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GREAT DREAMS: MYTH AND REALITY OF THE AGRICULTURAL SECTOR IN SOUTH MACROREGION OF KAZAKHSTAN

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ABSTRACT

This main *aim* of the research paper is to analyze economic indicators of crop production in agriculture sector of South macro region and identify the influence of crop processing and storage enterprises allocation in agriculture development.

Methodological parts of the research paper consists of methods comparison of socio – economic data, regression, correlation and trend analysis.

The *value* of the research is based on determination of link between variety factors and gross output in different oblasts what allows to define the proper way of development.

Finding – Results of the research shows perspective for agricultural development relying on three main issues such as rural population, specialization and storing.

Key words – gross agricultural output, crop production, macro region.

INTRODUCTION

Result of last two decades indicate that agriculture was under support of government. Around ten big state programs were developed and implemented. Some of them still in process. One of them will be discussed in this research paper. It demonstrates allocation of agricultural enterprises in territorial development. According to this document – 'Predictive scheme of territorial and spatial development of the country until 2020' Government made decision to create six macro regions by integrating them in accordance with similarities of economy the oblasts. One of them is called South macro region, which incorporates oblasts such as Almaty, South–Kazakhstan and Zhambyl. In the paper we use word 'oblast', not 'region' in terms of describing each oblast. Because of the word 'region', it covers several oblasts.

They were combined by economic specialization based on agriculture and food production. Also similarities are economic development indicators, climate condition, socio–economic specification of those oblasts. Let's to consider common trait for those oblasts is high concentration of rural population. For example, Almaty oblast's rural population dynamic has stable growth. In 2014 rural population was 1526,8 thousand people (76.9% of total population of the oblast) and in 2016 this indicators demonstrated 75.8% and in 2018 – 1552,8 thousand people (again 76.9%), this year total population of the oblast was 2017.3 thousand people [2]. This fact shows ultimately necessity to develop agriculture economy. The same situation in South Kazakhstan, proportion of rural population is around 60%, in 2014 it's share was 60,1%. From 2014 up to 2015 rural population slightly decreased by 122.7 thousand people, then started again to increase from 1 563,1 thousand people in 2016 till 1 588,2 thousand people in 2018 [3], data of Zahmbyl oblast in 2014 considered by 1110,9 thousand people, including 664,1 thousand rural population, that is 59.7% [4.]. By comparing population of three oblasts with republic level we note that its proportion is 33% according to data in 2018, that is 6 063 693 people, as for rural population of these oblasts 49,1% (3783156 people, whereas total rural population in Kazakhstan is 7700940 in 2017).

Correspondingly, the indicator depicts correctness of developing South macro regions by choosing these oblasts.

Next indicator that we would like to point out is common specific traits for all oblasts in terms of crop production. What is specialization? The table shows how many districts are specialized in various types of crop production.

Table 1 – Specialization similarities of crop production in South macro region

	Wheat	Barley	Corn	Legumes	Sunflower	Feed crops	Potatoes	Vegetables	Apple		Grapes
Almaty	13	17	15	15	16	17	16	17	13		8
South Kazakhstan	9	9	13	6	13	13	7	13	9		10
Zhambyl	8	10	8	7	7	10	7	10	8		8

The table developed based on official site of Agriculture Ministry http://mgov.kz/ [5]

The data shows number of districts, for example, all 17 rural districts of Almaty oblast specialized to produce feed crops, because Almaty oblast has the stable growth of cattle. Also, vegetable plays vital role in agriculture, therefor all districted are specialized there. Potatoes production is important for all oblasts. By analyzing potatoes, we can conclude that potatoes yield has 'unusual picture' (we will discuss it in analytical part). Two big oblasts are specialized on oilseeds – two oblasts Almaty and South Kazakhstan, where located the biggest companies, they are production cooperatives ('Ak-Bidai', 'Birlik', 'Kuiik').

Next indicator that we devote our research is processing, warehousing and storage issues of agriculture products. These issues are oriented to meet costumers' needs. Therefore, we believe, small farmers or individuals cannot solve manage storage or processing issues of their product.

LITERATURE REVIEW

Obviously, main literature will be based on official reports of various organizations both international and local level. According to the World Bank report based on 'Agricultural sector risk assessment' in which published in 2016, gross agriculture output is only around 5%, however, one-third of the country's working population are employed. That is wonderful potential for increasing, enhancing and improving food security issues of the country as well as social livelihoods. Analyzed that agriculture sector of Kazakhstan has strong land resources, however, lack of rainfall period that leads low and highly fluctuated yield level [6].

