

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



Diploma Thesis

**Economic evaluation of winter wheat production in
Krasnodar Region**

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

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DIPLOMA THESIS ASSIGNMENT

Anastasiia Konograi

Economics and Management

Thesis title

Economic evaluation of winter wheat production in Krasnodar Region

Objectives of thesis

Agriculture is the branch of economy which aimed at providing the population with food and receiving raw materials for a number of industries. Food security of the state depends on a agriculture. Krasnodar Region is most developed Russian region in the agrarian sphere. The agricultural industry is the leading direction of Krasnodar Region economy.

Research question: How can economy of Krasnodar Region be evaluated with help of econometric modeling which shows statistical data of winter wheat and sunflower yield?

Expected outcome: Analysis of winter wheat significance for economic development of Krasnodar Region in comparison with sunflower cultivation is expected outcome of the dissertation work.

Methodology

Collecting and preparing data of different scientific works of authors in the sphere of econometric modeling, materials and the data obtained from reference materials, periodicals, the statistical information and the Internet, SPSS program, linier regression equations, regression analysis of the collecting data are the methodology of the work.

The proposed extent of the thesis

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Keywords

Economy, Krasnodar Region, winter wheat, sunflower, econometric modeling, agriculture

Recommended information sources

Borodich, S. A. Econometrics. Moscow: New knowledge, 2011. ISBN 985-445-358-8

Dougherty, Christopher Introduction to Econometrics. New York: Oxford University Press, 2009 – 3rd ed., 573p. ISBN-10: 0199567085

Glukhovskiy A.B. Fertilizer of winter wheat in Krasnodar Region. Krasnodar, 2008.



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Declaration

I declare that I have worked on my diploma thesis titled "Economic evaluation of winter wheat production in Krasnodar Region" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 30.03.2017

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And I would like to say many thanks to my parents for their support.

Economic evaluation of winter wheat production in Krasnodar Region

Abstract

This thesis describes winter wheat as the main source of economic development in the southern part of Russia – in Krasnodar Region. Food security of the region and all country depends on agriculture.

Theoretical part considers general information about Krasnodar Region and its meaning in agricultural sector. Winter wheat is the leader among other grains. For comparison of wheat value in economic sector other important product for regional food security was taken – sunflower. That is why theoretical part includes information about winter wheat and sunflower production in Russia and especial in Krasnodar Region.

Practical part presents financial aspects of winter wheat and sunflower production. For example, export of these agricultures abroad and dynamic of prices are shown in this part of work. Prediction of prices on the future agricultural year is constructed. Econometric modeling of winter wheat and sunflower and its analysis are also included in practical part. SPSS program is the main tool for practical part. It helps to systematize all data in period 2010-2015 years and to take the main factors which influence on winter wheat and sunflower yield.

Key words

Krasnodar Region, winter wheat, sunflower, econometric modeling, economic evaluation, agriculture, food security, linier model, export.

Ekonomické hodnocení výroba ozimé pšenice v Krasnodarském kraji

Abstrakt

Tato práce popisuje ozimou pšenici jako hlavní zdroj hospodářského rozvoje v jižní části Ruska - v Krasnodarském kraji. Potravinová bezpečnost v regionu a celé země je závislá na zemědělství.

Teoretická část se zabývá obecnou informací o Krasnodarském kraji a jeho význam v zemědělském sektoru. Ozimá pšenice je lídr mezi jiné zrn. Pro srovnání hodnoty pšenice v ekonomickém sektorů jiný důležitý produkt pro regionální bezpečnost potravin byl pořízen - slunečnice. To je důvod, proč teoretická část obsahuje informaci o ozimé pšenice a slunečnicového výrobu v Rusku a zvláště v Krasnodarském kraji.

Praktická část reprezentuje finanční aspekty ozimé pšenice a slunečnice výroby. Například export těchto zemědělstvím v zahraničí a dynamika cen jsou uvedeny v této části práce. Predikce cen na budoucí zemědělský rok je konstruován. Ekonometrické modelování ozimé pšenice a slunečnice a jejich analýzy jsou také zahrnuty v praktické části. Program SPSS je hlavní nástroj pro praktickou část. Program pomáhá organizovat všechnu datu v období 2010-2015 let, a identifikovat hlavní faktory, které mají vliv na ozimé pšenici a slunečnice výnos.

Klíčová slova

Krasnodarskij kraj, ozimá pšenice, slunečnice, ekonometrické modelování, ekonomické zhodnocení, zemědělství, bezpečnost potravin, lineární model, export.

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1 Introduction

Agriculture is the branch of economy which aimed at providing the population with food and receiving raw materials for a number of industries. Problems in the sphere of agriculture result in social tension and instability in society therefore its development is controlled in all countries. For indicators of agriculture role in world economy it is possible to use such indicators as: specific weight of agriculture in structure of GDP, investment into agriculture, a share occupied in agriculture among economically active population.

Agriculture is one of the major presented branches practically in all countries. About one billion of the population is engaged in world agriculture (Gutova M. N., 2001).

Food security of the state depends on agriculture. Food security is the most important component of national country security. In economic literature food security is defined as "state of the country economy including her agro-industrial complex at which needs of the population for food are satisfied".

The agricultural industry is the leading direction of Krasnodar Region economy. Agriculture of Krasnodar Region has provided high volume of production in recent years and it is the first place across the Russian Federation. The share of Krasnodar Region agriculture in the total cost of the agricultural production manufactured in Russia has made more than 6.6%. Krasnodar Region takes the first place in the Russian Federation on production of wheat, corn, sunflower, rice, sugar beet, and haricot (Makarets L. I., 2009).

Winter wheat is the main grain which is cultivating in Krasnodar Region. Winter wheat influence not only food security of region but all country in general. This grain is one of the elements of economic indicators in region and in Russia. Wheat is exporting in many countries and main channel locates in Krasnodar Region.

Other important agricultural product is sunflower seeds. Krasnodar Region also takes the first place in cultivation of sunflower. Krasnodar Region is sowed by sunflower on 440 thousand hectares of the earth. Sunflower seeds are using for production of different products and main of them is sunflower oil (ab-centre.ru).

Importance of winter wheat for Krasnodar Region is indisputable. Cultivation of sunflower was taken for comparison. Dynamic of development of two these cultures demonstrate value of Krasnodar Region in economic industry of Russia.

Various tools and methods are using for getting of quality results in this Master's Thesis.

This work includes analysis of wheat and sunflower export abroad, dynamic of prices during the last years and yield of these agricultures. Prediction of prices on the future agricultural year is constructed and described.

Econometric models of winter wheat and sunflower are built. SPSS program is the main tool for practical part. It helps to systematize all data in period 2010-2015 years and to take the main factors which influence on winter wheat and sunflower yield.

Yield is key factor for development of agricultures. All another indicators are depended on yield. Among of these indicators are: price, amount of export, GDP.

It is important to support leading position of region in the agrarian market. And this Master's Thesis describes some of ways which can affect on retention and improving of Krasnodar Region position.

2 Objectives and Methodology

2.1 Objectives

The main objective of this Thesis is evaluation of production of winter wheat in Krasnodar Region.

Krasnodar Region is the main region in Russia in agricultural sphere and the main producer of winter wheat. Sunflower was taken as the second important agricultural product for Krasnodar Region in the comparison with winter wheat.

Thesis shows depending of different factors influencing on winter wheat and sunflower production. One of the objectives is building and analysis of econometric modeling of two agricultural products.

Another aim is evaluation of economic meaning of winter wheat with comparison of sunflower on the basis statistical data from official sources.

2.2 Methodology

Using methods in this Thesis are: observation, comparison, analogy, horizontal and vertical analysis, economic and financial analysis.

Collecting and preparing data of different scientific works of authors in the sphere of econometric modeling and in agricultural industry, materials and the data obtained from reference materials, periodicals, the statistical information and the Internet, production function analysis of the collecting data are the methodology of the work.

Theoretical part includes information about agricultural condition of Krasnodar Region which was observed in different works of specialists in this sphere. Also theoretical part reflects scientific works of authors in econometrics.

Analytical part includes monitoring, observation and analysis of data about export, costs of wheat and sunflower seeds and current situation on the agrarian market. For the building of econometric model were taken statistical data during period of 2010-2015 from official sources. Data of Goskomstat of the Russian Federation have formed information base of the research. Different analytical and theoretical works of authors were used for building and describing of econometric model.

3 Theoretical Part

3.1 Representation of Krasnodar Region

Value of Krasnodar Region in the Russian Federation is defined by the different factors.

Krasnodar Region realizes geostrategic function of an outpost of stability at the southern boundaries of Russia.

Krasnodar Region is the border territory and the only exit of Russia to the Black Sea and through it to the major international maritime routes.

Krasnodar Region realizes interests of Russia in a zone of Azov and Black Sea and Mediterranean economic cooperation (Gutova M. N., 2001).

Industrial, construction, fuel and energy complexes, area of information and communication technologies, and also agro-industrial, transport, recreational and tourist complexes make a basis of productive forces of Krasnodar Region.

The last three activities (agro-industrial, transport, resort and tourist complexes) correspond to priorities of socially economic development of Russia and define the special status of Krasnodar Region in the national economy.

Dynamic development of agro-industrial complex of Krasnodar Region ensures food security of the country:

- the region has the richest resources of farmlands, including chernozems which area makes 4805 thousand hectares (these are more than 4 percent of the Russian and about 2 percent of world reserves);

- the region wins first place among subjects of the Russian Federation on output of grain, sugar beet, fruits and berries, the second place on production of seeds of sunflower and honey;

- the region takes the second place among subjects of the Russian Federation on production of eggs, meat of cattle and a bird (in live weight), the third place on production of milk (Konograi A. S., 2016).

Across the territory of the region there pass the most important railway routes of federal importance which are focused towards sea international ports of edge and resorts of the Black and Azov seas.

Air transport of Krasnodar Region is presented by four airports, two of which are international (Krasnodar, Sochi).

Unique climatic conditions of region, existence of the advanced medical institutions and technologies, historical places for Russia create the potential for development highly effective, competitive the recreational complex of the international level forming positive image of the country on the international scene and providing the growing needs of the population for the services connected with rest, treatment and tourism:

- climate in the region is one of optimum in Russia for accommodation and activity of the person. Krasnodar Region is the warmest region of Russia;
- combination of favorable climatic conditions and existence of mineral waters are making Krasnodar Region the most popular tourist region of Russia;
- potential resort and tourist complex of region is realized due to creation in the territory a special recreational type of economic zone (Minakova I. A., 2008).

Krasnodar Region is the tourist region in which high recreational potential development of cultural tourism is directly connected with development of other types of tourism and rest.

Appeal of domestic resorts to citizens of Russia is caused by a number of factors which is among:

- habitual language environment;
- traditional food;
- lack of need to receive the visa;
- an opportunity to choose flexible hours of rest.

These factors are especially important for families with children. Besides, internal tourism is perceived by consumers as safer that is a universal tendency (Konanov S. I., 2011).

Krasnodar Region is the complex center of improvement, rest and tourism having a network of the various enterprises specializing in the organization of sanatorium treatment, improving, sea, water, excursion and informative rest. Natural and resource recreational potential of the Russian South is characterized by a variety and in general is very capacious that is caused by a combination of flat, seaside, foothill and mountain landscapes, existence of various types of mineral waters, therapeutic mud, quite comfortable climatic features.

Travel business remains already many years to one of the stablest and profitable businesses around the world. The Russian tourism industry was included into ten world leaders for 2014. The world council for travel and tourism has made the highest league of tourist powers in the world in 2004 and in 2014. Russia was included in the top of ten. According to experts of WTTC, our tourist industry enviable rates generate new workplaces that are speak about improvement of domestic economic structure (Tereshina M. V., 2011).

The corresponding status of Krasnodar Region in the Russian Federation is defined by its contribution to a gross domestic product (GDP) and to the formation of the federal budget, as well as high values of the countries and in formation of the federal budget, and also high values of some other indicators of development of the region.

Krasnodar Region is one of the regions of Russia which are independently providing the operating budget outlays and at the same time makes an essential contribution to the federal budget (Konograi A. S., 2016).

Thus, in the region there is a strong potential for development, which gives the possibility of its contribution to the realization of goals Russian Federation.

