main objective of this thesis was to conduct an overall tomato sector assessment in Anenii Noi district of the Republic of Moldova and to identify the possibilities how to improve the situation, figure out the basic problems which farmers are faced with and of course to find the solutions how to solve the situation. Secondly try to show the advantages of the tomato crop which could be extended in this region due to the geographical position and other specified advantages. Also try to find the ways how to extend the tomato production abroad as well as to find solutions how to compete with tomatoes from abroad on local market.

3.2. Specific Objectives

Specific objectives were defined as:

- (i) Identification of main actors operating within both public and private sector.
- (ii) Identification and explanation of all issues, constraints and impediments faced at harvest, quality, price, payment system, transportation, sale points, stocking and processing technologies.
- (iii) Estimation of tomato consumption, production and trade quantities.
- (iv) Identification and description of trade policies relevant to tomatoes export and import, including of quality and food security standards.

4. Methodology

4.1 Studied area

Research for this thesis took place in Anenii-Noi district see (Figure 4) which is situated in central eastern part of Republic of Moldova. It is one of those 37 districts that constitute Moldova and it consists of 45 villages with the largest city with same name called Anenii-Noi. According to the 2004 census, population of Anenii-Noi district was 81710 people and dividing that population into rural and urban we can say that 8358 people live in urban area and 73352 people live in rural area.

In research presented by Matcu and Sochirca (2002) of the total Anenii-Noi district area, agricultural land occupies 66.12% (58666 ha), built land 8.79% (7797 ha), land with spontaneous vegetation 22.81% (9537 ha forest/parks/trees), the land covered by water 1.97% (1748 ha) and 0.31% (276 ha) of overburden land.

Figure 4- Location of Anenii-Noi district, where research took place



Source: USAID, 2012

4.1.1 Puhaceni village

According to Matcu and Sochirca, (2002) Puhăceni is a village and commune in the district of Anenii-Noi. The village covers an area of approximately 2.37 square kilometers, with a perimeter of 5.88 km. Puhăceni commune has a total area of 35.37 square kilometers. The village is located along the Dniester River (see Figure 5) and is divided into four smaller areas: The Garage, The Hill, The Marsh and The Dniester. Local governing body is Puhăceni village hall.

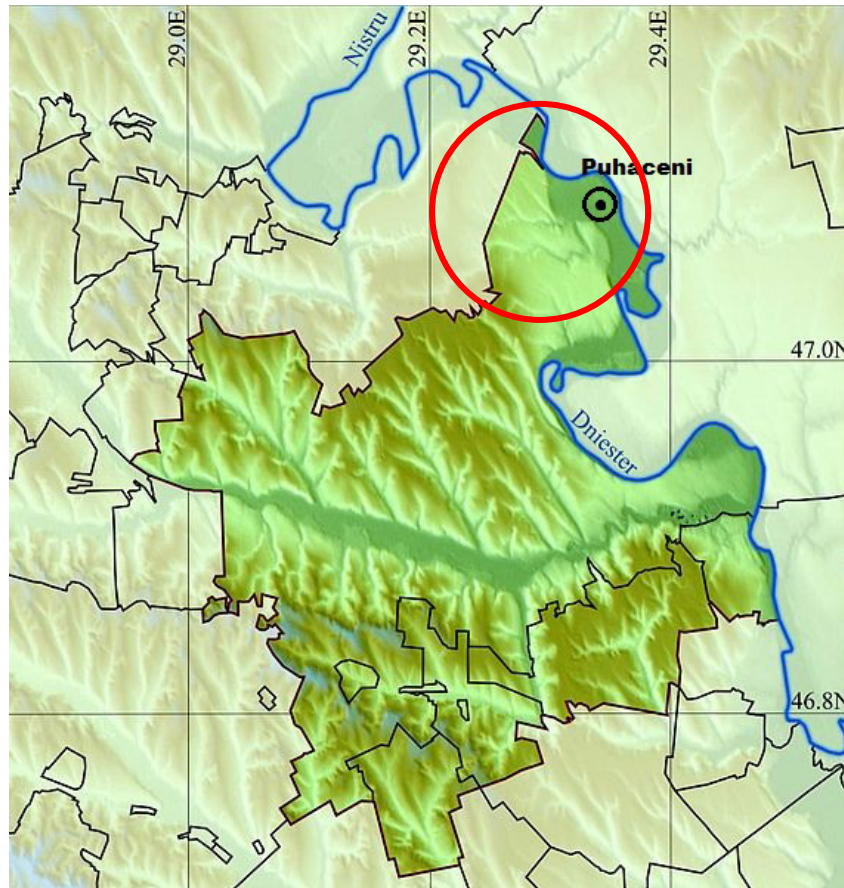
In 1997, the village population was estimated at 4105 Puhăceni citizens. According to the 2004 census, the village population is 3775 people, and the current number is 3881 of inhabitants, 49.25% are male and 50.75% female. Ethnic composition of the population in the village is as follows: 98.78% - Moldovan / Romanian, 0.37% - Ukrainians, 0.61% - Russians, 0.03% - Turks, 0.05% - Bulgarians, 0.05% - Poles, 0.11% - other nationalities. According to 2004 census, there were 1189 village households. Average household size was 3.2 persons. Households were distributed according to the number of people who form them, as follows: 17.41% - 1 person, 18.67% - 2 persons 19.85% - 3 persons, 26.83% - 4 persons, 10.68% - 5 persons, 6.56 % - 6 and more persons. In 2012 in the village are 1391 households.

As the same authors Matcu and Sochirca, (2002) stated, Puhăceni village is located in a ravine surrounded by rolls of hills and bordered by the river Dniester. Is located in the south-east of the capital in which it shows a hilly terrain with alluvial soils, lands rich in chernozems, sands, clays and stone. Groundwater reserves serve the village with drinking water supply and water from the river enables the agricultural works territories suffering from drought during the summers. Climate is temperate in Puhăceni village. Winters are mild and short, rarely frost but if frosts appear it are causing great harm in agriculture. Summer is warm and is sometimes accompanied by heat and drought. Rainfall amount is reduced, it is not balanced: mostly of 71% falls in summer. Winter precipitations fall as rain and as snow.

Village economy is based on businesses, agricultural and industrial export of goods, import of raw material, links to nearby villages, internal and external trade conducted between citizens (Matcu and Sochirca, 2002). The village is developing private property in the branches: viticulture, fruit growing, beekeeping and livestock - cattle, pigs, sheep, etc. In the last 15 years the population grows vegetables in greenhouses; tomatoes grown are sold to markets in the country and sold to middlemen agents, export them in Belarus. Village economy is based on agriculture which constitutes the main occupation. Puhăceni citizens have many skills and

hobbies. They have a neat household, cooks well, fix various electric motors and pumps for irrigation, but hopes to start a business.

Figure 5 - Location of Puhaceni village in Anenii-Noi district.



Source: National Bureau of Statistics, 2012

4.1.2 Delacau village

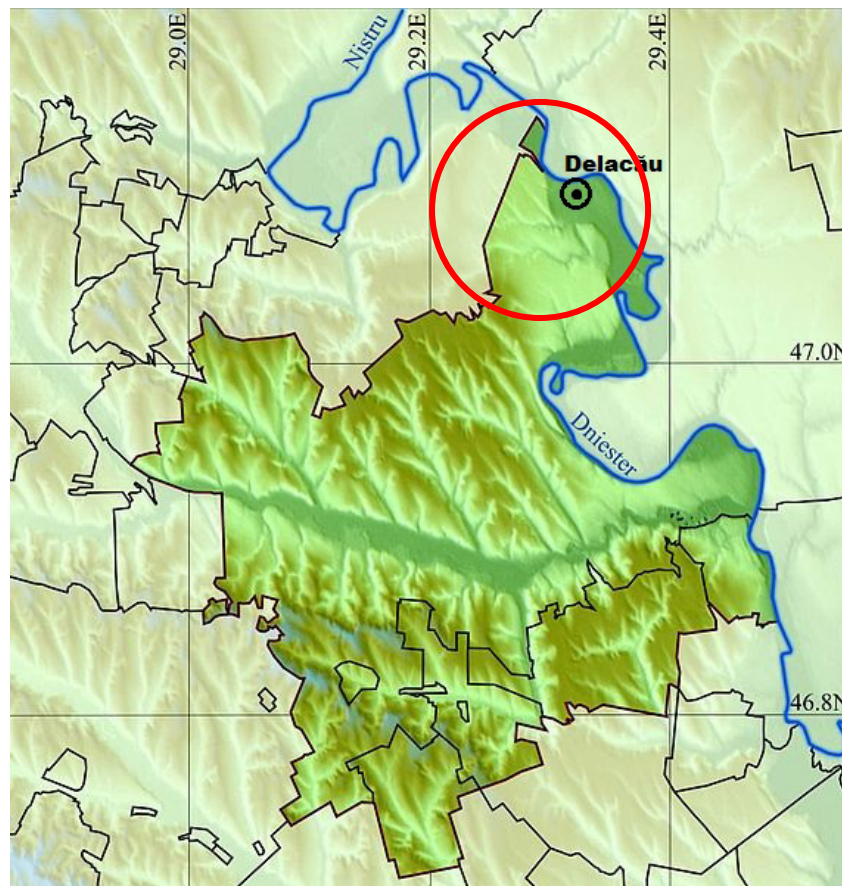
Following the idea of the same authors Matcu and Sochirca (2002), Delacau is a village and commune in the district of Anenii-Noi. The village covers an area of approximately 1.60 square kilometers, with the perimeter of 7.75 km. Delacau is the only village in the municipality with the same name (see Figure 6). The village lies at a distance of 38 km from Anenii-Noi city and 45 km from Chisinau. Delacau village was mentioned in documents in 1455.