Johannes Kamp et al devoted research paper to discuss and develop some recommendations for Kazakhstani agriculture sector. Collapse of Soviet Union economy in 1991 resulted in new profound changes. 41 million ha of cropland that were abandoned across the steppe zone in Kazakhstan, since 2000, steppe zone has been recovering in Kazakhstan and combined because of the withdrawal of state support for agriculture. According to the authors' research, more than 50% of abandoned cropland has been reclaimed, and agricultural expansion and intensification are predicted to continue.

Official document of The Economist Intelligence Unit [8] says that our country has a growing labor force and considerable catch-up potential, but the poor business environment, weak competition in some sectors and large distances to global markets will remain significant constraints. It demonstrates economic growth of macroeconomic indicators, namely economic growth of agriculture in 2017 by 3,2%, in 2019 by 3,0%, in 2020 by 2,8% and in 2022 by 2,7% [8]. Real facts depict that growth rate of gross agriculture output equals 10,4% in 2017 with comparison with 2016.

Scientists conduct variety research on Kazakhstani agriculture sector. One of the big arena for research is to assess available idle croplands and their suitability for future cropland expansion via analyzing long-term agricultural land-cover change [9].

MACROECONOMIC ASPECTS

The growth rate of agricultural output of the country depicts solid growth step-by-step.

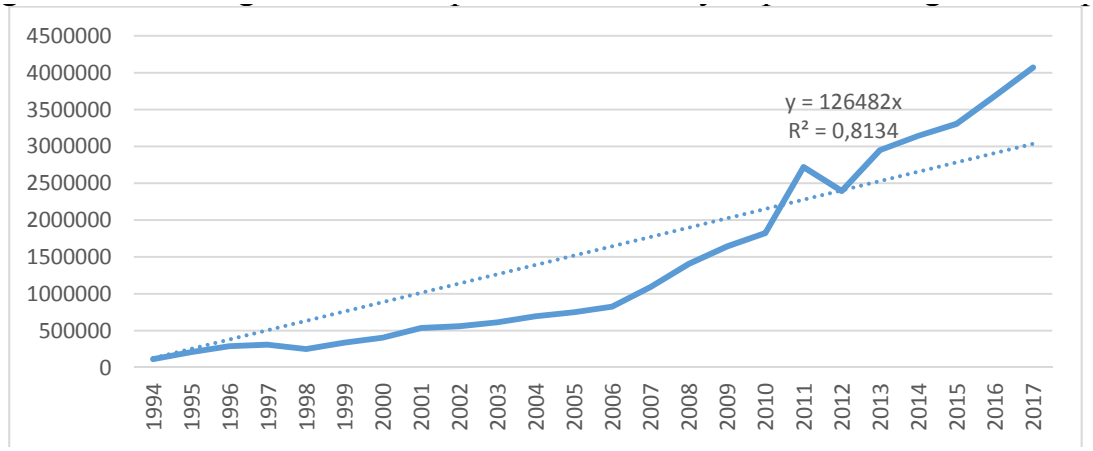

Figure 1 – Times series graph of agriculture output in the Republic of Kazakhstan

This time series graph illustrates constant growth, however, by looking inside of the data, we notice that growth rate is quite weak.

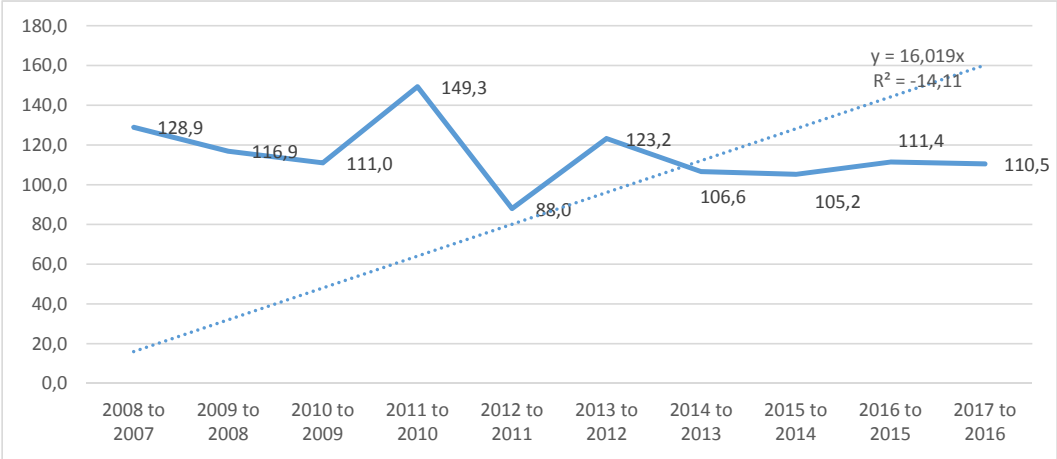

Figure 2 – Growth rate of agriculture output

According to the economic *Rule of 70*, it is noticeable that growth rate is slow down, $\frac{70}{10,5} = 6$, the same growth rate will be repeated within 6 years.