3.1.1 Geography of region

Krasnodar Region is located in the south of Russia and it is a part of North Caucasus economic region. After division of Russia into federal districts the region became a part of the Southern Federal District. Krasnodar Region occupies the space of 76 thousand square kilometers and it is the most southern region of Russia. In the region over five million people, including about 53% – live in the cities and 47% – in the rural zone.

The territory of region is divided into two sharply different parts: northern flat and southern mountain. The flat zone is Kuban Lowland and occupies two thirds of the territory and this is economically the most developed part.

Economic development of Krasnodar Region determines by a set of factors. An exit to the Black and Azov seas promotes development of international trade and cooperation with many foreign countries (Minakova I. A., 2008).

Location of Krasnodar Region is possible to see in the figure 1.

Figure 1 Map of the Krasnodar Region location



Source: usfunds.com

Natural features also promote development of regional economy. Flat nature of a relief of a steppe part, the richest soils and soft climate are favorable for development of agricultural industry. Coasts of two seas, the Caucasus Mountains, mineral sources influenced creation of the largest in the country recreational complex. The basis of industrial production is constituted by various mineral resources of the region. The five-million population of region provides it with manpower (Konanov S. I., 2011).

3.2 Regional food security

Economic security of the region is characterized by a condition of various spheres and defining components:

- production;
- raw;
- financial;
- scientific and technical;
- social and demographic;
- sphere of safety;
- public;
- food;
- ecological;
- information.

Ensuring food security of the state depends, first of all, from the potential of agricultural production, investments into the sphere of production of the food, including an agronomical complex (agrarian and industrial complex), and rendering the necessary help to a producer in creation of necessary social and economic conditions for work. In other words the food security is meant as ability of the state to provide with requirement food at the expense of own resources (Tereshina M. V., 2011).

The food security of the region is the main instrument of ensuring stability of social and economic processes of the region.

The food security holds a specific place in economic stability of development of regions. Concerning other types of safety which are a part economic (information, external economic, production, etc.), the food security is the most important.

The system of ensuring food security in the region is connected with the solution of legal and socio-economic tasks, with protection of economic interests of domestic producers, improvement of the financial and tax mechanism, modernization of technical and technological supply, the state support of the agrarian sphere, development of infrastructure of the food market.

Krasnodar Region is one of the country's region which are most developed in the agrarian relation. The agricultural industry is the leading direction of economy of Krasnodar Region. In Kuban about 10% of the Russian volumes of grain, over 80% of rice, more than 20% of grain corn, about 15% of sugar beet and 14% of sunflower, all volume of tea, subtropical and citrus fruit crops are made (Gutova M. N., 2011).

In the region the legal base for steady functioning of agrarian and industrial complex and ensuring increase in production in the next years is created. It allowed even to provide in extremely adverse weather conditions of 2010 a grain yield more than 10 million tons with productivity 52.5 centner per hectare.

In Krasnodar Region the State program of development agricultural industry and regulation of the markets agricultural production is realized.

Within the State program of development agricultural industry practical work on implementation of the priority national project "Development of Agrarian and Industrial Complex" is carried out.

Main directions of the program are:

- sustainable development of rural territories;

- creation of the general operating conditions of agricultural industry;
- development of priority subsectors of agricultural industry;
- achievement of financial stability of agricultural industry (Konanov S. I., 2011).

It once again shows that Krasnodar Region influences mainly food security of all country in general. The main factor on which the state places emphasis is the agricultural industry. Thanks to an agricultural industry of Krasnodar Region it is possible to be confident that social and economic development of the region will be steady against crisis situations.

3.2.1 Agriculture of Krasnodar Region

Kuban is the leader in agro-industrial complex of Russia for a long time.

Krasnodar Region has unique climatic conditions.

Taking into account the developed geographical conditions and features the territory of region is conditionally divided into five natural and economic zones, as determined in them specifics of productive agricultural activity of people.

In the natural relation the territory of region consists of two parts. Northern and central parts are occupied with steppes with chernozem soils, and southern includes almost all Black Sea coast and is busy mainly with a mountain surface.

Steppe Kuban is very favorable for farming therefore practically all its territory represents one huge field.

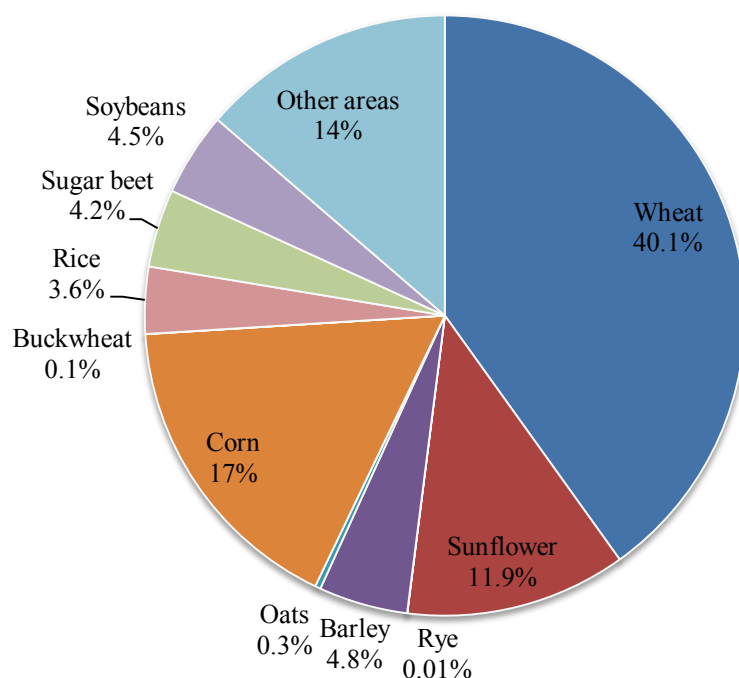
Thus, the geographical location and climatic conditions of region, availability of good agricultural holdings determined the main direction of regional economy - it is powerful agro-industrial complex on production and conversion of agricultural products and deliveries of food to industrial centers of the country.

Total land area in the region more than 7.5 million hectares, including 3.9 million hectares of an arable land (ab-centre.ru).

Crop production industry

In the region structure of sown areas the greatest share is occupied by cultivation of wheat (40.1% of all areas), corn on grain (16.9%), sunflower (11.9%), barley (4.8%), soy (4.5%), sugar beet (4.2%), and rice (3.6%) (figure 2).

Figure 2 The structure of sown areas in Krasnodar Region, 2015 (in percentage)



Source: Rosstat

The general sizes of acreage in Krasnodar Region in 2015 constituted 3 679 thousand hectares and it is 4.6% of all acreage in Russia. The region is in the 5th place by the size of acreage in the Russian Federation.

It is one of the main regions ensuring food security of the country.

Favorable climatic conditions and features of a geographical location of Krasnodar Region allowed it to take the leading place among regions of Russia on production and conversion of agricultural products (agro2b.ru).

Table 1 shows place and share of Krasnodar Region among Russian Federation in general. Data is presented in thousand tons.

Table 1 Gross collections of main crop plants in Krasnodar Region (thousand tons)

Name of culture	2010	2011	2012	2013	2014	2015	Place among of regions of Russian Federation in 2015	Share of region among Russian Federation in general in 2015, in percentage
Wheat	6535	7218	4520	6968	7652	8464	1	13.70%
Sunflower seeds	1028	1056	1100	1166	1058	1017	1	11%
Sugar beet	7095	9283	8178	6717	6749	7174	1	18.40%
Corn	1395	2246	2753	3293	3310	3327	1	25.30%
Barley	1063	1009	564	931	979	938	4	5.30%
Rice	828	824	857	727	823	845	1	76.20%
Beans	-	1	1,2	1,3	1,4	1,5	1	20.30%

Source: based on the data from Rosstat

The general sizes of acreage in Krasnodar Region in 2015 have made 3 679.0 thousand hectares this is 4.6% of all acreage in Russia. The region is in the 5th place by the size of acreage in the Russian Federation (ab-centre.ru).

Livestock production industry

Kuban is the leader in production of livestock products in the Southern Federal District. The priority directions of an industry of livestock production are: increase in number of cattle; widespread introduction of progressive domestic and world production technologies of pigs of meat breeds; increasing production in meat and egg poultry farming.

Processing industry

Krasnodar Region is one of the leading regions of Russia on production and conversion of agricultural products and deliveries of food to industrial centers of the country. High quality of products is noted at the most prestigious Russian and international exhibitions. The perspective directions of development of the food industry of region are the growth in volumes of production of meat and dairy products, soy conversion, modernization of production capacities of the entities of an industry (Makarets L.I., 2009).

Investment policy

State policy of administration of Krasnodar Region is directed to active investment attraction in agro-industrial complex.

Complete and unconditional protection of the rights and interests in accordance with the legislation of the Russian Federation and international treaties of the Russian Federation is provided to foreign and domestic investors in the territory of Krasnodar Region. Various forms of participation in projects implementation are offered possible investors. These are 100% attraction of the foreign equity, including due to creation of the new entities, acquisition by the investor of shares of the organization, supply of equipment, leasing of the equipment, a commodity loan, acquisition of a share of the turned-out products, cheaper credits, etc. Comparable on scales with the European state the region can accept in agricultural production hundreds of millions dollars of investments annually. State policy of Krasnodar Region administration is directed to active investment attraction in agro-industrial complex (Makarets L.I., 2009).

3.2.1.1 Winter wheat as a main grain of Krasnodar Region

Winter wheat is one of the most widespread major food crops on the globe, the value which grains it is determined by the high content of protein, fat, carbohydrates, etc.

Russia in 2008-2015 exported from 13.9 to 30.7 million tons of grain. Since 2013 export grain in general steadily grows. The same dynamics is observed also on wheat – the main export culture.

Winter wheat is a high-yield and most valuable food crop. It is cultivated in the majority of regions in Russia. Where winter wheat well winters, it is the leading grain culture. Krasnodar Region is one of the main exporters of winter wheat in Russia (Lazarev V. I., 2013).

For today in region threshed 68 thousand hectares, accounting for 5% of the total area of crops – 1427 thousand hectares. At the moment, the gross harvest amounted to 394.2 thousand tons with an average yield of 57.9 kg/ha.

In the table 2 the five largest exporters of wheat in the world are demonstrated. Among them is Russia and the main part of export belongs to Krasnodar Region.

Table 2 Share of 5 largest exporters in the world export of wheat (% of the total amount of export)

Year	Australia	Canada	Russia	USA	France
2015	10,1	13,9	12,5	12,4	11,7
2014	12,1	16	14,6	16,2	13,5
2013	13	14,2	10	24	14,2
2012	22,7	17,3	15,5	24,9	15,9
2011	16,3	13,5	12,5	27,1	16,8
2010	15,5	18	11,6	27	20,6
2009	20,1	18,6	16,2	21,2	16,3
2008	24,7	28,8	12,4	31,8	17,2
2007	17,5	20,5	16,8	38,3	16,7
2006	22,7	18,7	9,8	23,6	16,8
2005	21,3	14,5	10,8	28,4	16,8
2004	37,9	21,2	6,6	44,3	20,8
2003	15,4	13,1	8,5	28,4	18,2
2002	29,6	18,2	12,6	29,7	16,8

Source: based on the data from comtrade

Export of wheat by estimates in 2015/2016 will constitute 24.45 million tons and in 2016/2017 – 31.5 million tons in case of total exports grain in 34.7 and 42.5 million tons respectively.

Wheat is the main export culture in Russia. About 8% of all world gross production of wheat is the share of our country (a share on crops – more than 11%). Acreage in Russia is steadily expanded (Tresling V. V., 2009).

Gross charges of wheat in Krasnodar Region in 2015 constituted 8 464 thousand tons, these are 13.7% of general amount across the Russian Federation. The region wins first place on charges of wheat to the Russian Federation and the sixth place by the size of acreage of this culture (5.5% of the general areas of wheat across the Russian Federation).