According to the 2004 census, village population was 2240 people, of which 49.38% - men and 50.63% - women. Ethnic composition of the population in the village is: 98.53% - Moldavians 0.27% - Ukrainians, 0.80% - Russians, 0.04% - Turks, 0.09% - Bulgarians and 0.27% - other nationalities. In the Delacau village during the census done in 2004 were

registered 709 households, while average household size was 3.2 persons. In 2012 there are 824 households.

Both Delacau and Puhaceni villages have the same characteristics from point of view of geography and agricultural activities. These villages are situated really close to each other and are almost merged. So, taking into consideration this fact we can say that description about agriculture in Puhaceni is available for Delacau as well.

Figure 6 - Location of Delacau village in Anenii-Noi district.



Source: National Bureau of Statistics, 2012

4.1.3 Serpeni village

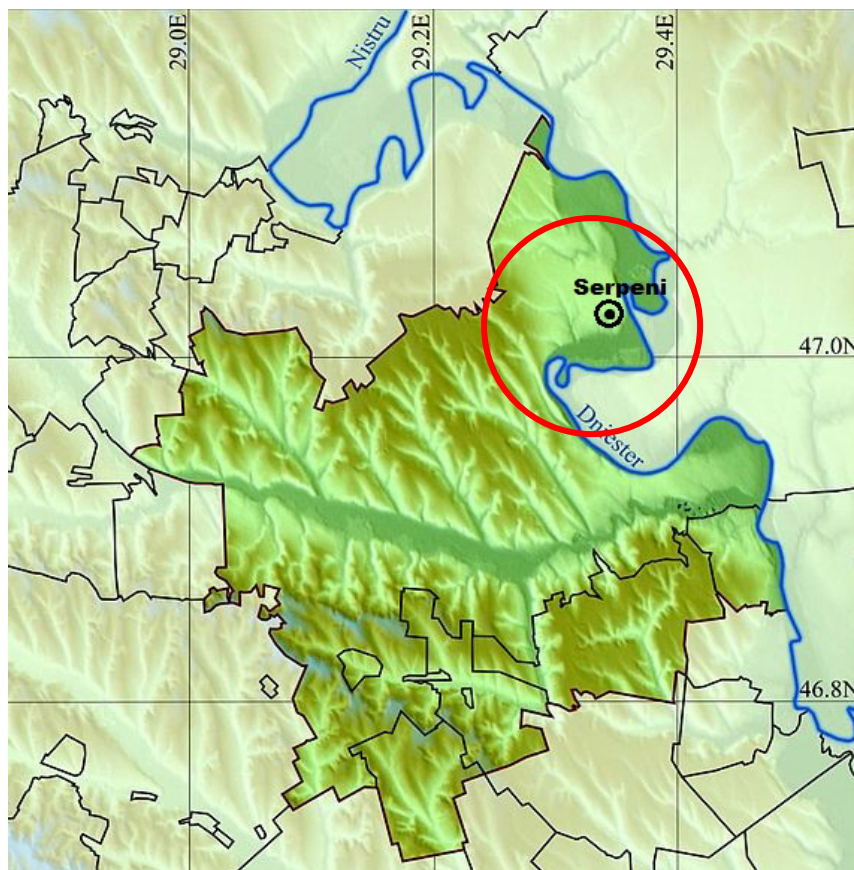
The same authors Matcu and Sochirca (2002) stated, Serpeni is a village and commune in the Anenii-Noi district see Figure 7. The village covers an area of approximately 2.37 square kilometers, with a perimeter of 8.41 km. Serpeni commune has a total area of 43.86 square kilometers. Serpeni is the only village in the municipality of the same name.

According to the 2004 census, the village population was the 3585 people, of which 49.99% men and 50.01% women. Ethnic composition of the population in the village is as

follows: 99.02% - Moldavians 0.39% - Ukrainians, 0.28% - Russians, 0.22% - Turks, 0.06% - Bulgarians, 0.03% - other nationalities. According to 2004 census, there were 1040 village households. Average household size was 3.5 persons. In 2012 there are 1213 households.

From historical point of view Serpeni has a very tragic history due to the battles that took place in this region during the Second World War. Serpeni village is located 50 km from Chisinau, on the picturesque bank of the Dniester. In 1985, near the village Serpeni was discovered and opened tomb in which were buried in mass Soviet soldiers who fell on the battlefield from Serpeni. (Matcu and Sochirca, 2002) In October 1985 the decision was taken about building a Military Glory Memorial, in which were reburied with military honors soldiers who died in this battlefield.

Figure 7 - Location of Serpeni village in Anenii-Noi district.



Source: National Bureau of Statistics, 2012

4.2 Timeframe

For collection of data and for preparation of results there were allocated three month during the summertime 2012. In May before going to the Republic of Moldova there were prepared the questionnaires in order to collect information as real as possible. Period of collecting information started at the beginning of summer at 18 of June and finished at 20 of September. During that period there were done some investigations in each of these three villages. For each village there were spent 3 days in order to have enough time to discuss all the problems together with farmers, to fill the questionnaires and analyze the situation on the field. Information collected during the summer was analyzed in September and the first preliminary results appeared in September but final results regarding the investigations were ready in October.

4.3 Research design

According to the plan elaborated by author, the main aspects of farmer's activity which have to be analyzed are: First of all, the basic information is about the farmers, their nationality, their studies and area of land where they grow tomatoes. Second information about the production of tomatoes either from open field or from greenhouses, their quantity and quality as well as market orientation. Finally and at the same time the most important part of this research is to understand the main problems farmers are faced with, and write down the main solutions that farmers are trying to implement. Regarding the analyze of the region the author tried to see the advantages of geographical position of Anenii-Noi district and to see the possibilities of improving the techniques of growing tomatoes in terms of using orientation on local and international market.

4.4 Sample size

In this part called sample size we are supposed to see the structure of respondents, their cooperation, time availability, conditions of doing the research and climate conditions during that time. The total number of respondents was 190 farmers and we can say that the author tried to divide total number of respondents between these three villages, but anyway the bigger part of them was from Puhaceni due to the location of that village and easier way of getting information.

Then, also a significant number of respondents were interviewed in other two Delacau and Serpeni villages. In a briefly description regarding the parameters mentioned above, we can say that gender distribution is unequal, 69% of farmers in this villages are men and just 31 are women. The other very important fact is that 60% of interviewed farmers have higher education and mostly agricultural studies. Basically the farmers were very friendly and tried to describe the situation to be as real as possible. The questionnaires consist of 24 questions, and during the answering farmers did not meet any problems. Also the times was very favorable for traveling through the villages and cooperate with farmers, as well as to see the situation on the field. Only few days were rainy and it was not an obstacle.

4.5 Data and data sources

During the elaboration of this thesis, two types of data collection were used. Thesis is mainly focused on analysis of collected data from small and medium-scale farmers. Questioners were elaborated for identification and description of trade policies relevant to tomatoes export and import, including food security standards. Questioned farmers were selected according to their activities and their production orientation in terms of growing crops and their market orientation. Secondary, thesis is based on scientific articles, statistical information and other databases which were carefully analyzed in order to have a clear view of studied problem. Main issues for data collection were identification of main actors operating with both public and private sectors including producing organizations, cooperatives, processing entities. Also identification and explanation of all issues, constraints and impediments faced at harvest, quality, price payment system, transportation, sale points, stocking and processing technologies.

4.6 Data collection methods

For collecting as much information as possible there were used several methods of data collection. Like primary data collection methods were selected and used interviews together with group discussions, direct observations for a better understanding from technical point of view, and finally questionnaires in order to get some numeric information which was carefully analyzed. During the data collection there were not any language or communication barriers because the author fluently speaks both Russian and Romanian languages and was able to understand and discuss everything needed to be analyzed.