Table 2 – The structure of agricultural product in South macro region

	Almaty oblast	South Kazakhstan	Zhambyl oblast	Total for the South macroeconomic region	Total agricultural output of Kazakhstan	The share of the region in countries level. %
1994	10410.22	8699.646	4 812.4	23 922.3	113611.3	21.1
1995	21804.33	20502	9 987.6	52 293.9	208919.2	25.0
1996	28739.82	22329.01	13 119.6	64 188.4	289073.1	22.2

1997	35498.23	27563.08	13 340.2	76 401.5	308740.1	24.7
1998	40869.69	29804.89	13 753.9	84 428.5	250360.8	33.7
1999	43957.55	36371.02	15 411.9	95 740.4	337253.8	28.4
2000	53605.87	49513.6	19 800.2	122 919.6	404145.9	30.4
2001	64924.76	55676.94	24 037.3	144 639.0	535124	27.0
2002	74905.96	70261.8	31 622.6	176 790.4	558742.3	31.6
2003	80609.16	87699.47	36 453.8	204 762.4	613306.9	33.4
2004	95635.26	80419.7	42 467.9	218 522.9	695801.4	31.4
2005	97290.22	88070.12	39 334.0	224 694.3	749077.8	30.0
2006	108132.3	93134.1	37 038.5	238 304.9	825557	28.9
2007	135318	103398.8	45 680.2	284 397.0	1089384	26.1
2008	187260.1	132972.9	56 656.8	376 889.8	1404493	26.8
2009	230029.8	137926.4	68 356.9	436 313.1	1641352	26.6
2010	296607.6	219786.1	99 374.6	615 768.3	1822074	33.8
2011	373180.2	270416.3	124 501.2	768 097.7	2720453	28.2
2012	424842.4	321108.4	131 789.1	877 739.9	2393619	36.7
2013	482595.4	375478.3	171 821.5	1 029 895.2	2949485	34.9
2014	535445.5	419687.1	218 577.7	1 173 710.3	3143678	37.3
2015	551101.1	426894.4	218 726.5	1 196 722.0	3307010	36.2
2016	597308.3	480399.3	237 065.9	1 314 773.5	3684393	35.7
2017	630931.6	505293.4	251 317.0	1 387 542.0	4070917	34.1

Although the South macro region takes 1/3 of agriculture production of the Republic of Kazakhstan, the growth rate has the same tendency as the entire agriculture production of the country. It is around 5,5%, by applying the Rule of 70 is equals 12 years. Which is no accident. This is a real research question. Slope should be calculated.