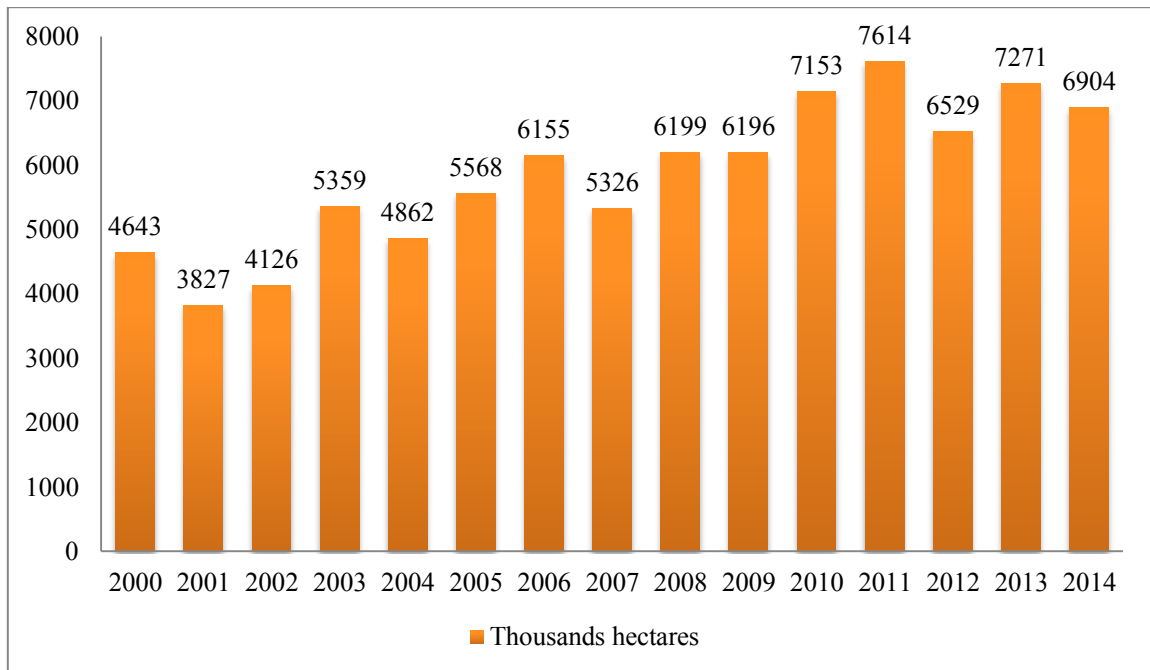
3.2.1.2 Production of sunflower in Krasnodar Region

The market of sunflower and sunflower oil has a strategic importance for Russia. Food security of the country, its security with vegetable oils and oil-containing products in many respects depend on the level of production sunflower development.

According to Rosstat data sunflower acreage in 2014 constituted 6 903.9 thousand hectares, this is 5.1% less than was sowed in 2013 but for 5.7% exceeds similar indicators in 2012 (ab-centre.ru).

In the figure 3 are displayed sunflower acreage in Russia during 2000-2014. Krasnodar Region plays the main role in these acreages.

Figure 3 Sunflower acreage in Russia during 2000-2014 (thousands hectares)



Source: Rosstat

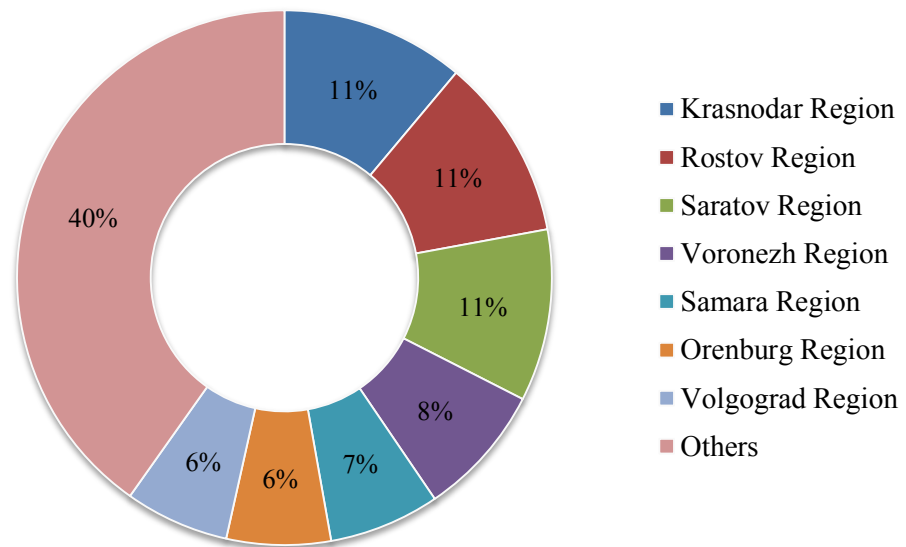
Productivity of sunflower in the Russian Federation in 2014 according to Rosstat was 14.0 c/hectare of the cleaned area that is 9.7% less than an indicator of 2013 – 15.5 c/hectare. The maximum value of productivity of sunflower in the Russian Federation was observed in 2013 – 15.5 c/hectare of the cleaned area, the minimum value – in 2001 – 7.8 c/hectare of the cleaned area.

The analysis of annual average tendencies for the long period allows to determine a contribution of advanced technologies usage to change of sunflower productivity in Russia.

Special value has cultivation of sunflower in the territory of Krasnodar Region: the specific weight of gross collection from the all-Russian level is 10.3%. Rather high productivity of sunflower in Kuban allowed in case of a share in the general sizes of the areas at the level of 6.6% to collect 12.4% of a general harvest of sunflower in the Russian Federation. Total value of harvest is 9810.8 thousand tons (Burlakova E., 2016).

In the figure 4 it is feasible to see that Krasnodar Region is the leader in sunflower production on the current time.

Figure 4 Structure of sunflower production in Russian Regions (in percentage)



Source: based on the data from ab-centre.ru

Production of sunflower seeds on November 01, 2016 in Krasnodar Region is 1 090.1 thousand tons it is 11.1% in a total amount of charges. Growth in a year constituted 57.8 thousand tons or 5.6% (Tresling V. V., 2009).

4 Practical Part

The practical part includes observation of financial aspects in agriculture. Further will be described deals in previous years and current situation for winter wheat and for sunflower and their export abroad.

One of the points in analytical part is description of prices on the products. So, prices on winter wheat and sunflower will be observed during some years. Also trends in prices for nearest years will be predicted.

Econometric model is one of the tools for analysis of crop production. Two econometric models will be built: winter wheat econometric modeling and sunflower econometric modeling. In theoretical part was mentioned that winter wheat and sunflower are the main products which are cultivated in Krasnodar Region.

In this part will be described the main factors which influence on the winter wheat production and sunflower production. For the best observation were taken not only one product. It is interesting to compare two econometric models with the same products during one period of time. But in two cases influencing of the same variables will be different for various products.

Finally, results will present variables which are more influential on economic part of cultivation of winter wheat and sunflower.

4.1 Economic analysis

Food drives the world; apart from clean water, access to adequate food is the primary concern for most people on earth. This makes agriculture one of the largest and most significant industries in the world; agricultural productivity is important not only for a country's balance of trade, but the security and health of its population as well.

Krasnodar Region plays the main role for Russian Federation in agribusiness. For the comparison data throughout Russia will be taken and its value in export, prices and yield of wheat and sunflower.

4.1.1 Winter wheat production

Southern Federal District is the leader in production of wheat. Gross charges here in 2013 constituted 14.2 million tons that is 26.7% more than in 2012. However in view of the fact that production surpluses in the Southern Federal District in 2013 were slightly lower than on average across the Russian Federation, the district share in the all-Russian production decreased from 29.6% to 27.2%.

The rating of regions of Russia on gross collection of wheat in 2013 is the next. First place among all regions of Russia on gross charges of wheat in 2013 is won by Krasnodar Region where they reached 6968.2 thousand tons. These are 13.4% of the all-Russian production. The second place is taken by Stavropol Region – 5257.2 thousand tons or 10.1% of general charges across the Russian Federation. On the third place is the Rostov region with 4743.4 thousand tons (9.1%) (ab-centre.ru).

4.1.1.1 Wheat export

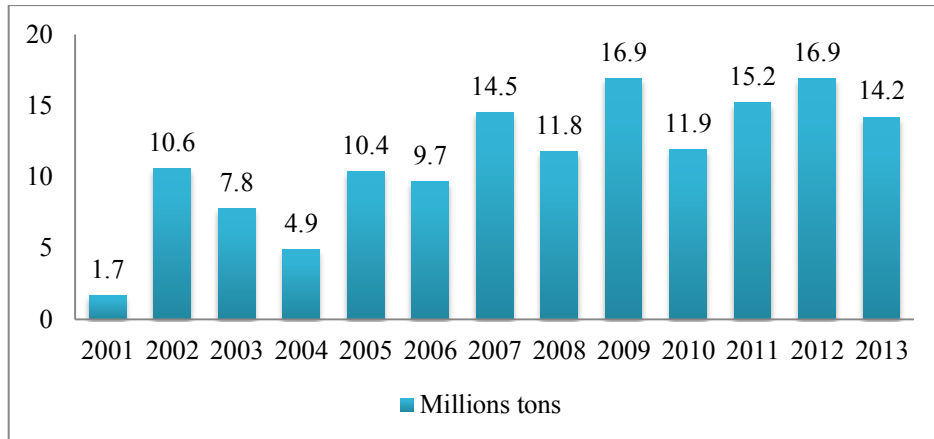
One of the important parts in the wheat production is export of wheat abroad. Economic situation of the country depends on possibility to supply own products to another countries. This is necessary not only for world trade but also for international relationship.

In previous points influent of wheat was described among Krasnodar Region and Russia in general. In this point will be described information about countries who are the main consumers of Russian wheat.

Figure 5 shows dynamic of wheat export from Russia during 2001-2013 period of time. General tendency presents gradual growth in export.

Further will be described wheat export for 2012-2016 period of time in more detail.

Figure 5 Value of wheat export from Russia during 2001-2013 (million tons)



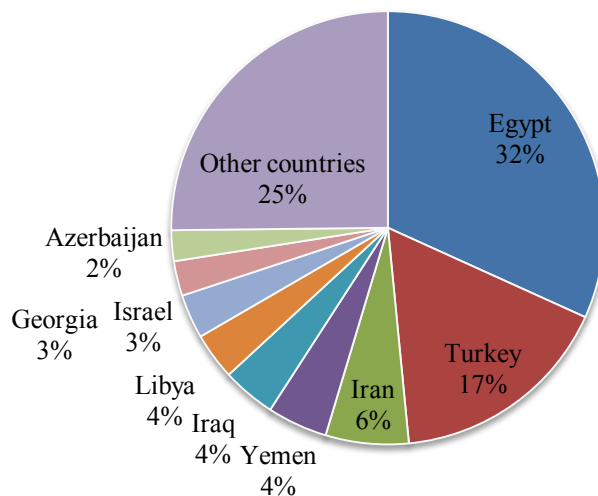
Source: *ab-centre.ru*

According to statistical data, the largest countries for wheat export from Russia during the 2012 year were Egypt and Turkey with shares of 32% and 17%. The total export amount is 16.9 million tons. Other large directions of sale were Iran, Yemen, Iraq and Libya, where around 4-6% of exports belong to these countries (Burlakova E., 2016).

Israel, Georgia and Azerbaijan take about 2-3% of wheat export from Russia.

Countries who are the main consumers of Russian wheat are revealed in the figure 6.

Figure 6 Structure of wheat export from Russia to the countries in 2012 year (in percentage)



Source: *ab-centre.ru*

For comparison export during 2013 is presented below.

According to official statistical data of customs authorities, wheat takes the 9th place in structure of export of the major Russian goods in January-November, 2013. The amount of its export in 2013 was 14.2 million tons that is 15.6% less than the previous year.