4.7 Pilot testing

Questionnaires were designed and discussed with local consultants Mr. Eugeniu Revenco in order to find the main strengths, weaknesses and opportunities of discussed problems and main things we have to focus on before starting the data collection.

4.8 Structured questionnaires

For collection of primary data we used structured questionnaires which were easy to implement and get as much detailed information as needed in order to understand the situation of tomato crop in Anenii-Noi district and farmer's market orientation. According to Foddy, (1994) method of questioning is one of the most effective for gathering information. Before designing the questionnaires structure, there were studied some literature sources and for example the recommendations of Gillham, (2008) were taken like a prime example.

There was created one type of questionnaire and it has 25 questions which were supposed to reflect the situation from point of view of analyzed problem. Some of the questions were closed and some were opened, so it was not a problem for respondents to answer them. According to the questions topics they can be divided in three parts: first part is showing the main information about the farmers (their studies, age, nationality and occupation). Second part is showing the information about farmer's activities and especially situation in tomato sector. Finally the third part is mostly focused on market orientation in tomato sector and the problems in that area, especially tomato export abroad. Questionnaires were designed in Romanian language due to predomination of Romanian speakers in this region. Also for any occasions we had few examples in Russian language. During the process of gathering information we realized that farmers have a strong willingness for cooperation.

4.9 Data analysis

All the data gathered from farmers was carefully analyzed and latter there were done graphs and tables which show us the results of our analysis. Basically there was used Microsoft Office Excel for a better hierarchy of data and possibility of construction of needed tables and graphs. Secondly for the construction of the econometric model there was used statistical application called Gretl and of course Microsoft applications. In the model we tried to figure out the dependence between consumption of tomatoes in the Republic of Moldova and some other

factors like price of tomatoes, population and inflation rate. The reason of construction of econometric model was to understand the reason of such a high level of import of tomatoes from abroad and to see which factor affect consumption the most.

5. Results and Discussion

5.1 Descriptive part

In this chapter there will be described the information that author collected during the summer and graphic representation of the results. There were completed 190 questionnaires and the results can be analyzed as follows.

Gender of the respondents

Due to the fact that mostly households consist of family members and a Moldavian specific of family farms, we can find out that these farms are run by men. During the discussions with the farmers, we can say that basically men had more specific information to say and can give more helpful advices. So in the figure nr 8 there is a graphic representation of gender distribution of respondents.

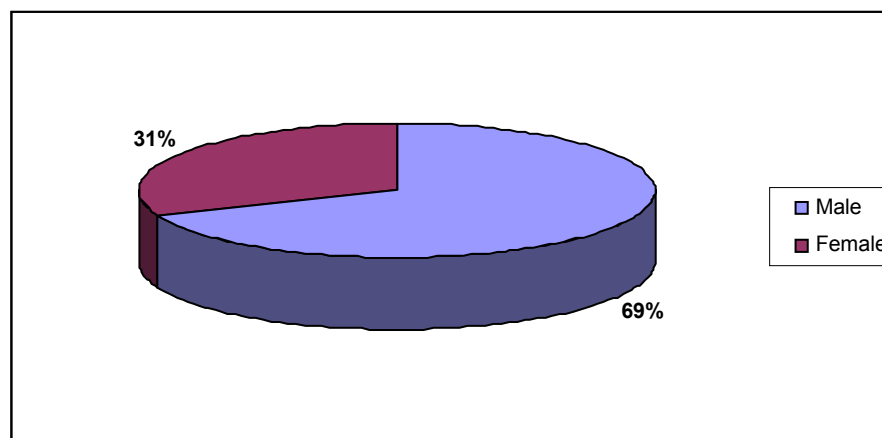


Figure 8- Respondents' gender distribution

According to National Bureau of Statistics, (2012) in the Republic of Moldova agricultural activities are practiced by the entire families but anyway the main responsibility is taken by men which rule the agricultural activity in households. So, comparing the results we got and the results presented by Statistical bureau where men are running 76% of agricultural activities, we can say that respondent's distribution in our case is representative.

Respondents' age distribution

All respondents were divided into four age categories as follows: First category is respondents between 50 and 60 years and is consisting 21% of total respondents. Second

category is respondents between 40 and 50 years with total distribution of 41%. Third one is 30-40 years with 22% and the last one is 20-30 years with 16 % distribution. Average age of the respondents was 41.7 years. Graphically the results can be shown in the figure nr 9

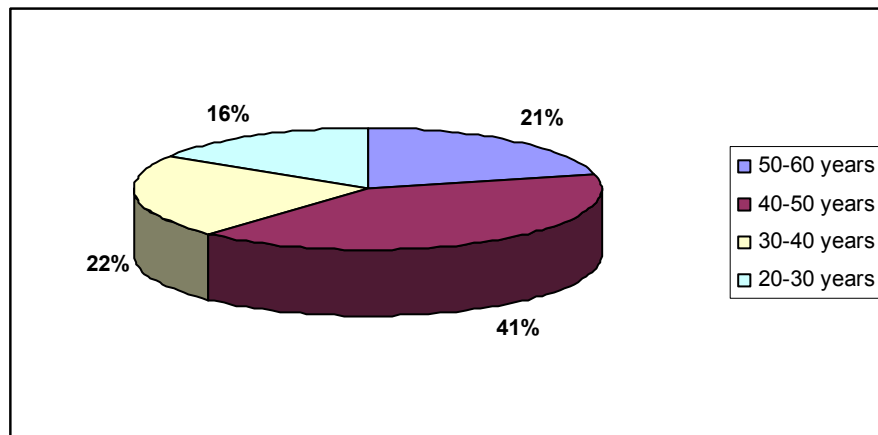


Figure 9- Respondents' age distribution

In the statistical research presented by Cara et al., (2012) could be highlighted the fact that average age of Moldavian farmers is 46 years. Step by step we will try to understand the main reasons why in Anenii-Noi district we got a different age structure. First of all the main reason is a beneficial agricultural position and in result citizens of these three villages start their farming activities earlier than in other regions. Secondly the soil fertility has a high quality and it is possible to grow different cultures especially high valuable crops. That is the reason why population of this region do not chose to emigrate abroad but try to work in their own villages getting good profit comparing to the profit of other farmers in Moldova. Finally we can say that especially young farmers try to implement some new technologies and in result age of farmers is younger than average per republic.

Location of respondents

From these three villages the respondents are distributed in the following way: in Puhaceni village there were 78 respondents, in Delacau village 64 and in Serpeni 48 respondents. Total number was 190 and also we could present the results graphically, see Figure 10.

Taking into consideration the fact that according to 2004 Census results, we can say that total population of these three villages is 9930 citizens. Trying to divide the total population proportionally in three parts we got the next results: Puhaceni village has 41% of total population, Serpeni has 36% and Delacau 22%. So we tried to separate the respondents according to that proportion.

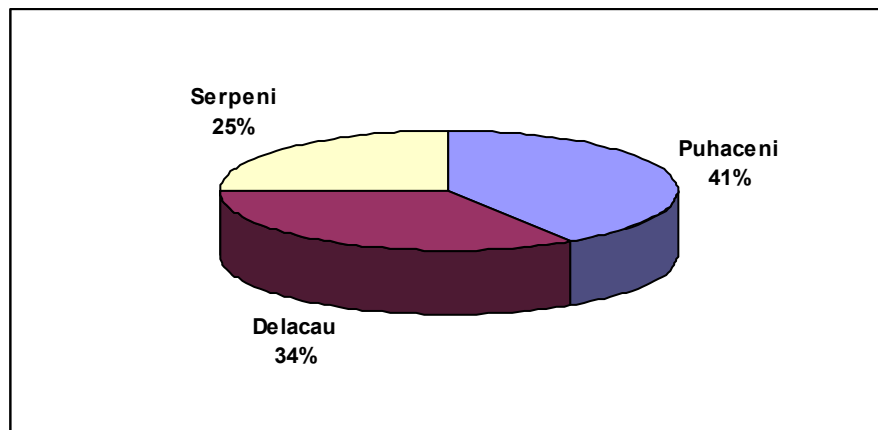


Figure 10- Respondents' distribution by village

Respondents' nationality and education

All these three villages are basically populated by Moldavians. So, of those 190 respondents 178 were Moldavians which represent 93.7% of total respondents' number. From point of view of education we can find out that a huge number of respondents have higher education. Graphically the respondents' education can be presented in Figure 11.