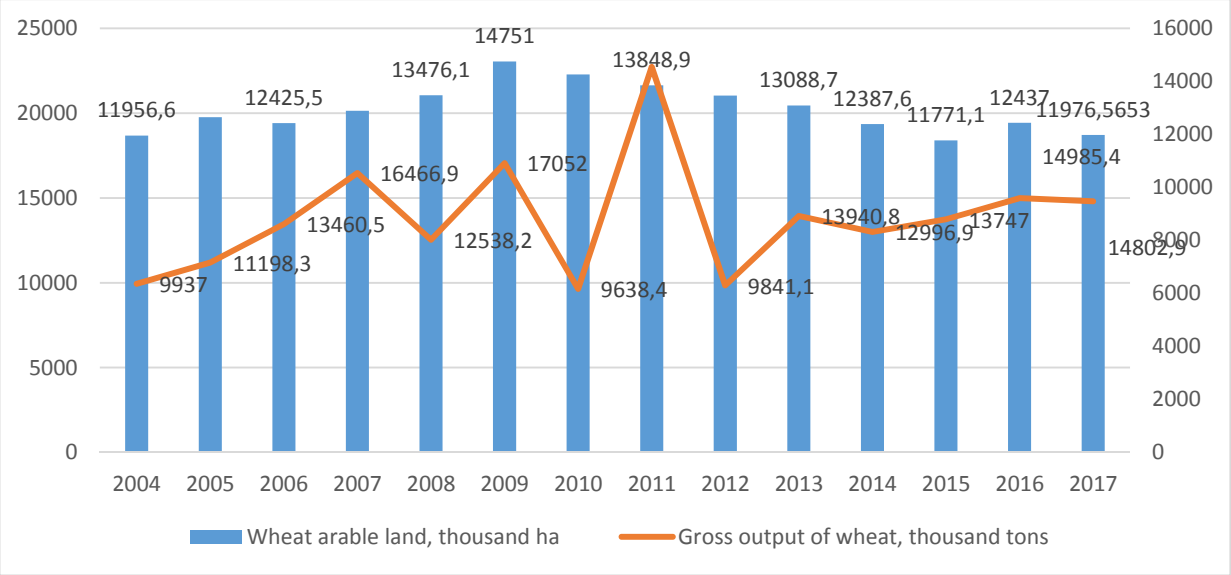

Figure 3 – Link between Wheat arable land and Gross output of wheat

Table 3 - Wheat arable land and Gross output of wheat

	Wheat arable land, thousand ha	Gross output of wheat, thousand tons
	Y (cause / independent variable)	X (effect / dependent variable)
2004	11956.6	9 937.0
2005	12647.9	11 198.3
2006	12425.5	13 460.5
2007	12892.3	16 466.9
2008	13476.1	12 538.2
2009	14751	17 052.0
2010	14261.7	9 638.4
2011	13848.9	22 732.1
2012	13464.0	9 841.1
2013	13088.7	13 940.8
2014	12387.6	12 996.9
2015	11771.1	13 747.0
2016	12437	14 985.4
2017	11976.6	14 802.9

$$Slope = \frac{\Delta Y}{\Delta X} = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{(11976.6 - 12437)}{(14802.9 - 14985.4)} = 2{,}5.$$

The slope calculation shows decreasing of Wheat arable land by 461 thousand ha leads to diminish gross output of wheat by 182.5 thousand tons.

HOW TO COPE WITH BIG DREAMS?

This part of research paper we analyze those mentioned problems: how to manage with agriculture development (how to evaluate implementation of government programs), issues on specialization and storing agriculture products.

It is worth to list government programs in order to see direction in agriculture development. These government programs are sources for Great Dream, namely,

the program of socio-economic development "Auyl" for 1991-1995, untill 2000. Agricultural Production Development Program for 2000-2002, Agricultural and Food Provision Program for 2003-2005, Rural Development for 2004-2010, sustainable development of agriculture for 2006-2010 and State program for the development of the agro-industrial complex for 2017-2021. These programs are government tool in order to regulate agriculture production field.

All these programs discuses and consider storing and processing of agriculture products. The structure of processing agriculture economy are presented by following indicators:

- wheat processing industry is 22,3%;
- diary industry is 16,7%;
- bakery is 15%;
- meat processing industry is 13,6%;
- oil and fat are 7,9%;
- fruit and vegetables are 7,6%;
- other industries 16,9% [10].

As it was mentioned above that in order to determine location issues of new a storing and processing agricultural enterprises in each oblast we conducted research by analyzing statistic data.

First, we start Almaty oblast, first we decided to grasp current situation. We focus on only crop production in agriculture.

We conducted research in order to determine in what direction to develop and forecast agriculture production growth in Almaty, Zhambyl and South Kazakhstan oblasts. 'Data analysis' package in excel was taken for calculation and correlation – regression model as a mathematical model.

Dependent indicator is gross output of agriculture product (Y) for 2000-2017 for crop production. As a main factors were chosen following indicators:

X1 – arable land, thousand ha;
X2 – gross output of grain (including rice) and legumes (in weight after refinement), thousand tons;
X3 – potato yield, thousand tons;
X4 – open ground vegetables yield, thousand tons;
X5 – grain (including rice) and legumes yield, from one hectares of land;
X6 – potatoes yield, from one hectares of land (t/ha);
X7 – open ground vegetables yield; from one hectares of land (t/ha);
X8 –fertilized area with mineral fertilizers (agricultural enterprises), thousand hectares;
X9 – Fertilizing of mineral resources, thousand hundredweight, in recalculation to 100% nutrients;
X10 – Investment into agriculture, million tenge;
X11 – number of agricultural enterprises all types of ownership, units.

On the basis of collected data we defined what factor (indicator) has impact on gross output of agriculture product (Y) in Almaty oblast during 2000-2017 years. Eleven indicators were gathered for 18 years. Based on given indicators we created table such as crop production indicators, correlation matrix, and regression statistics.

We have chosen arable land territory of only four indicators (grain, potatoes, open ground vegetables and fodder crops in thousand ha) among all crop products intentionally, because their share in crop production is around 90%. For example, the share arable land of these products was 96.7% (1512.2 thousand ha) in 1992 and 81,6% in 2015 respectively.