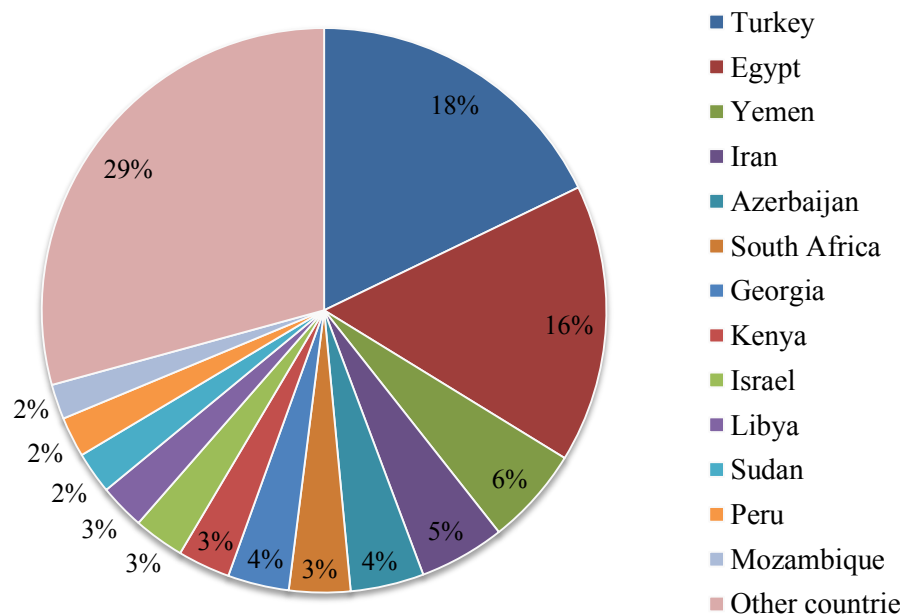
The cost of export of wheat in 2013 constituted 3.6 billion USD that is 23.8% less than a year ago.

Two key directions of wheat export from Russia in 2013 are Turkey and Egypt where 33.7% of all exported wheat were shipped in total.

Other main consumers are Yemen, Iran and Azerbaijan where 4-6% is share of export. Total export amount is 14.2 million tons (ab-centre.ru).

In the figure 7 is depicted structure of wheat export from Russia to the countries in 2013 year.

Figure 7 Structure of wheat export from Russia to the countries in 2013 year (in percentage)



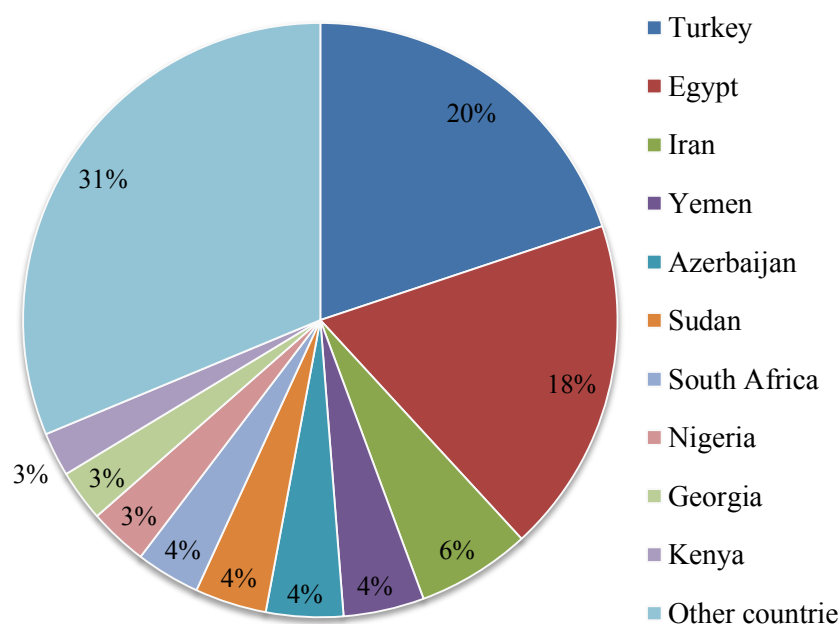
Source: ab-centre.ru

Annually the largest volume of wheat export from the country is necessary for July-September. So, in 2013 for these three months more than a half of all volume this is 7.7 million tons has been exported.

In 2014 Russia closes the three of the largest exporters of wheat in the world, with volumes of export deliveries and without trade with Belarus and Kazakhstan. Total amount is 22.1 million tons. It for 60.4% or for 8.3 million tons is more than similar indicator for 2013. In 5 years (in relation to 2009) volumes of Russian export of wheat have grown by 32.1%, in 10 years (by 2004) this is for 373.4%. Following the results of 2014 in structure of world wheat export the share of Russia were 12.6% (Minakova I. A., 2008).

Structure of wheat export from Russia to the countries in 2014 year is in the figure 8. Turkey and Egypt are still the main countries which are consumer wheat from Russia. Iran, Yemen, Azerbaijan, Sudan and South Africa follow with 4-6% of share.

Figure 8 Structure of wheat export from Russia to the countries in 2014 year (in percentage)



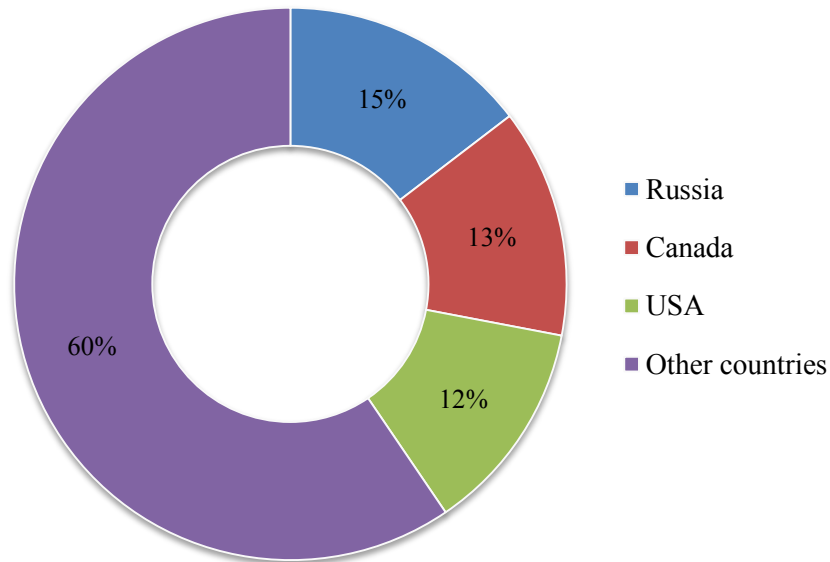
Source: *ab-centre.ru*

More interesting situation became in 2015 year when Russia have raised by list top among world's largest countries exporters. Total amount of export from Russia was 25.5

million tons. In the same time Canada had 22 million tons and the USA had 21.09 million tons.

Figure 9 is demonstrated largest exporters of wheat in percentage.

Figure 9 Largest world exporters of wheat in 2015/16



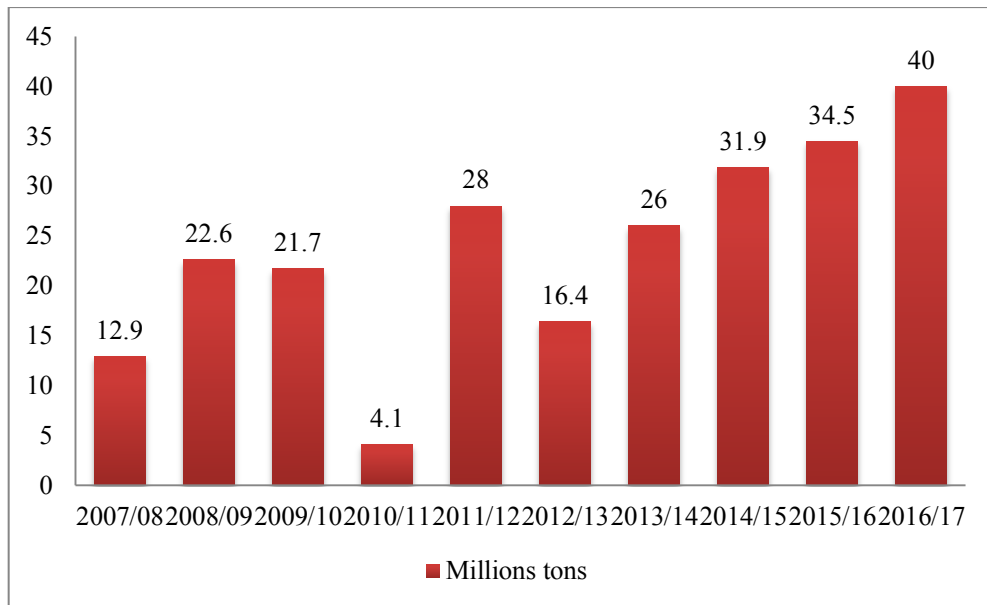
Source: vedomosti.ru

Total amount of wheat export during 2015/16 agricultural year was 168.3 millions tons among of all countries.

According to the Russian Ministry of Agriculture for August 15, 2016 grain and leguminous crops are cleaned on 21.9 million hectares it is 46.4% of cultivated area (for the same date there were 19.4 million hectares the previous year) and already were 72.7 million tons of grain (the previous year there were 57 million tons). Productivity has increased from last year's 29.4 c/hectare to 33.1 c/hectare.

Figure 10 shows dynamic of crop export during 2007-2016 agricultural years. Situation of the last three years can predict favorable trends in export of crops and the main part in export of wheat which is more productive crop for Russia. In Krasnodar Region gross collecting grain in 2016 was 14.7 million tons (ab-centre.ru).

Figure 10 Export of crop from Russia (in millions tons)



Source: vedomosti.ru

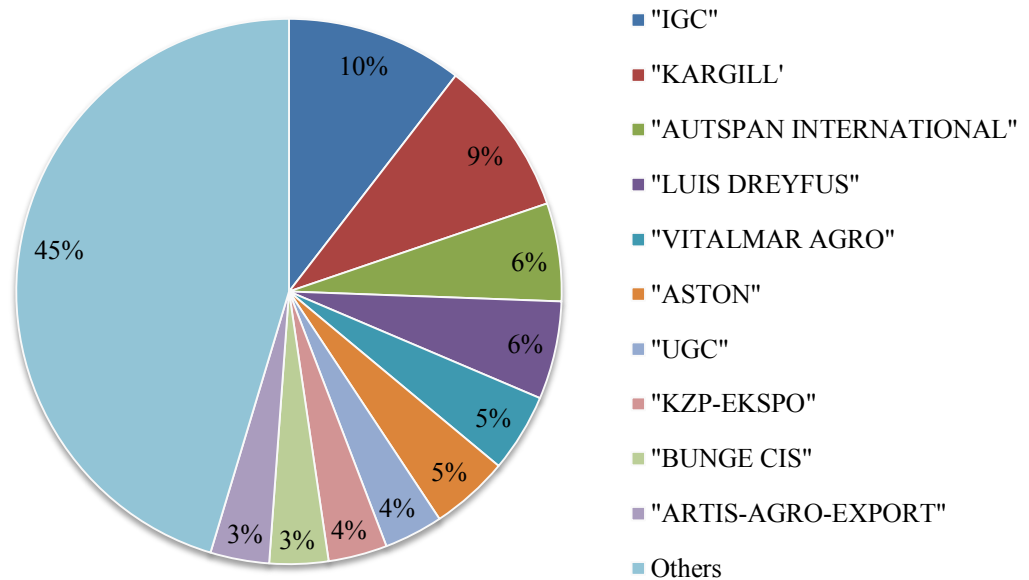
According to the Southern customs office, for January-September, 2016 from Krasnodar Region have sent 5.3 million tons of cereals from them 3.6 million tons of wheat for export.

The main import countries of grain and its products of processing are Albania, Greece, Djibouti, Egypt, Yemen, Jordan, Spain, Kenya, Lebanon, the Republic of Korea, Turkey, Sudan, Bangladesh and some other.

Krasnodar Region is important center for communication between countries. It has main seaports which connect with general countries-consumers of Russian wheat. One of the biggest seaports in Krasnodar Region is Novorossiysk where are main shipments of grain.

List of companies which have deal with export of grain to other countries during period 2014-2015 will be shown below (figure 11). These companies play meaningful role for agricultural industry not only in Krasnodar Region but also among all Russia.

Figure 11 The main companies exporters of grain from Russia during the season 2014/2015 (in percentage)



Source: based on the data from agro2b.ru

So, it is rating of the most powerful companies from top to bottom.