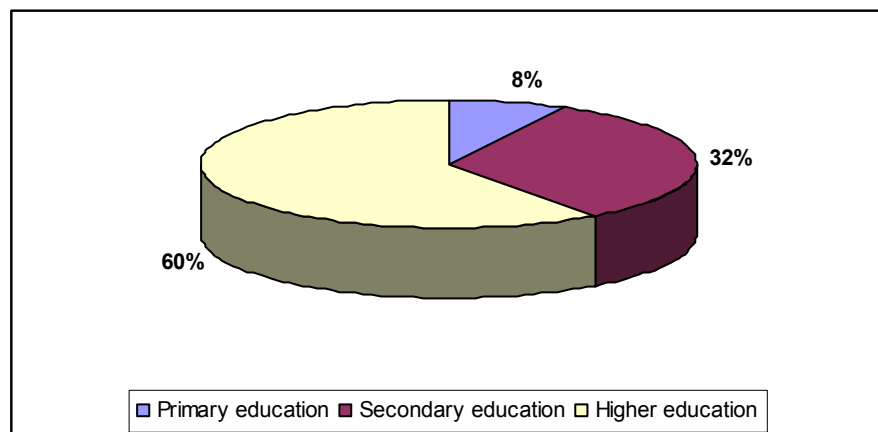


Figure 11- Respondents' education

It means that from theoretical as well as from practical point of view the farmers are good prepared and have enough knowledge and skills to rule their farming activities. Also during the interview they confirmed that they use these knowledge's and always try to improve their activity through orientation on some new technologies. In result we can realize that education play a big role in farming activity as well as experience. National Bureau of Statistics, (2012) stated that 58% of Moldavian farmers have a higher education, so we can say it is a very benefited fact and the most important thing is that the result we got is much closed to the result presented by National Bureau of Statistics.

Farmers' activity and tomato production

Basically Moldavian farmers are activating in private sector and a big number of farmers have their own pieces of land where they grow different kind of cultures. Interviewing 190 farmers we realized that tomato production is very popular in this region and tomatoes are grown in open fields and in greenhouses too. Generalizing farmers' answers regarding the growing area, we can find out that tomatoes are grown in open field on an average territory of one hectare, but if we talk about tomatoes from greenhouses, this scale is smaller and in average total territory is 0.02 hectares. In the report presented by Cara et al., (2012) we can compare the results and say that in average farmers are growing tomatoes on the territory of 0.8 hectares in open field and 0.008 maximum 0.01 hectares of tomatoes in greenhouses. So, the average production per republic is less than production in Anenii-Noi district. This point's out the advantage of studied district, especially, its geographical position and excellent soil fertility.

Regarding the question about market orientation, farmers' opinions were different from person to person. Around 163 respondents from those 190 said that production of their tomatoes is used for family consumption and for sale as well. But at the same time 27 farmers affirmed that tomatoes grown in their households are used just for their own consumption. Obviously every farmer consumes its own production but anyway the biggest part of production is sold on the market. So if to generalize the information mentioned before, we can represent the results graphically in Figure 12.

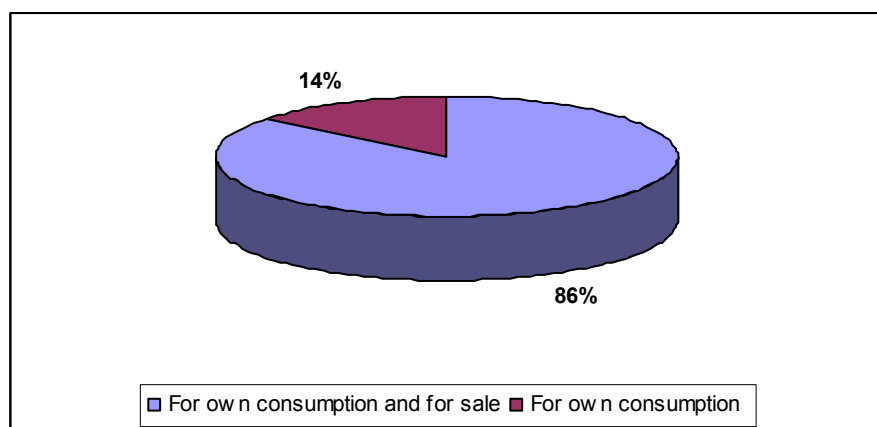


Figure 12- Open field tomatoes market orientation in Aneni-Noi district

In result we can realize that in Aneni-Noi district from point of view of market orientation, farming system can be classified as Subsistence and Market oriented Farming System. This fact results from high percentage of products which are sold and this percentage is shown in the figure above. At the same time if we talk about tomatoes grown in the greenhouses, then we can say that definitely these tomatoes are more market oriented due to the higher selling prices and more industrialized agricultural technologies used.

Market orientation of greenhouse tomatoes are shown in the Figure 13 which is represented bellow.

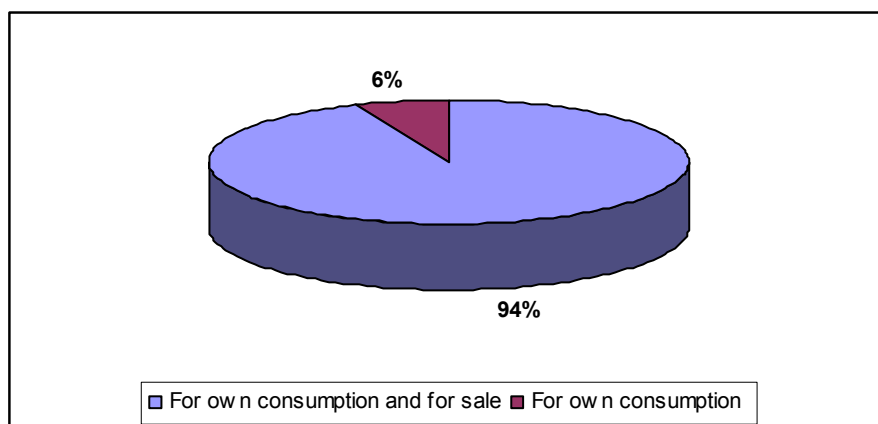


Figure 13- Greenhouse tomatoes market orientation in Aneni-Noi district

Of course market orientation of tomatoes from greenhouses is higher but at the same time quantity of production is much lower. Anyway this type of activity brings a lot of benefits and the biggest advantage is that farmers have a possibility to enter the market earlier and sell the products with higher price. Especially in this district farmers try to focus more on the production of tomatoes in greenhouses because their advantage is a good geographical position which brings them possibility to sell their products in Chisinau. Distance from Aneni-Noi district to the capital city Chisinau is just fifty kilometers, and it is a big advantage to sell the tomatoes there before Turkish tomatoes will appear on the market.

In the research presented by National Bureau of Statistics, (2012) regarding market orientation of Moldavian tomatoes there is a gap between the results we got and the results presented by scientists. First of all market orientation in Aneni-Noi district is very high and is twice higher than in other regions. As we said before, this fact appears because of high and intensive production of tomatoes and possibility of using irrigation system with water from Dniester River. So, in result the production is higher and the biggest part is supposed to be sold.

In order to go ahead and to analyze the efficiency of tomato sector, of course there is a necessity to see the volume of production. After interviewing big number of farmers and analyzing the questionnaires, we can find out that in average the volume of production of tomatoes from open field is 39 tones of tomatoes per year, but the volume of tomatoes from greenhouses is around 8 tones.

Regarding the quantity of production in average per republic, analyzing the ideas of Cara et al., (2012) we can say that production of tomatoes from open field is 18 tones and tomatoes

from greenhouses is around 3 tones. This difference appears due to the facts related to production factors explained above.

Like a conclusion regarding the tomato production we can highlight the fact that farmers are trying to intensify the production which is already big, to increase the productivity and at least to get the stability in production. In result farmers got an intensive farming system. They try to use the land as effective as possible with getting high inputs from their activity. Unfortunately some problems still exist and these problems will be analyzed ahead. The main problems were written in the questionnaires and farmers were supposed to choose few of them which in their opinion are the biggest barriers in tomato production (See Table 4).

Table 4. Main problems, farmers are faced with during the process of growing tomatoes.

Main problems of the farmers within growing process	Percentage of questioned farmers (confirmed)
Expensive or low-quality planting material	79%
Transportation of finished products from the field to the market	83%
Lack of wholesale markets	87%
Expensive place at the market	59%

Source: Authors data, 2012

Situation of Moldavian tomatoes on local market

During the conversation with farmers there was analyzed the situation and highlighted the main problems regarding the tomato local and international market. So, Moldavian tomatoes especially tomatoes grown in Anenii-Noi district are sold both on local and international market, but there is a big difference in the quantity sold local and quantity of tomatoes which are exported. The results are presented in the Figure 14.