Place 1: Superiority in export of grain from Russia belongs to LLC “International Grain Company”. The market share of the company constitutes 9%. Novorossiysk through which 46.39% of grain was sent remains primary port of shipment for IGC. The Temryuk port – 35.23% of the shipped grain became the second for popularity. Through Rostov-on-Don and Caucasus port 9.8% and 5.9% of grain respectively were exported.

Place 2: Cargill. The share of the company export grew to 8%. A part of grain was shipped through the Novorossiysk port.

Unlike the closest competitors, Cargill chose as the main direction of export Sudan where about 22% of grain left. Further Turkey (16.76%) and Saudi Arabia (13.42%) follow. Also Cargill sent about 13% of grain to Nigeria. Small batches in the past season went to Israel, Peru, the UAE and Algeria (agro2b.ru).

Place 3: Autspan International. 5% of the market is the share of the company.

Traditionally Autspan prefers to cooperate with Saudi Arabia (26% of the shipped grain), Iran (19%), Nigeria (15.5%), leaving less than 20% of export on a total share of Turkey and Egypt. About 8% of grain delivered to Jordan. The main amount of grain was shipped through Novorossiysk.

Place 4: "Luis Dreyfus Kommoditiz Vostok" also occupies 5% of the export market.

So far the main point Luis Dreyfus remains Novorossiysk. Through port there passed 84% of export.

Place 5: "Vitalmar Agro".

During the season 2014/2015 share of export "Vitalmar the Agro" grew to 4% of the market. The main amount of grain is shipped through Tuapse port, having provided the most part of a grain cargo flow of port. About 42% of grain is sent through Novorossiysk.

"Vitalmar Agro" in the past season sent about 23.5% of grain to Egypt. To Yemen 12% of the Russian grain, and are shipped to Saudi Arabia – 11%. Also about 11% of export intended for Korea. To Turkey slightly less than 8% of grain is delivered.

Place 6: Aston. Share of company export is 4% of the market.

The geography of Aston export includes Turkey (27% of grain), Egypt (15.7%), Iran (15.7%), Saudi Arabia (13%) and Kenya (6.2%). Other grain was shipped generally to the countries of the Middle East.

Place 7: "The consolidated grain company". The market share of the company grew to 3% of the market.

The company is the largest supplier of grain for Jordan. And also is the only exporter of the Russian grain in Nicaragua (ultimagazine.ru).

Place 8: Krasnodarzernoprodukt Expo". A share in the market is 3%.

Shipped about 62% of KZP grain through Novorossiysk, 19% of export passed through Yeysk, 8.5% - through Caucasus port. Export supply of grain was performed mainly to the countries of the Mediterranean Basin and the Middle East - Egypt, Turkey, Algeria, Albania, Jordan, Lebanon, the UAE, etc. – to more than 15 ports.

Place 9: Export volume of the Russian grain at "Bunge SNG" from market shares is 3%.

Among exporters of the Russian Bunge grain is the leader in deliveries to Egypt, Georgia and Mexico. 34.36% of grain went to Egypt, Mexico received 17.54% of export of

Bunge, and 14,84% are sent to Georgia. The share of export to Turkey constitutes 9.42% of grain crops. Smaller batches of grain were shipped to the Middle Eastern and African countries.

Place 10: Artis-Agro Export Company. The company occupies 3% of the market.

"Artis-Agro Export" has business contacts with the companies from Europe, North Africa and Central Asia. The main partners are such companies as Cargill (USA), Bunge (Germany), Topfer (Germany), Glinkor (USA) and others. Therefore the main buyers of "Artis-Agro Export" are the countries of Africa, Europe, and the Middle East (agro2b.ru).

In the table 3 is displayed information about realization of wheat in farms of all categories in Krasnodar Region during 2010-2015 period of time. It is available to notice how many thousand tons all farms realized of wheat.

Table 3 Realization of wheat in farms of all categories (thousand tons)

Year	Farms of all categories	Agricultural organizations	Farms
2010	5277	4065	1210
2011	6760	5310	1449
2012	3883	2910	972
2013	5927	4293	1633
2014	6679	4802	1876
2015	7375	5274	2100

Source: based on the data from krsdstat.gks.ru

In 2015 the volume of grain export through ports of Krasnodar Region reached 20.574 million tons. The Russian grain through the Kuban ports in 2015 was delivered to 64 countries including of Egypt, Bangladesh, Nigeria, the Republic of South Africa, Sudan, Yemen, Morocco, and Turkey. Export of grain and products of its processing through ports of Krasnodar Region in 2016 was 21.346 million tons that is 3.8% higher than in 2015 (krsdstat.gks.ru).

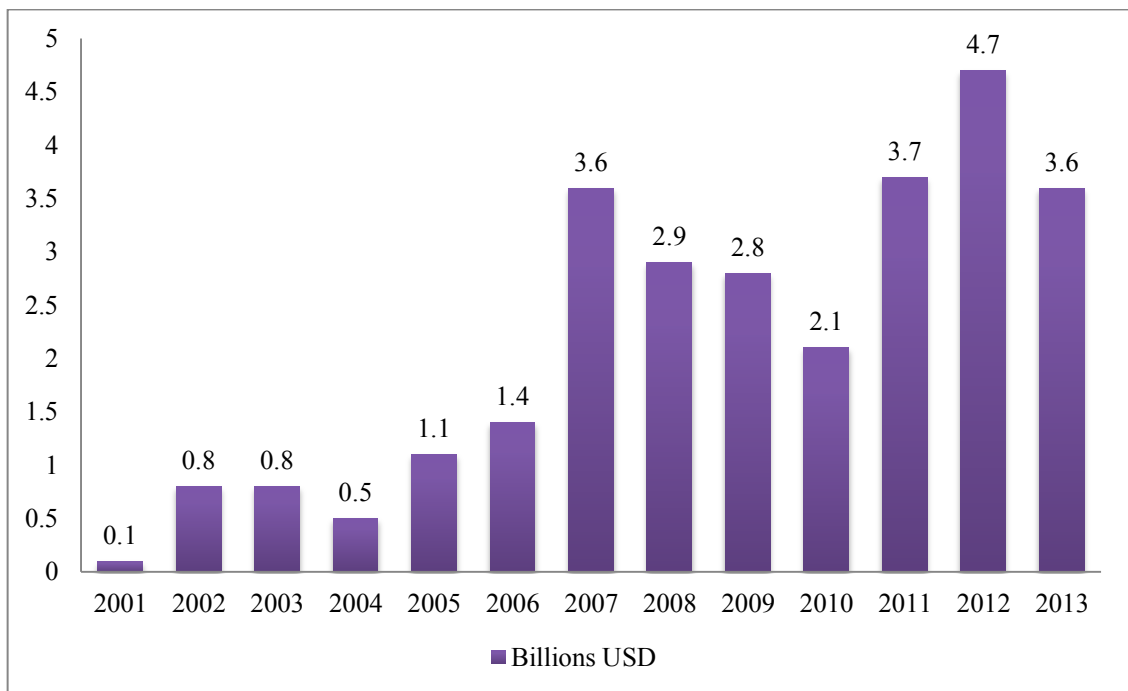
4.1.1.2 Dynamics of wheat cost

Top prices on wheat in Russia were observed at the beginning of 2013. One of the lowest levels of a wheat harvest in 2012 over the last 10 years in Russia is the reason. After

the beginning of new harvest cleaning in 2013 the prices fell significantly. So, in comparison with the first quarter 2013, in the fourth quarter the same year average prices on wheat in Russia dropped more than by 35% and were at the level of a little more than 6 thousand rub/t (ab-centre.ru).

Figure 12 shows cost of wheat export from Russia during period 2001-2013 in billions USD.

Figure 12 Cost of wheat export from Russia during 2001-2013 years (billions USD)



Source: ab-centre.ru

Krasnodar Region is the main region which is transported wheat abroad. Costs of wheat in Krasnodar Region play important role in economic structure of Russia.

In the table 4 can be evaluated dynamic of wheat costs during period 2010-2016 in rubles per ton. Significant leap occurred within these years. A price increased by 6391 rubles and this is 61.73% (krsdstat.gks.ru).

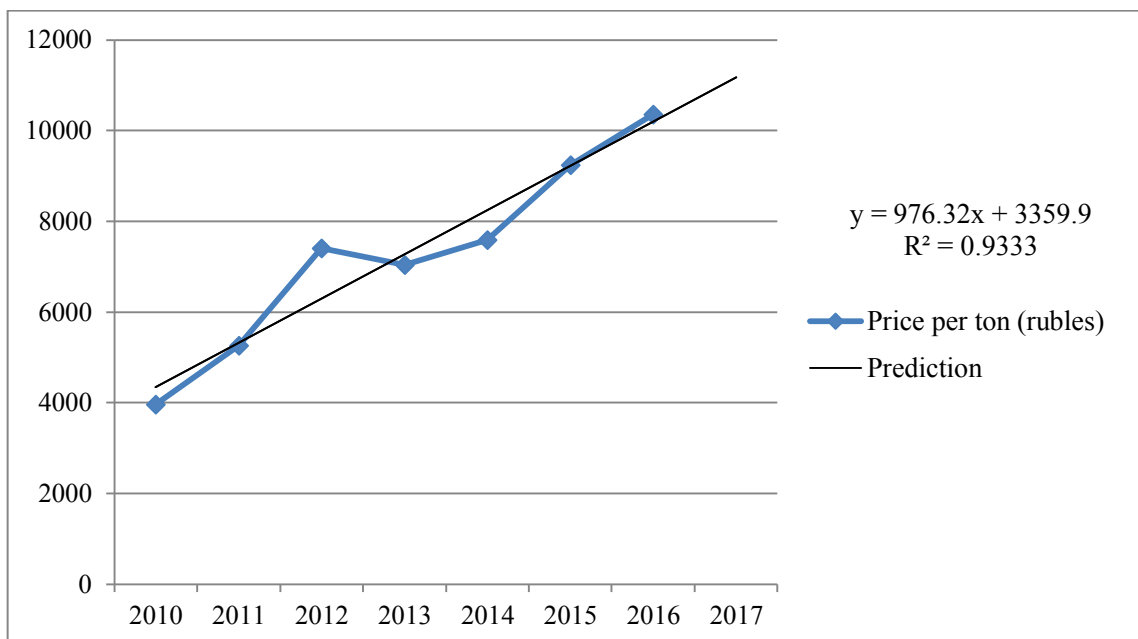
Table 4 Prices of winter wheat per ton in Krasnodar Region

Year	Price per ton (rubles)
2010	3962
2011	5255
2012	7413
2013	7033
2014	7593
2015	9247
2016	10353

Source: based on the data from krsdstat.gks.ru

Based on statistical data from official sources can be predicted price of wheat on the future agricultural year (figure 13).

Figure 13 Prediction of wheat price on 2017 year (per ton in rubles)



Source: own work based on the data from krsdstat.gks.ru

From the figure above it is feasible to identify that coefficient of determination (R^2) equal 0.9333. It means that this prediction is statistically significant. Also linier equation was getting.

Formula 1 Linier equation of winter prediction

$$Y = 976.32 * X + 3359.9,$$

where Y is price and X is year.

Variable before X equal 976.32 it means that price of wheat will be raised by 976.32 rubles within one year.

This situation is good trend for winter wheat production and its export from the economic point of view.

But price is only one component of successful wheat development. Main value belongs to yield of winter wheat. That is why in the next point econometric model of winter wheat yield will be observed and main variables will be defined which influence on this value.

4.1.2 Sunflower production

Sunflower is economically effective culture in the region, however in the 1990th doubling of sunflower acreage was followed by decrease in productivity, crushing of sites in connection with emergence of a large number of small producers, increase in expenses of work and cost of seeds production.

But nowadays this agriculture is significant for Krasnodar Region. Kuban is the leader of sunflower production among other regions.

4.1.2.1 Sunflower export

The volume of sunflower seeds export from Russia in relation to gross gathering is on low marks.

But at the same time Russia in large volumes exports products of seeds processing of sunflower it is generally sunflower oil.