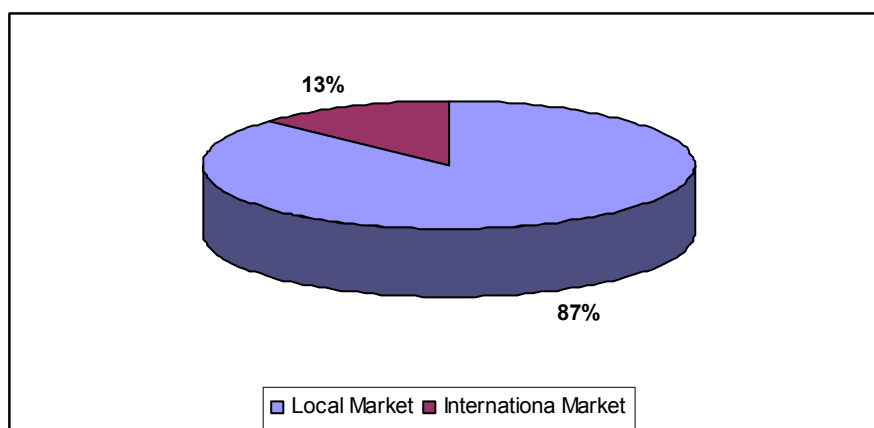


Figure 14-Anenii-Noi district tomatoes sold on local and international market

First of all we should analyze the situation on local market. Taking into consideration the fact we mentioned before about a good geographical situation of Anenii-Noi district we can see the main target areas where the tomatoes from Puhaceni, Delacau and Serpeni are sold. So, after studying the questionnaires and discussions with tomato producers we can represent the results graphically in the following way (see Figure15).

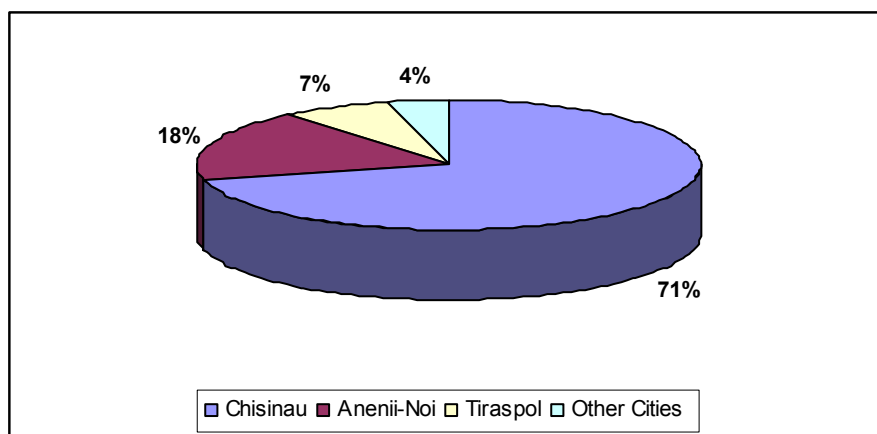


Figure 15-Main local markets for tomatoes from Anenii-Noi district.

In the report presented by USAID, (2012) there is highlighted the fact that the export of tomatoes is very different. So, if we are speaking about the export of fresh tomatoes we can say that just 2% are exported but other way around with processed tomatoes which are exported in proportion of 90%. Our results can not be compared with the results presented above because we do not take into consideration export of processed tomatoes. Anyway the results we got are high and 13% of exported tomatoes are a very high indicator.

In addition, from the facts mentioned by respondents we can find out the following additional conclusion about tomato production and tomato supply on local market. Total production of Moldavian tomatoes which are sold on local Moldavian market in average is 41 tones per one producer. From point of view of delivering time of tomato on local market, farmers affirmed that usually selling period is since June until November. Also a very important fact is the most suitable type of tomatoes which is grown in this district. So, farmers confirmed that the best types are: Kristal, Neptun and Tolstoy. Obviously there exist some problems the farmers meet during their activity of selling tomatoes on local Moldavian market. So these problems are analyzed in Table 5.

Table 5. Main problems of farmers while selling tomatoes on local Moldavian market.

Main problems of the farmers while selling tomatoes on local market	Percentage of questioned farmers (confirmed)
Lack of wholesale markets	87%
Expensive places at the markets	59%
Bad market infrastructure	36%
Huge competition	43%

Source: Authors data, 2012

Respondents were supposed to choose few opportunities just to show the biggest problems that exist on local market. Of course the biggest problem is the lack of wholesale markets and the markets which exist already are not enough for all the producers and in result on these markets appear a huge competition due to limited places. All markets that exist are supposed to be bigger with a good infrastructure and a lot of selling places for producers. In result producers will be able to sell their production on market and supply a bigger number of consumers with local production.

Situation of Moldavian tomatoes on international market

Export of Moldavian tomatoes show a good perspective of development of this sector especially it came to solve the problem with supply of this crop. Anyway there exist some problems which are supposed to be analyzed in order to find some solutions to improve this sector.

First of all in this research there is a possibility to figure out the percentage of Moldavian tomatoes which are exported abroad. So, from those 190 respondents only 25 affirmed that their tomatoes are exported abroad but other 165 affirmed that there is not so easy to export this product due to some problems. The results about the export are presented in the Figure 14 but in Figure 16 there are presented main countries where Moldavian tomatoes are exported to. Regarding the question about the export destination there were offered four opportunities, such countries like: Russia, Ukraine, Belarus and Romania. The fifth opportunity was other country which was supposed to be specified. In Figure 16 we can see the proportion of main destinations of Moldavian exported tomatoes in international markets.

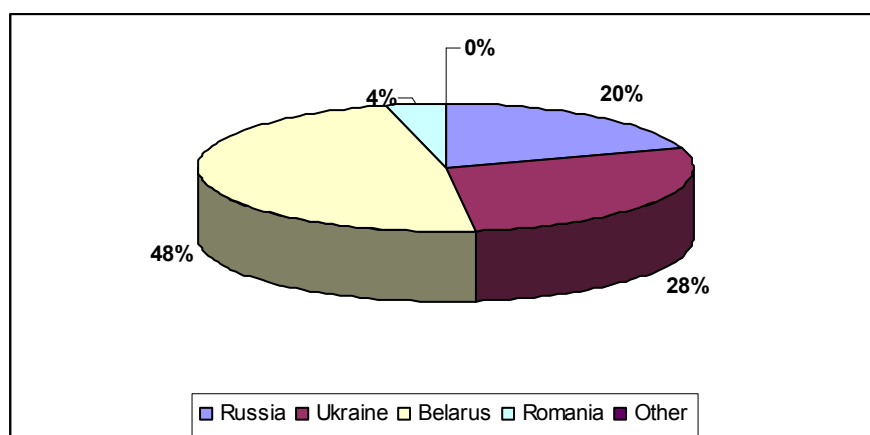


Figure 16-Main international markets for tomatoes from Anenii-Noi district

At the same time, according to research presented by USAID, (2012) we can find some differences between the results we got and results presented by USAID. So, first of all of course the biggest part is exported to Belarus but in our case it is 48% comparing to 42% per republic. Secondly in our case we have Ukraine with 28% on the second place but per republic the second place is taken by Russia with 27%. In our case Russia is on the third place with 20% but per republic on the third place is Romania with 31% of total export. This difference appear because of really close situation of Anenii-Noi district to Ukraine, Russia and Belarus. So, that is the reason why the export is so limited to Romania and other countries.

Regarding the volume of production we can say that farmers affirmed that in average the quantity varies between fifty to eighty percent of their total production. So it means that as rule tomato producer's export in average around twenty tons of tomatoes per year. It is not such a huge quantity and we can realize that there are still some limitations from point of view of importer and the requirements have to be fulfilled by Moldavian producer. In order to have access on international market Moldavian tomatoes must fulfill the requirements in terms of quality, packaging and delivering time. Following the opinion of interviewed farmers we can represent the results in Table 6.

Table 6. Main requirements for Moldavian tomatoes on international market.

Main requirements for Moldavian tomatoes on international market	Percentage of questioned farmers (confirmed)
Quality inspection	93%
Packaging in boxes	78%
Without packing (for processed tomatoes)	31%
Other (time and type of delivering)	16%

Source: Authors data, 2012

The same as tomatoes which are sold on local market, tomatoes for international market are exported during the period of time since June until November and also the most suitable types for export are Kristal, Neptune and Tolstoy. So, in conclusion we can say that total production of tomatoes in Anenii-Noi district is not divided into local or export oriented, because there are no differences in terms of type and quality. These were just the limitations in terms of requirements and of course there exist some problems regarding the export which have to be solved. As tomato producers argued, beside quality requirements they meet some more problems which are presented in Table 7.

Table 7. Common problems with the export of tomatoes to foreign countries.

Common problems for export of Moldavian tomatoes on international market	Percentage of questioned farmers (confirmed)
Volatile demand from importers	34%
Competition with other countries (Turkey, Romania etc.)	71%
Competition with local producers	31%
Other (high cost for transportation)	17%

Source: Authors data, 2012

As we can see, the biggest problem is still the competition with other countries which also export their production abroad. In some cases export is good for tomato producers but usually due to some taxes Moldavian production becomes expensive abroad and it can not conquer with production from other countries.

In result we can present the situation of Moldavian tomatoes in a table called SWOT analysis which is presented bellow:

<i>Strengths</i>	<i>Weaknesses</i>
<ul style="list-style-type: none"> • The possibility to produce in all regions of Moldova • Existence of experienced growers following the districts traditions • The possibility of obtaining relatively high profits (high value crops) • Local demand is stable, high, and even increasing (including the off-season) • Relatively cheap labor • Varieties produced in Moldova are qualitative and accepted by the consumer • High demand from traditional export 	<ul style="list-style-type: none"> • Incomplete knowledge on modern cultivation technologies • Lack of farmer's markets and limiting access to existing markets of producers • Limited information on the market and it's usage • Fluctuations in price depending on the season • Lack of storage facilities especially cooling season, when there is overproduction • Lack of supply networks • Poor Infrastructure

markets (Russia, Belarus) • Production of organic tomatoes - exploring niche of organic products in the EU	• Lack of managerial skills of producers
<i>Opportunities</i>	<i>Threats</i>
<ul style="list-style-type: none"> • High demand both local and export • Ability of extensive labor employment • Obtaining large harvests by adopting modern and advanced technology • Access on new markets • Connecting small and large producers with local processors • Possibility of producing significant quantities of tomatoes processed in different ways 	<ul style="list-style-type: none"> • Serious competition from foreign exporters (especially Turkey) • Import prices below the cost of local production • The risk of natural disasters (especially droughts, which are increasingly recorded in Moldova) • Risk of over-production combined with the inability or lack of competitiveness of export.

Figure 17- SWOT analysis of tomato sector in Moldova

5.2 Analytical part

In this part there will be analyzed some aspects of Moldavian tomatoes and especially we will focus more on statistical data. In Econometric model there is described the dependence between consumption of tomatoes in Moldova and other factors like: population, inflation rate and tomato price. So, we can analyze it as follow:

(i) Introduction

In this project, we will analyze the Consumption of tomatoes in Moldova. Our model will examine the relationship between Consumption, Price, Population and Inflation.

Data was acquired from official of the Statistical Bureau of Moldova.

(ii) Economic model and econometric model

Assumption:

Price, Population and Inflation rate indicators directly relate to the Consumption of tomatoes in Moldova. When the population increases, consumption of tomatoes will increase. When price increases, consumption will decrease. Consumption of tomatoes will decrease when inflation rate will increase.

(iii) Data set

Table 8. Data set used for calculations of the model.

Year	Total consumption (thousand tones) CONS	Price per Kg (USD) PRI	Population (million citizens) POP	Inflation rate (%) INF
1998	94.5	0.8	3.654	6.9
1999	112.6	0.75	3.652	9.4
2000	108.7	0.81	3.646	7.3
2001	115.9	0.79	3.640	8.4
2002	119.7	0.74	3.631	9.6
2003	117.1	0.78	3.623	5.2
2004	121.5	0.65	3.613	11.6
2005	118.9	0.7	3.604	12.4
2006	117.1	0.73	3.595	11.8
2007	114.9	0.78	3.585	12.7
2008	120.4	0.61	3.577	12.3
2009	87.8	1.19	3.570	12.7
2010	105.9	0.81	3.566	6.9
2011	107.3	0.8	3.562	7.3
2012	96.7	1.04	3.560	7.6

Source: Moldova's Ministry of Agriculture and Food Industry, 2012

In order to do the calculations we need some basic data which we got from the ministry of agriculture presented in the table above. So price, population and inflation rate are the main factors which affect the consumption of tomatoes and they will help us to understand the situation.

Consumption function is influenced by Price, Inflation and Population

Consumption = f (Price, Inflation and Population)

(iv) Econometric model:

$$\text{CONSt} = \gamma_1 + \gamma_2 \text{PRI}_t + \gamma_3 \text{POP}_t + \gamma_4 \text{INF}_t + u_t$$

Declaration of variables

CONS – Consumption of tomatoes per year

γ_1 – Interception

PRI_t – Price of tomatoes

POP_t – Population

INF_t – Inflation rate

U_t – error term

Table 9. Correlation matrix

PRI	POP	INF	
1.0000	-0.3429	-0.1006	PRI
	1.0000	-0.2565	POP
		1.0000	INF

Source: Author's calculations, 2013

As table 9 shows, there is no multicollinearity since coefficients of correlation between pair of explanatory variables (X_{2t}, X_{3t}); (X_{2t}, X_{4t}); (X_{3t}, X_{4t}) are all <0.8.

(v) *Estimation of econometric regression*

Table 10: OLS, using observations 1998-2012 (T = 14)

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	175.924	185.772	0.9470	0.36398	
PRI	-61.3897	11.5607	-5.3102	0.00025	***
POP	-6.07468	49.9458	-0.1216	0.90539	
INF	0.591753	0.62799	0.9423	0.36628	
R-squared	0.761370	Adjusted R-squared		0.696290	
rho	0.270984	Durbin-Watson		0.894809	

Source: Authors calculations, 2012

Only variable price is statistically significant at 1% level with the coefficient γ_2 is estimated by -61.4. Therefore it indicates an average increase in price with 1USD leads to decrease in the consumption by 61.4 thousand tones.

(vi) *Testing the model - Durbin Watson test (testing autocorrelation)*

This test is used to see if there is autocorrelation. The assumption here is that the disturbance of (U_t) relating to any observation is not influenced by the disturbance related to

other observation. In this case it helps us to make sure that the T-test, F-test, R^2 are reliable then all of the competed values are efficient. As table 10 shows, $D= 0.894$ we have critical value for Durbin-Watson test (5% significant level).

T	K	Dl	Dh	4-Dh	4-Dl
14	4	0.7666	1.77882	2.22118	3.23334

According to this table $d= 0.894 \in (dl;dh)$: is not significantly possible to make the decision about statistical significance of autocorrelation, it is a grey zone. Since Durbin Watson test cannot help us to make decision then the Breusch-Godfrey test for first order autocorrelation is applied. So, there should be applied Breus-Godfrey test to check the autocorrelation.

Table 11: Breusch-Godfrey test for first-order autocorrelation

	<i>Coefficient</i>	<i>Std. error</i>	<i>t-ratio</i>	<i>p-value</i>
const	-30.0389	189.247	-0.1587	0.8770
PRI	4.07730	12.3786	0.3294	0.7487
POP	7.35907	50.7599	0.1450	0.8876
INF	0.0303576	0.631567	0.04807	0.9626
uhat_1	0.308450	0.324479	0.9506	0.3642

Unadjusted R-squared = 0.082875

Test statistic: LMF = 0.903642, with p-value = $P(F(1,10) > 0.903642) = 0.364$

Source: Authors calculations, 2013

Table 11 shows that P-value= 0.364 it means that null hypothesis of no autocorrelation is not rejected and there is no autocorrelation.

(vii) Testing the model - Goodness of fit (R^2)

Due to the insignificance of variables $X3t$ and $X4t$ (population and inflation) in the case of R^2 in known as coefficient of determination to measure the goodness of fit. It means that it gives the percentage of proportion of the total variation in consumption explained by price ($X2t$), population ($X3t$) and inflation ($X4t$) together. The R^2 values lies between 0 and 1, the closer R^2 is to 1 the better is the fit of estimation line. For this consumption function, as regression table.10 shows, the computed R^2 is 0.761370. Meaning that 76 percent of the variation in consumption can be explained by price.

(viii) Conclusion

The model is estimated by OLSM and in the model there is an assumption about the relationship between the endogenous and exogenous variable namely consumption of tomatoes, price, population and inflation rate. The model expresses statistically significant negative relationship between consumption and price and price is the only factor which can affect the consumption of tomatoes in the Republic of Moldova. Other factors do not have such a big influence. It means that consumers are price sensitive and each change in price especially when it goes up affect the consumption in opposite way.

6. Conclusions and Recommendations

6.1 Conclusions

In Moldova tomatoes are grown in all regions, especially in river valleys. Area planted with tomatoes in the country is about 20 thousand hectares. Growing tomatoes is a major economic and food activity and is a profitable business because tomatoes are used extensively in food and canning industry production, are rich in nutrients, represent a culture that allows working for profit and could be grown by sowing or planting seedlings both in greenhouses and in the open.

In Moldova, the biggest share lies to tomatoes vegetable production. Tomatoes are required by the consumer and are particularly valuable in terms of food and price.