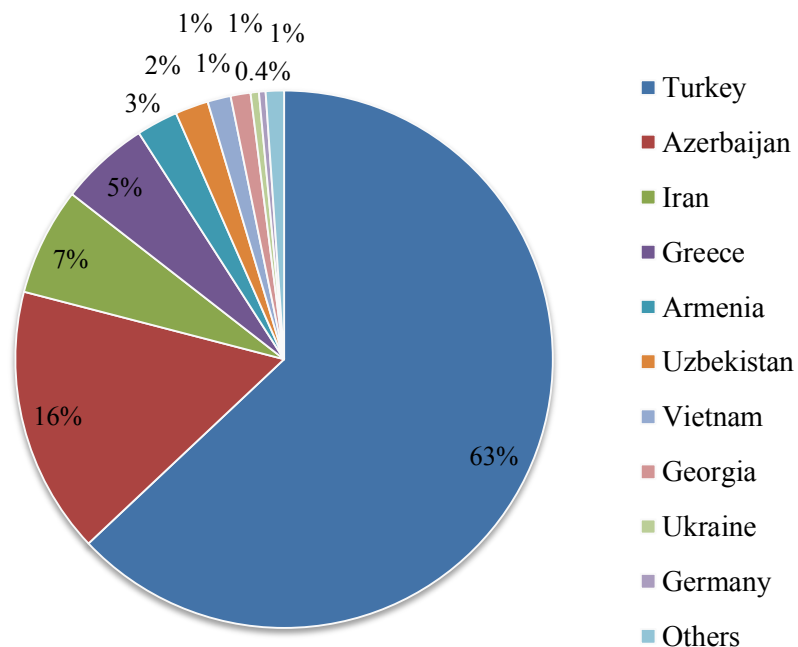
The export volume of sunflower seeds from Russia in 2015 (without shipments to the countries of the Customs union of EEU) was 37.1 thousand tons that is 47.2% and this is on 33.1 thousand tons is less than in 2014. The cost of export constituted 12.9 million USD (Burlakova E., 2016).

The main buyer of the Russian sunflower is Turkey. In 2015 the share of Turkey in the total amount of export decreased to the level of 50.3% in the same time in 2014 it was 63.1%.

Azerbaijan is the second place of the Russian sunflower export and its share is 26.7% in 2015. Export from Russia to Azerbaijan in relation to 2014 decreased by 12.3% and in 2015 was 9.9 thousand tons.

Figure 14 shows structure of sunflower export from Russia to countries in 2014 year. Total value of export is 70.2 thousand tons.

Figure 14 Structure of sunflower export from Russia to counties, 2014 year (in percentage)



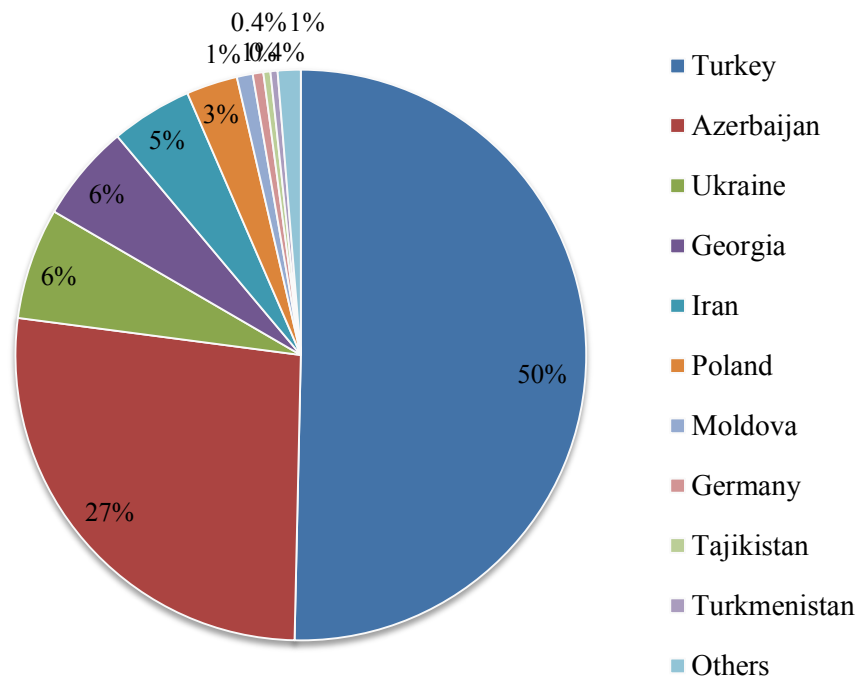
Source: *ab-centre.ru*

In 2015 amounts of sunflower export from the Russian Federation to Ukraine increased up to 2.3 thousand tons. For comparison, in 2014 amounts were 0.3 thousand tons. Following the results of 2015 the share of Ukraine in the total amount of sunflower export from Russia constituted 6.3%.

Sunflower export growth was to Georgia - from 0.8 thousand tons in 2014 to 2 thousand tons in 2015. The share of Georgia in 2015 reached 5.5% against 1.2% in 2014 (*ab-centre.ru*).

For comparison figure 15 demonstrates structure of sunflower export from Russia to countries in 2015 year. Total value of export is 37.1 thousand tons.

Figure 15 Structure of sunflower export from Russia to counties, 2015 year (in percentage)



Source: *ab-centre.ru*

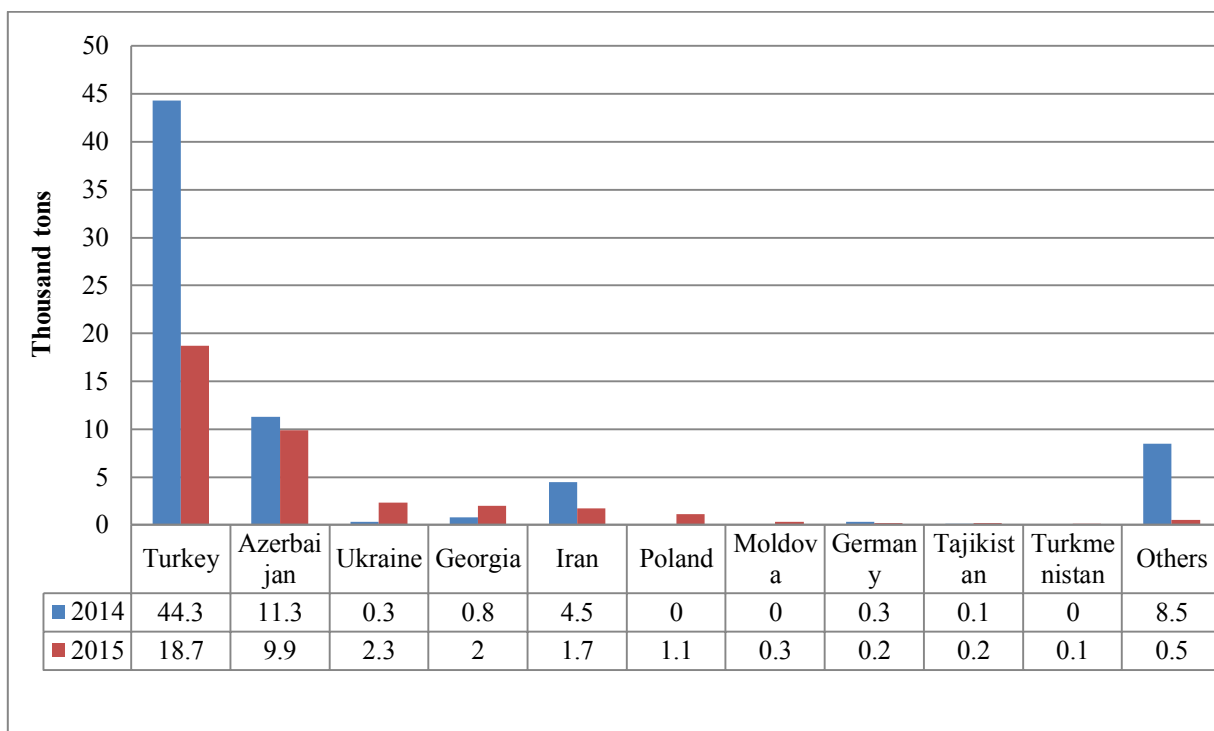
In TOP-10 the key buyer's countries of the Russian sunflower seeds in 2015 have also entered:

- Iran (export volume is 1.7 thousand tons, a share in the total amount of import is 4.6%);
- Poland (1.1 thousand tons this is 2.9%);
- Moldova (0.3 thousand tons this is 0.9%);
- Germany (0.2 thousand tons this is 0.6%);
- Tajikistan (0.2 thousand tons this is 0.4%);
- Turkmenistan (0.1 thousand tons this is 0.4%).

Cumulative deliveries of sunflower seeds to the countries which haven't entered in TOP-10 have made 0.5 thousand tons and this is 1.3% of total amounts of export (*ab-centre.ru*).

In the figure 16 it is available to recognize of dynamic of sunflower export from Russia to countries during period of 2014-2015 in thousand tons.

Figure 16 Dynamic of sunflower export from Russia to countries during 2014-2015 (thousand tons)



Source: *ab-centre.ru*

Sunflower export from Russia in January-February of 2016 constituted 13.3 thousand tons. In relation to January-February of 2015 deliveries were reduced by 32.8% or for 6.5 thousand tons, in relation to the same period of 2014 - were reduced by 43.4% or for 10.2 thousand tons (Burlakova E., 2016).

If take of Krasnodar Region separately from other regions of Russia it is possible to recognize that this value is big. These numbers confirm high influence of Krasnodar Region on deliveries of sunflower abroad.

In the table 5 is shown information about realization of sunflower seeds in farms of all categories in Krasnodar Region during 2010-2015 period of time. It is feasible to defect how many thousand tons all farms realized of sunflower seeds.

Table 5 Realization of sunflower seeds in farms of all categories (thousand tons)

Year	Farms of all categories	Agricultural organizations	Farms
2010	925	658	262
2011	771	498	268
2012	969	695	269
2013	890	608	277
2014	936	651	281
2015	857	582	270

Source: based on the data from krsdstat.gks.ru

It is possible to notice that realization of sunflower seeds is decreased by 7% in comparison of data during 2010-2015 period of time. But fluctuations of realizations are in limits of 100 thousand tons. Only in 2011 realization represents the lowest indicator in 771 thousand tons. But tendency of other years shows that this indicator can be improved in the future years.

4.1.2.2 Sunflower prices

If to observe of sunflower prices in period of 2010-2016 then great growth will be defined.

During last years prices of sunflower seeds rapidly are increasing. So, between 2014 and 2015 period of time it is possible to allocate that sunflower price per ton is increased by twice in Krasnodar Region. In percentage it is about 80% of growth. It is connect with depreciation of ruble.

On the other hand in 2015/16 agricultural year sunflower price a little bit decreased in comparison with previous year. Deficiency of raw materials in the market remains because capacities of the Russian factories exceed the sunflower volumes planned to process. Therefore now the internal price of sunflower is rather low it is about 20–22 rubles per kilogram depending on the region. Price considerable decrease isn't expected (Tresling V. V., 2009).

In the table 6 prices of sunflower seeds during 2010-2016 are depicted.