In recent years the average crop exceeding 10 t / ha - using standard technologies, and advanced technologies has allowed for harvest of up to 40 t / ha. It is also important to note that the cost of production of tomatoes per unit of area are among the highest of all the 40 varieties of vegetables grown in the country, and is about 4000 USD per hectare. On the other hand, it can be high in terms of revenue results that were in 2011 an average of 10 000 USD per hectare.

According to achieved results we can conclude that most of farmers in Anenii-Noi district are high skilled with education and ability to improve their activity. These farmers focus on tomato sector because this activity has several advantages (high value, high volume of production and possibility to export production) but anyway there are limitations which have to be avoided. Competition on local market with other producers could be avoided if Moldavian government will create some impediments and introduce some taxes for imported tomatoes in order to increase the price for imported tomatoes and protect their own producer, following the theory of custom protectionism. Secondly, most of farmers would like to export their production abroad and make their tomato production activity more industrialized and get a higher income. So, that is possible if the investments will affect directly the production process and make it more effective with usage of modern technologies. Unfortunately that kind of research about the problem we are discussing were not done before and according to that study we can say that no other crop in the Republic of Moldova has such a huge number of advantages especially in this region.

Due to the possibility of building a good irrigation system which will come from Dniester River and rich soil, farmers have no other crop which could give them such big advantages like

tomatoes does. This is the fact which Moldavian government and farmers have to be aware and try to improve it.

6.2 Recommendations

To improve the tomato sector producers need a fast increase in volumes and improved product quality. Tomato production may be hampered by lack of irrigation and climatic conditions such as frost and hail. Needs of the sector can be arranged in the following order of priority:

1. Access to financing for making improvements / investment required is a key component in maintaining competition.
2. Training in irrigation (capillary) and implementation of irrigation systems. Currently, only seven percent of all agricultural land in Moldova is irrigated.
3. Tunnels to extend the growing season and protecting tomatoes against rainfall during harvest or in case of hail or frost.
4. Cold room for storing tomatoes. Accepted quality standards revolve Moscow for higher quality because products imported from Europe. These post harvesting activities play a big role in tomato production.
5. Sorting and grading. These processes must be carried out in strict accordance with the quality standards and food security.
6. Packaging. After the sorting according to the destination market requirements, products must be packed in suitable containers.
7. Market research. Producers need assistance to assess the price and market demand for products. This can be done by collecting and analyzing market news.

7. References

- Agenția Pentru Restructurarea Agriculturii. 1998. Politica Agrară Actuală: Evoluție, Probleme, Sugestii. ARA Moldova. Chișinău, 36 pp.
- Alecu I. 2011. Management în agricultură, Editura Ceres, București, 48pp.
- Andries S, Cerbari V, Filipciuc V. 2010. Starea de calitate a învelișului de sol și măsuri de remediere. Akademos, 3(18): 80-87.
- Baghinschi V. 1979. Funcțiile de producție și aplicațiile lor în agricultură, Editura Ceres, București, 78pp.
- Berca M. 2009. Agrotehnica-Modern transformation of agriculture. Ceres, Bucuresti, 87 pp
- Biroul National de Statistica al Republicii Moldova. 2010. Resursele naturale și mediul în Republica Moldova: Culegere Statistica. Chisinau, 17 pp.
- BizGates. 2010. Fresh Fruit and Vegetable Market In Moldova: FACTS & FIGURES. Chisinau, 31pp
- Bostan I, Todos P, Carabulea B, Ciumac J. 2012. Centrul universitar stiintific, de instruire și transfer tehnologic în industria alimentară. Akademos, 1(24): 127-130
- Bostan I. 2011. Utilizarea surselor regenerabile de energie - eoliană, hidroelectrică și solară. Akademos, 4(23): 54-59.
- Bruce L. Gordon C. 2002. Handbook of Agricultural Economics, Elsevier, 2(3): 1547-1592.
- Cara O, Orlova E, Bargan T, Chiperi M, Isac T. 2011. 2012. Activitatea agricolă a micilor producători agricoli în Republica Moldova (în tabele) Chisinau, 8pp
- Cazac V, Daradur M, Nedelcov M. 2005. Clima actuală în Republica Moldova și tendințele ei de schimbare (temperatura aerului). Mediul ambiant, 4 (22): 39-41.
- Chayanov A. 1966. The theory of the peasant economy. Irwin, Homewood Illinois, 96 pp
- Chirică L. 2011. Apele de suprafață: probleme și soluții. Mediul ambiant, 2(56): 7-10
- Chislea I. 2011. Încotro va merge industria zahărului după o ascensiune de zece ani?. Economist. Chisinau, 124 pp
- Cholamali M. 2006. Fenomenul migrației în Republica Moldova. Populația Republicii Moldova în contextul migrațiilor internaționale, 2: 19-34.
- Csaki C. 2000 Agricultural reforms in Central and Eastern Europe and the former Soviet Union: Status and perspectives, Agricultural Economics, 22 (1): 37-54
- Czech development agency. 2012. Development of ecological agriculture in Moldova.[online]. Prague: Czech development agency. Available at http://www.czda.cz/czda/en_126/en_138/en_277.htm (accessed on 19 March 2013).

Czech development agency. 2012. Support of organic agriculture in Moldova. [online]. Prague: Czech development agency. Available at http://www.czda.cz/czda/en_126/en_138/strengthening-the-competitive-ability-and-efficiency-of-moldovan-small-and-medium-farmers.htm (accessed on 22 March 2013).

Dries L, Swinnen J. 2004. Foreign direct investment, vertical integration and local suppliers: evidence from the Polish dairy sector *World Development*, 32 (9): 152–154.

Duca G. 2010. Propunerile Academiei de stiinte a Moldovei privind eficientizarea sectorului energetic. *Akademos*, 1(16): 34-41.

Dudwick N, Youssef D. 1998. *Social Assessment Guides Policies on Rural Land Reform in Moldova*, The World Bank, Washington D.C., 124 pp

Dumitrashko M. 2003. Survey of rural households. Institute of Management and Advanced Training in Agribusiness (IMATA), 78-82 pp

Foddy W. 1994. *Constructing questions for interviews and questionnaires: Theory and practice in social research* (New ed.). Cambridge, UK: Cambridge University Press, 24(6): 186 .

Gillham, B. 2008. *Developing a questionnaire* (2nd ed.). London, UK: Continuum International Publishing Group Ltd., 129 pp

Gorton M, Dumitrashko M, White J. 2006. Overcoming supply chain failure in the agri-food sector: A case study from Moldova, *Food Policy*, 31 (1): 90-103.

Gorton M, Dumitrashko M, White J. 2006. Overcoming supply chain failure in the agri-food sector: A case study from Moldova, *Food Policy*, 31(1): 90-103.

Gorton M. 2001. Agricultural land reform in Moldova, *Land Use Policy*, 18 (3): 269-279.

Gow H, Swinnen J. 2001. Private enforcement capital and contract enforcement in transition economies *American Journal of Agricultural Economics*, 83(3): 686–690.

Guido G. 2005. Informal export barriers and poverty, *Journal of International Economics*, 66 (2): 447-470.

Iosif G. 2002. Analiza calității produselor, Editor Tribuna Economică, București, 35-47 pp

King C. 1999. *The Moldovans Romania, Russia and the Politics of Culture* Hoover. Institution Press, Stanford, 63-91 pp.

Lerman Z. 2004. Policies and institutions for commercialization of subsistence farms in transition countries, *Journal of Asian Economics*, 15(3): 461-479.

Macours K, Johan F, Swinnen M. 2008. Rural–Urban Poverty Differences in Transition Countries, *World Development*, 36(11): 217-218.

Macours K, Swinnen J. 2002. Patterns of agrarian transition *Economic Development and Cultural Change*, 50 (2): 365–395.