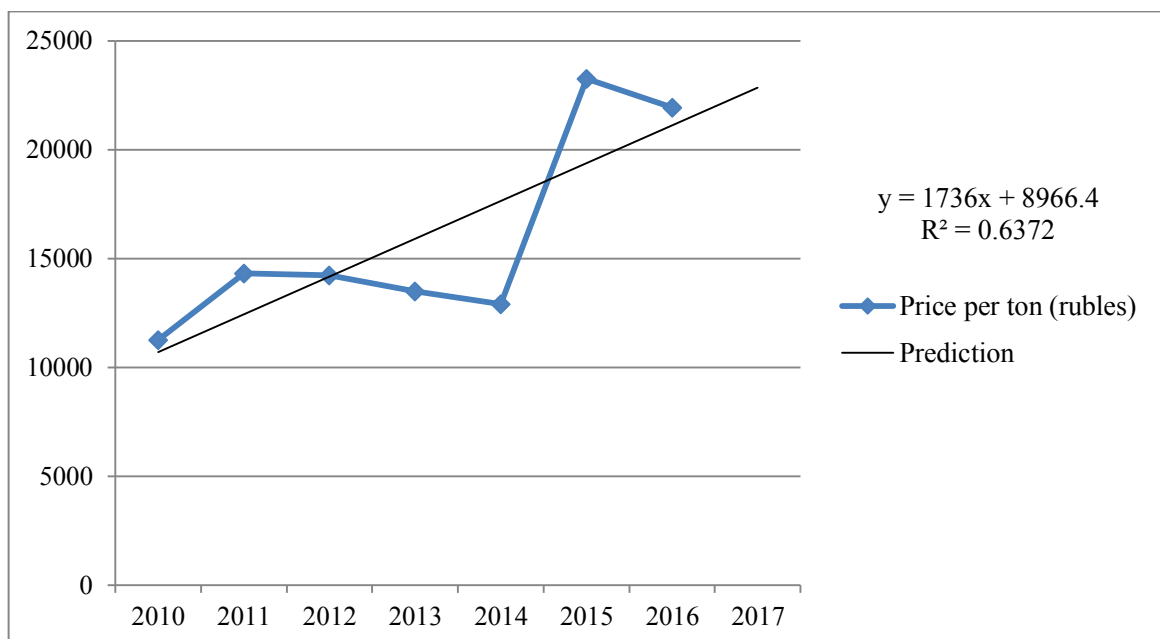
Table 6 Prices of sunflower per ton in Krasnodar Region

Year	Price per ton (rubles)
2010	11252
2011	14325
2012	14221
2013	13484
2014	12891
2015	23254
2016	21945

Source: based on the data from krsdstat.gks.ru

Based on statistical data line of trend can be formed which shows prediction of price on the future year. Figure 17 shows dynamic of sunflower prices and line of trend (prediction).

Figure 17 Prediction of sunflower price on 2017 year (per ton in rubles)



Source: own results based on the data from krsdstat.gks.ru

According to figure above coefficient of determination and linier equation were got. Coefficient of determination (R^2) equal 0.6372 and it means that this trend is significant for the future year by 63.72%.

Formula 2 Linier equation of sunflower prediction

$$Y = 1736 * X + 8966.4,$$

where Y is price and X is year.

Variable before X equal 1736 it means that price of sunflower will be increased by 1736 rubles within one year.

This is positive trend for sunflower production and its export from the economic point of view.

But price is only one component of successful sunflower development. Main value belongs to yield of sunflower seeds. That is why in the next point econometric model of sunflower yield will be observed and main variables will be defined which influence on this value.

4.2 Econometric model

An economic model is a set of assumptions that describes the behaviour of an economy. The three main aims econometrics are as follows:

- formulation and specification of econometric models;
- estimation and testing of models;
- using of models.

Econometric modeling is the main tool for getting of quality practical part. For this purpose will be used SPSS program. SPSS is a comprehensive system for analyzing data. This program has scores of statistical and mathematical functions, scores statistical procedures, and a very flexible data handling capability. Two equations of linier model were analyzed in the final (Borodich S. A., 2011).

Standard linear model are the basis for expected equations.

Formula 3 General linear model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \varepsilon,$$

where Y is dependent variable and X_1, X_2, \dots, X_k are independent variables (Dougherty C., 2009).

Correlation analysis, coefficient of multiple determinations, P value ant other values will be observed during building of econometric model.

4.2.1 Econometric modeling of winter wheat

According to statistical data from official sources of Krasnodar Region main variables were taken for econometric modeling. They show of influence on winter wheat growth. So, for example, these variables are: yield, price per ton, mineral fertilizers, total tones, land, average monthly salary and machines for seeding.

Factors are presented in the next measures: yield in ton per hectare, price per ton in rubles, mineral fertilizers in kilograms per hectare, land in thousands hectares, average monthly salary in rubles, machines for seeding in units and total tons in thousands tons.

For the building of econometric model are necessary to choose Y and X. So, yield of winter wheat per hectare was taken for the variable Y. And X is another factor which includes the remaining variables.

Data are observed during 2010-2015 period of time. All factors and data are available to recognize in the table 7.

Table 7 Data of winter wheat

Year	Yield (t/h)	Mineral Fertilizers (kg/h)	Total tons (thousands tons)	Land (thousand hectares)	Average monthly salary	Machines for seeding (units)	Price per ton (rubles)
2010	4,97	141	6516	1310	13376	6571	3962
2011	5,51	152	7203	1307	15109	6634	5255
2012	3,98	164	4493	1128	16617	6251	7413
2013	5,01	150	6954	1387	18296	6013	7033
2014	5,47	160	7642	1398	20031	5926	7593
2015	5,75	163	8452	1470	22432	5467	9247
	y	x1	x2	x3	x4	x5	x6

Source: based on the data from *krsdstat.gks.ru*

The next step is building of econometric model in SPSS program.

Mineral fertilizers, total tones, land, average monthly salary, price per ton and machines for seeding were taken as X₁, X₂, X₃, X₄, X₅ and X₆ variables. In the table 8 is revealed correlation analysis of these variables with dependant variable.

Table 8 Correlation analysis of winter wheat with six variables

		Yield	Fertilizers	Total tons	Land	Monthly salary	Machines	Price
Pearson Correlation	Yield	1,000	-0,070	0,977	0,887	0,439	-0,349	0,155
	Fertilizers	-0,070	1,000	-0,022	-0,056	0,710	-0,631	0,864
	Total tons	0,977	-0,022	1,000	0,962	0,567	-0,509	0,282
	Land	0,887	-0,056	0,962	1,000	0,628	-0,616	0,345
	Monthly salary	0,439	0,710	0,567	0,628	1,000	-0,970	0,943
	Machines	-0,349	-0,631	-0,509	-0,616	-0,970	1,000	-0,920
	Price	0,155	0,864	0,282	0,345	0,943	-0,920	1,000

Source: own results based on the data from SPSS program

In the results of correlation analysis it is possible to see that monthly salary parameter isn't significant for this model. It is because value of monthly salary is high and it can't influence on yield.

The next step is assembling and evaluation of correlation without variable of monthly salary.

Results are displayed in the table 9.

Table 9 Correlation analysis of winter wheat with five variables

		Yield	Fertilizers	Total tons	Land	Machines	Price
Pearson Correlation	Yield	1,000	-0,070	0,977	0,887	-0,349	0,155
	Fertilizers	-0,070	1,000	-0,022	-0,056	-0,631	0,864
	Total tons	0,977	-0,022	1,000	0,962	-0,509	0,282
	Land	0,887	-0,056	0,962	1,000	-0,616	0,345
	Machines	-0,349	-0,631	-0,509	-0,616	1,000	-0,920
	Price	0,155	0,864	0,282	0,345	-0,920	1,000

Source: own results based on the data from SPSS program

So, in the results is shown that total tons variable isn't significant and also as monthly salary doesn't influence on yield of winter wheat.

Further correlation analysis of the four variables will be observed. Results are demonstrated in the table 10.

Table 10 Correlation analysis of winter wheat with four variables

		Yield	Fertilizers	Land	Machines	Price
Pearson Correlation	Yield	1,000	-0,070	0,887	-0,349	0,155
	Fertilizers	-0,070	1,000	-0,056	-0,631	0,864
	Land	0,887	-0,056	1,000	-0,616	0,345
	Machines	-0,349	-0,631	-0,616	1,000	-0,920
	Price	0,155	0,864	0,345	-0,920	1,000

Source: own results based on the data from SPSS program

Price is mostly insignificant among other values and it will be excluded. As a result other correlation analysis will be estimated without variable of price.

Results are shown in the table 11.

Table 11 Correlation analysis of winter wheat with three variables

		Yield	Land	Fertilizers	Machines
Pearson Correlation	Yield	1,000	0,887	-0,070	-0,349
	Land	0,887	1,000	-0,056	-0,616
	Fertilizers	-0,070	-0,056	1,000	-0,631
	Machines	-0,349	-0,616	-0,631	1,000

Source: own results based on the data from SPSS program

Finally, three suitable parameters were getting. Land, mineral fertilizers and machines for seeding are more significant parameters for yield per hectare of winter wheat according to correlation analysis. For the next estimation of data it is necessary to check other important values.

In the next table 12 is revealed coefficient of multiple determinations which shows efficiency of factors influencing on winter wheat cultivation in the sum.

Table 12 Coefficient of multiple determinations for winter wheat (R Square)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,989 ^a	0,977	0,943	0,15137

Source: own results based on the data from SPSS program

So, R Square equal 0.977 that is 97.7%. It means that this model is significant and Y on 97.7% is significant of X.

The next step is analyzing of winter wheat coefficients and P value and getting on this basis of linier model (table 13). Dependent variable is yield and independent are land, fertilizers and machines.

Table 13 Coefficients of winter wheat

Model	Unstandardized Coefficients		Standardized Coefficients	t	P value	
	B	Std. Error	Beta			
1	(Constant)	-22,734	5,508		-4,127	0,054
	Land	0,008	0,001	1,564	7,914	0,016
	Fertilizers	0,048	0,014	0,672	3,351	0,079
	Machines	0,002	0,000	1,039	4,085	0,055

Source: own results based on the data from SPSS program

Using of information above in the table it is feasible to evaluate P value. P value should be less than 0.05. It means that fertilizers and machines variables don't influence on dependent coefficient – yield and these parameters can be excluded from the linier equation.

Formula 4 Linier model of winter wheat

$$Y = -22.734 + 0.008 * X + \varepsilon,$$

where Y is yield and X is land.

According to all factors and values which influence on linier model estimation it is possible to interpret that only one parameter can change value of yield.

If land is increasing on 1 thousand hectare then yield per hectare will be grown by 0.008 tons.

From the received results can be seen that for the best yield per hectare is more reasonable to increase only land.

4.2.2 Econometric modeling of sunflower

Linear regression model of winter wheat was observed in the previous point. For comparison in this point econometric model of sunflower will be built and analyzed. Based on the statistical data from official source in Krasnodar Region will be built linear regression model of sunflower.

And the same parameters will be used for the main variables as in the case with winter wheat. They are: yield, price per ton, mineral fertilizers, total tones, land, average monthly salary and machines for seeding. And the same measures are: yield in tons per hectare, price per ton in rubles, mineral fertilizers in kilograms per hectare, land in thousands of hectares, average monthly salary in rubles, machines for seeding in units and total tons in thousands tons.

Data are observed during 2010-2015 period of time. All factors and data are available to notice in the table 14.

Table 14 Data of sunflower

Year	Yield (t/h)	Mineral Fertilizers (kg/h)	Total tons (thousands tons)	Land (thousand hectares)	Average monthly salary	Machines for seeding (units)	Price per ton (rubles)
2010	2,08	40	1029	494	13376	6571	11252
2011	2,33	43	1056	454	15109	6634	14325
2012	2,32	37	1100	474	16617	6251	14221
2013	2,57	40	1166	454	18296	6013	13484
2014	2,43	48	1103	453	20031	5926	12891
2015	2,41	43	1052	436	22432	5467	23254
	y	x1	x2	x3	x4	x5	x6

Source: based on the data from krsdstat.gks.ru

For the Y variable was taken yield parameter and for the X variable are the other factors: mineral fertilizers, total tones, land, average monthly salary, machines for seeding and price per ton.

The same algorithm of actions are using in this point as in previous point where econometric modeling of winter wheat was described.

In the table 15 is depicted correlation analysis of getting results with six independent variables.

Table 15 Correlation analysis of sunflower with six variables

		Yield	Mineral fertilizers	Total tons	Land	Monthly salary	Machines	Price
Pearson Correlation	Yield	1,000	0,254	0,811	-0,780	0,689	-0,605	0,303
	Mineral fertilizers	0,254	1,000	-0,086	-0,518	0,465	-0,319	0,116
	Total tons	0,811	-0,086	1,000	-0,268	0,288	-0,266	-0,206
	Land	-0,780	-0,518	-0,268	1,000	-0,836	0,715	-0,718
	Monthly salary	0,689	0,465	0,288	-0,836	1,000	-0,970	0,741
	Machines	-0,605	-0,319	-0,266	0,715	-0,970	1,000	-0,749
	Price	0,303	0,116	-0,206	-0,718	0,741	-0,749	1,000

Source: own results based on the data from SPSS program

In the results of correlation analysis it is feasible to emphasize that monthly salary variable isn't significant for this model. It is because value of monthly salary is high and it can't influence on yield of sunflower.

The next step is assembling of other correlation analysis without monthly salary variable. The results are depicted in the table 16.

Table 16 Correlation analysis of sunflower with five variables

		Yield	Mineral fertilizers	Total tons	Land	Machines	Price
Pearson Correlation	Yield	1,000	0,254	0,811	-0,780	-0,605	0,303
	Mineral fertilizers	0,254	1,000	-0,086	-0,518	-0,319	0,116
	Total tons	0,811	-0,086	1,000	-0,268	-0,266	-0,206
	Land	-0,780	-0,518	-0,268	1,000	0,715	-0,718
	Machines	-0,605	-0,319	-0,266	0,715	1,000	-0,749
	Price	0,303	0,116	-0,206	-0,718	-0,749	1,000

Source: own results based on the data from SPSS program

From the table above it is visible that variable of machines isn't suitable for the model and its value is high and it should be excluded.

The next step is forming of the model without machines variable. Results will be shown in the table 17.

Table 17 Correlation analysis of sunflower with four variables

		Yield	Mineral fertilizers	Total tons	Land	Price
Pearson Correlation	Yield	1,000	0,254	0,811	-0,780	0,303
	Mineral fertilizers	0,254	1,000	-0,086	-0,518	0,116
	Total tons	0,811	-0,086	1,000	-0,268	-0,206
	Land	-0,780	-0,518	-0,268	1,000	-0,718
	Price	0,303	0,116	-0,206	-0,718	1,000

Source: own results based on the data from SPSS program

From the information above it is possible to allocate that price per hectare isn't significant for yield per hectare. And for the getting other results will be built the next correlation analysis without this variable.

Results of correlation analysis without price variable are shown in the table 18.

Table 18 Correlation analysis of sunflower with three variables

		Yield	Mineral fertilizers	Total tons	Land
Pearson Correlation	Yield	1,000	0,254	0,811	-0,780
	Mineral fertilizers	0,254	1,000	-0,086	-0,518
	Total tons	0,811	-0,086	1,000	-0,268
	Land	-0,780	-0,518	-0,268	1,000

Source: own results based on the data from SPSS program

The next observation of correlation analysis is shown that mineral fertilizers variable isn't significant for this model and it is necessary to exclude this variable.

In the table 19 are demonstrated results without mineral fertilizers variable.

Table 19 Correlation analysis of sunflower with two variables

		Yield	Total tons	Land
Pearson Correlation	Yield	1,000	0,811	-0,780
	Total tons	0,811	1,000	-0,268
	Land	-0,780	-0,268	1,000

Source: own results based on the data from SPSS program

Significant variables were got after some steps of building of correlation analysis. Total tons and land are mostly influence on yield of sunflower.

Further will be evaluated coefficient of multiple determinations (table 20).

Table 20 Coefficient of multiple determinations for sunflower (R Square)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1,000 ^a	0,999	0,999	0,00580

Source: own results based on the data from SPSS program

So, R Square equal 0.999 that is 99.9%. It means that this model is significant and changing of Y on 99.9% is interpreted of X changing.

The next step is interpretation of sunflower coefficients and P value and getting on this basis of linier model. Coefficients are presented in the table 21. Dependent variable is yield and independent are total tons and land.

Table 21 Coefficients of sunflower

Model		Unstandardized Coefficients		Standardized Coefficients	t	P value
		B	Std. Error	Beta		
1	(Constant)	2,285	0,096		23,790	0,000
	Total tons	0,002	0,000	0,649	39,171	0,000
	Land	-0,005	0,000	-0,606	-36,614	0,000

Source: own results based on the data from SPSS program

It is necessary to check P value. All values of P coefficient are equal 0.00. It means that total tons and land are significant for yield of sunflower.

Linier model was received on the basis of the coefficients.

Formula 5 Linier model of sunflower

$$Y = 2.285 + 0.002 \cdot X_1 - 0.005 \cdot X_2 + \varepsilon,$$

where Y is yield, X₁ is total tons and X₂ is land.

According to this equation it is visible that growth of total tons on 1 thousand per hectare will increase of yield per hectare on 0.002 tons provided that land is not changing.

In the same time if land variable is increasing on 1 thousand of hectare then yield per hectare will decrease on 0.005 tons provided that land is not changing.

Analyzing two variables and its influence on yield it is possible to allocate that increasing of total tons is more significant for sunflower yield then increasing of land amount.

5 Results and Discussion

Winter wheat and sunflower seed are leaders in agro industry of Krasnodar Region. Theoretical and practical parts of this Master's Thesis demonstrate it from various points.

Export of wheat from Russia abroad depicts great figures and statistics.

First of all, total amount of grain was defined by using of Russian statistics. This is 72.7 million tons of grain in 2016 but in the previous year this number was only 57 million tons. It means that growth of grain has made about 22%. And wheat reflects the biggest value in total amount of grain.

So, in Krasnodar Region gross collecting of grain in 2016 was 14.7 million tons. And this is 20% of total amount across all country.

According to the Southern customs office, for January-September, 2016 from Krasnodar Region have sent 5.3 million tons of cereals from them 3.6 million tons of wheat for export. And this is about 24% from grain of Krasnodar Region.

It is feasible to determine of differentiation in realization of wheat in farms of all categories in thousands tons: in 2010 year it was 5277 thousand tons and in 2015 is 7375 thousand tons. Realization is increased by 2098 tons and this is growth by 28%.

Krasnodar Region active takes part not only in cultivation of agricultural products but also it is the meaningful international point for interaction between the countries. The Russian grain was delivered to 64 countries through the Kuban ports in 2015. Export of grain and products of its processing through ports of Krasnodar Region in 2016 achieved 21.346 million tons that is 3.8% higher than in 2015.

Rise of Russian export is connected with number of factors: devaluation of ruble, strengthening of dollar, low tariffs for transportations and unfavorable weather conditions for a harvest in other producing countries.

The next step it is considering of winter wheat prices per ton in rubles across Krasnodar Region. For comparison were taken data during 2010-2016 period of time. It is available to defect that prices were changed by 62% during 6-7 years. 3962 rubles had cost of wheat ton in 2010 and the last agricultural year shows number in 10353 rubles per ton. Such rapid increase in prices is explained by increasing of grain quality.

Line of trend was built on the basis of prices which are mentioned above. And this prediction reveals that price of wheat will be raised by 976.32 rubles within one year. This

is trend is optimal for Krasnodar Region because export is increasing and with growth of prices will increase revenue from selling.

Further results of sunflower analysis will be observed and described.

Sunflower export from Russia in beginning of 2016 constituted 13.3 thousand tons. In relation to beginning of 2015 deliveries were reduced by 32.8% or for 6.5 thousand tons. In relation to the same period of 2014 export was reduced by 43.4% or for 10.2 thousand tons. According to these data it is feasible to notice that trend of rapidly increasing of sunflower export is changed and has tendency to decline.

Realization of sunflower seeds in farms of Krasnodar Region of all categories in thousands tons was monitored. In 2010 realization was 920 thousand tons and in 2015 was 857 thousand tons. It is possible to recognize that realization of sunflower seeds is decreased by 7% in comparison of data during 2010-2015 period of time. But fluctuations of realizations are in limits of 100 thousand tons. Only in 2011 realization demonstrates the lowest indicator in 771 thousand tons. But tendency of other years shows that this indicator can be improved in the future years.

During last years prices of sunflower seeds rapidly are increasing. So, between 2014 and 2015 period of time it is desirable to notice that sunflower price per ton is increased by twice in Krasnodar Region. In percentage it is about 80% of growth. It is connect with depreciation of ruble. This situation has allowed to raise revenue and to increase export.

In 2015/16 agricultural year sunflower price a little bit decreased in comparison with previous year. Deficiency of raw materials in the market remains because capacities of the Russian factories exceed the sunflower volumes planned to process. Currently the internal price of sunflower is rather low it is about 20–22 rubles per kilogram. Price considerable decrease isn't expected. In comparison of years 2010 and 2016 the price was 11252 rubles per ton and 21945 is now.

Line of trend was formed on the basis of prices which are mentioned above. And this prediction shows that price of sunflower will be increased by 1736 rubles within one year.

In comparison of two agrarian cultures with financial point of view winter wheat remains the leader not only in terms of the indicators but also in quality of development and the current tendency.

After evaluation of two these agrarian cultures with economic point of view it is meaningful to define methods of their development in the future. For this purposes econometric modeling was used.

For winter wheat and for sunflower models the same variables were implemented. Dependent value is yield and the aim of econometric modeling is analyzing of factors which are influenced on yield.

The next linier model was got according to winter wheat econometric model:

$$Y = -22.734 + 0.008 * X + \varepsilon,$$

where Y is yield and X is land.

Considering of all factors and values which influence on linier model estimation it is feasible to interpret that only one parameter can change value of yield. If land is increasing on 1 thousand hectare then yield per hectare will be grown by 0.008 tons.

Linier model of sunflower is looking as:

$$Y = 2.285 + 0.002 * X_1 - 0.005 * X_2 + \varepsilon,$$

where Y is yield, X_1 is total tons and X_2 is land.

According to this equation it is visible that growth of total tons on 1 thousand per hectare will increase yield per hectare on 0.002 tons provided that land is not changing. In the same time if land variable is increasing on 1 thousand of hectare then yield per hectare will decrease on 0.005 tons provided that land is not changing. Evaluation of two variables and its influence on yield it is available to emphasize that increasing of total tons is more significant for sunflower yield then increasing of land amount.

6 Conclusion

Krasnodar Region is perspective and development region. It provides of food security of region and country in general. And agricultural industry of region locates the top places among of Russian Federation.

This Master's Thesis described value of winter wheat in Russia and in Krasnodar Region. Wheat is the main exported culture abroad. In 2015/2016 agricultural year Russia became the leader among other export leaders. Russia has overtaken such countries as Canada and USA. This indicator gives encouraging prognosis on the future.

Krasnodar Region is the main channel and point for export of agro products abroad. A lot of companies prefer to use ports which are located in this region. The biggest port is Novorossiysk. Millions of grain is passing through this point.

Sunflower production in Krasnodar Region takes the first place as wheat production. Export of sunflower and products of its processing also plays important role in economic development of country.

Devaluation of ruble was in Russia during 2014/2015 agricultural year. It has exerted strong impact on prices of products in different categories. Mostly this situation has affected on rapidly increase of sunflower prices. Cost was increased by twice. But for international customers these changes were not significant and deliveries abroad did not decrease. Revenues from selling became higher that had positive impact on economic sphere.

Prediction of cost was made for every culture. And both of these predictions tell about trend of price increasing.

Econometric model is one of the tools which is helped to define way of improvement winter wheat and sunflower production. Yield of these products was taken for research. Econometric model of wheat demonstrated that only one variable can influence on measure of yield, this is land. And econometric model of sunflower identified that total tons and land are more significant for yield.

Econometric model is only one of the ways to predict variants of agriculture development. But this is statistics can change in any time. Government should pay attention to development of every sector for confidence in the future. The agricultural industry was always one of the most difficult for development. Taking into account the

huge territory and various climatic conditions for enhancement of agrarian sector in Russia it is necessary to put a lot of efforts.

Government has to publish effective projects, laws, actions and other for development of agriculture. For example, now “State Program of agriculture development and regulation of the markets agricultural production, raw materials and food for 2013 – 2020” operates in Russian Federation (mcx.ru).

Purposes of program are:

- providing population of the country with safe agricultural production and food;
- increase in competitiveness of the Russian agricultural production in the internal and external markets;
- ensuring sustainable development of rural territories, employment of country people, increase of life level and qualification;
- preservation and reproduction of the natural resources used for needs of agricultural production.

This program includes such directions as:

- development of crop production;
- development of livestock production;
- support of small farms;
- technical and technological modernization;
- preservation and restoration of soils fertility;
- development of wholesale distribution centers;
- development of financial and credit system of agro-industrial complex;
- development of branches of agro-industrial complex;
- sustainable development of rural territories.

All of these purposes and programs should be achieved by country. And every factor of development is interconnected between each other. It is essential to pay enough attention to every problem and then agro industry will improve and with it the country will come to new level in the economic sphere.

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