- Mâtcu M, Sochircă V. 2002. Geografia umană a Republicii Moldova- ARC, Chisinau, 19-25 pp
- Mihailescu V. 2010. Securitatea energetică a Republicii Moldova în contextul aderării la Comunitatea Energetică, 64 pp.
- Ministerul Economiei. 2005. Tendințe în Economia Moldovei: iunie. Chișinău. MERM, 140 pp.
- Miroiu C. 2008. Contribuții la studiul microflorei parazite și saprofite pe tomatele cultivate în câmp și spații protejate, teză doctorat, USAMV, Iași, 62-65 pp
- National Bureau of Statistics. 2012. Moldova in figures. [online]. Chisinau: Biroul National de Statistica din Moldova. Available at http://www.statistica.md/public/files/publicatii_electronice/Moldova_in_cifre/2012/Moldova_in_cifre_2012_en_fr.pdf (accessed on 12 March 2013).
- OECD. 1997. Agricultural Policies in Transition Economies. Monitoring and Evaluation, OECD, Paris, 56-67 pp
- Orlova E. 1998. Adaptation of agricultural statistics to structural changes and new information needs in transition, 56-58 pp.
- Popescu V. 2008. Summer-Autumn Vegetables. Ceres, Bucuresti, 56 pp
- Preasca I. 2011. În anul 2010, circa 20,5% din valoarea importurilor în Republica Moldova a revenit resurselor energetice. Adevărul, Chisinau, 19-24 pp
- Preasca I. 2011. Ucrainenii au găsit și petrol în Republica Moldova. Adevărul, Chisinau, 18(26): 36-48.
- Preasca I. 2012. Bogățiile țării rămân ascunse în pământ. Subsolul Moldovei conține importante zăcăminte naturale. Adevărul, Chisinau, 7 (24): 19-112.
- Raportul National de Dezvoltare Umană în Moldova. 2009. Schimbările climatice în Republica Moldova: Impactul socio-economic și opțiunile de politici pentru adaptare. Dezvoltare Unana, 82 pp.
- Rizov M. 2008. Institutions, reform policies and productivity growth in agriculture: evidence from former communist countries, Wageningen Journal of Life Sciences, 55 (4): 307-323.
- Schmitt G. 1991. Why is the agriculture of advanced Western countries still organised by family farms? Will this continue to be so in the future? European Review of Agricultural Economics, 18: 443-458.
- Sîrghi I. 2009. Politica de stimulare a natalității în Republica Moldova: realizări și riscuri. Policy Brief, 5 (2): 1-5.
- Soroceanu V. 2000. Creșterea economică și mediul natural, Editura Economică, București. 89 pp
- Stanciu G. 2006. Horticultura României. Editura Economica, Bucuresti. 12-34 pp
- Stiopca O, Cîpciriuc L, Bejan A. 2011. Moldovan tomato value chain study. USAID/Ukraine Regional Contract Office. 21-48 pp

Swinnen J, Gow H. 1999 Agricultural credit problems and policies during transition to a market economy in Central and Eastern Europe Food Policy, 24 (1): 21–47.

Tkach V. 1999. Moldova and transdnestriapainful past, deadlocked present, uncertain future. Frank Cass, London, 8(2): 130-159.

Vadineanu A. 1999. Dezvoltarea durabilă, vol.1, Teorie și practică, Editura Universității, București, 87 pp

8. Annexes

List of annexes:

Annex 1. Tomatoes Production and Trade Flow	65
Annex 2. Production cycles for greenhouse and open field tomatoes	65
Annex 3. Discussions with farmers	66
Annex 4. Primitive greenhouse in Puhaceni village	66
Annex 5. Construction of greenhouses (inside)	67
Annex 6. Translated questionnaire in English language	67
Annex 7. Filled Questionnaire	70

Annex 3. Discussions with farmers.



Source: Authors archive, 2012

Annex 4. Simple greenhouse in Puhaceni village.



Source: Authors archive, 2012

Annex 5. Construction of greenhouses (inside).



Source: Authors archive, 2012

Annex 6. Translated questionnaire in English language.

1) What is your gender?

2) How old are you?

3) In which village do you live?

4) Your nationality?

5) What studies do you have?

6) Are you a private farmer or you work for a public sector?

7) What is the scale of your area (plot) for growing tomatoes in the open field (field, garden)?

8) What is the scale of your area (plot) for growing tomatoes in greenhouses?

- 9) Are tomatoes grown in open field used for your own consumption or for sale?**
- 10) Are tomatoes grown in greenhouses used for own consumption or for sale?**
- 11) What is the volume of production of tomatoes you have per year from the open field (garden)?**
- 12) What are the main problems which exist for you during the process of growing tomatoes in the open field?**
- a) expensive or low-quality planting material*
 - b) expensive fertilizers*
 - c) expensive rental for mechanization (tractor plowing)*
 - d) expensive labor or labor shortages*
 - e) transportation of finished products from the field to the market*
 - e) other*
- 13) What is the volume of production of tomatoes you have per year from greenhouse?**
- 14) What are the main problems that exist for you while growing tomatoes in greenhouses?**
- a) expensive or of poor quality planting material*
 - b) Expensive fertilizers*
 - c) high prices for gas/electricity*
 - d) transportation of finished products from the greenhouses to the market*
 - e) other*
- 15) What are local (Moldovan) markets where do you deliver your tomatoes for sale?**
- 16) What is the volume of production of tomatoes (tones or kg), you sell at the local (Moldavian) market per year?**
- 17) Which month do you sell your products to local (Moldavian) markets?**
- 18) What kinds of tomatoes are best selling in the local (Moldovian) markets?**

19) What are the main problems with the selling of tomatoes at the local (Moldavian) markets?

- a) lack of wholesale markets*
- b) expensive places at the markets*
- c) bad market infrastructure*
- d) huge competition*
- e) other*

20) Do you export tomatoes to any foreign countries? If yes, which countries?

- a) Russia*
- b) Ukraine*
- c) Belarus*
- d) Romania*
- e) other*

21) What is the volume of production of tomatoes (tones/kg) you export to foreign countries per year?

22) What are the requirements of the importer in relation to your production of tomatoes?

- a) Quality inspection (regarding the requirements of international quality standards of tomatoes)*
- b) Packaging in boxes*
- c) Without packing*
- d) Other*

23) In which month are you exporting tomato products to foreign countries?

24) What are the local varieties of tomatoes that are well exported to foreign countries?

25) What are the common problems with the export of tomatoes to foreign countries?

- a) Volatile demand from importers*
- b) Competition with other countries (Turkey, Romania and so on.)*
- d) Other*
- c) Competition with local producers*

Annex 7. Filled Questionnaire

1) Ваш пол?

Barbet

2) В каком году Вы родились?

1971

3) В каком селе Вы проживаете?

Puhaceni

4) Ваша национальность?

Moldova

5) Какое ваше образование?

Superior.

6) Являетесь ли Вы частным фермером или же работаете в государственном предприятии?

Fermier privat

7) Каков масштаб Вашей площади (участка) для выращивания томатов на открытом грунте (поле, огород)?

1 гектар

8) Каков масштаб Вашей площади (участка) для выращивания томатов в закрытом грунте (теплицах)?

2 сотки

9) Томаты с открытого грунта (поле, огород) Вы выращиваете для собственного потребления или же для продажи?

Для себя и продажи

10) Томаты с теплиц Вы выращиваете для собственного потребления или же для продажи?

11) Какой объём продукции томатов Вы имеете в год с открытого грунта (поле, огород)?

35 тонн

12) Какие главные проблемы существуют для Вас во время выращивания томатов в открытом грунте?

а) дорогой или же некачественный посадочный материал

дорогие удобрения

- г) дорогая или же нехватка рабочей силы
- в) дорогая аренда механизации (трактор, вспашка)
- д) транспортировка готовой продукции с поля на рынок
- е) другое

13) Какой объём продукции томатов Вы имеете в год с теплиц?

8 ТОНН

14) Какие главные проблемы существуют для Вас во время выращивания томатов в теплицах?

- а) дорогой или же некачественный посадочный материал
- б) дорогие удобрения
- в) высокие цены на газ/электричество
- г) транспортировка готовой продукции с теплиц на рынок
- д) другое

15) На какие местные (молдавские) рынки Вы поставляете томаты на продажу?

Кишинёв

16) Какой объём продукции томатов (тонн/кг) Вы продаёте на местном (молдавском) рынке в год?

43 ТОНН

17) В какие месяца Вы поставляете свою продукцию томатов на местные (молдавские) рынки?

С июня по ноябрь

18) Какие сорта томатов хорошо продаются на местных (молдавских) рынках?

Tolstai; Kristal; Neptun;

19) Какие общие проблемы имеются с продажей томатов на местных (молдавских) рынках?

- а) отсутствие оптовых рынков
- в) плохая инфраструктура рынков
- б) дорогие места на рынках
- г) большая конкуренция
- д) другое

20) Экспортируете ли Вы томаты в зарубежные страны? Если да, то в какие?

Нет

- а) Россия,
- б) Украина,
- в) Белоруссия,
- г) Румыния
- д) если другое государство, то какое?

21) Какой объём продукции томатов (тонн/кг) Вы экспортируете в зарубежные страны в год?

Не экспортирую

22) Какие требования имеет импортёр по отношению к Вашей продукции томатов?

- а) проверка качества (с учётом требования международных стандартов по качеству томатов)
- б) упаковка в ящиках
- в) без упаковки
- г) другое

23) В какие месяца Вы экспортируете свою продукцию томатов в зарубежные страны?

—

24) Какие местные сорта томатов хорошо экспортируются в зарубежные страны?

—

25) Какие общие проблемы имеются с экспортом томатов в зарубежные страны?

- а) нестабильный спрос со стороны импортёров
- б) конкуренция со стороны других государств (Турция, Румыния итд.)
- в) конкуренция со стороны местных производителей
- г) другое