ALMATY OBLAST

Let us consider interaction of pointed out indicators with dependent indicator (Y) based on correlation matrix. We got three models on crop production based on secondary data of Almaty region.

We got interconnected three models among chosen indicators (factors).

1) Gross output of agriculture of Almaty oblast (Y) depends on grain (including rice) and legumes yield, from one hectares of land (X5), and open ground vegetables yield; from one hectares of land (t/ha) (X7).

2) Gross output of agriculture of Almaty oblast (Y) depends on potatoes yield, from one hectares of land (t/ha), and open ground vegetables yield; from one hectares of land (t/ha) (X7).

3) Gross output of agriculture of Almaty oblast (Y) depends on open ground vegetables yield; from one hectares of land (t/ha) (X7) and number of agricultural enterprises all types of ownership, units.

Model 1.

Regression model of dependence of gross output of agriculture on grain (including rice) and legumes yield, from one hectares of land (X5) and open ground vegetables yield; from one hectares of land (t/ha) (X7) is adequate and reliable model and coefficients also justify it. Coefficients such as Fisher ((F=9,414), t-student tb5=2.47, tb7=2.58. Also R^2=59% means, that gross output of agriculture products depends on these two indicators. Therefore, regression model is

$$У= -292562,96+20390,36*X5+1067,06*X7$$

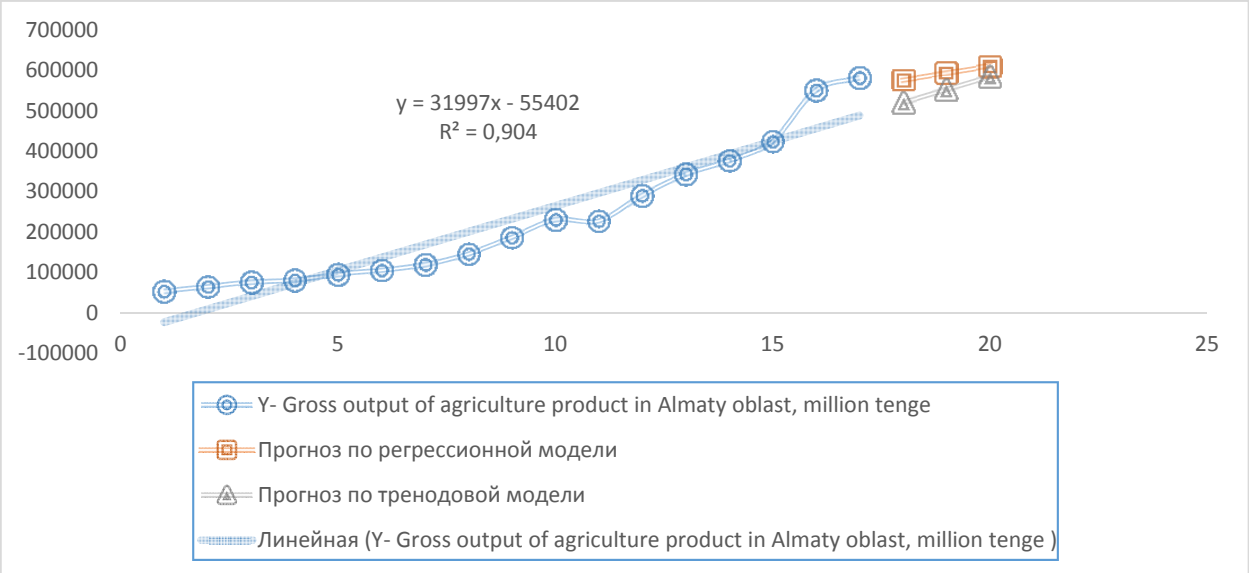

Figure 4 – Forecasting of gross agriculture product in Almaty oblast by applying regression and trend analysis for 2018-2020 years

As a result of analysis it was possible to forecasting for 2018, 2019 and 2020 by using regression model, also trend model is demonstrated in the figure 4. Forecasting indicators are shown in table 4. So, forecasting of grain (including rice) and legumes yield, from one hectares of land (X5) and open ground vegetables yield, from one hectares of land (t/ha) (X7) was fixed as 3% growth in 2018, 5% is in 2019 and 7% in 2020, all of relied on previous periods indicators.

Table 4 – Forecasting of indicators by regression model for 2017-2019 in Almaty oblast

	2017	2018	2019
X5 forecast	26,88	27,41	27,93
X7 forecast	300,66	306,50	312,33
У forecasting by regression analysis	576411,02	593284,30	610157,58
У forecasting by trend model	520544	552541	584538

Grain (including rice) and legumes production in Almaty oblast was 48.5% in 2015 from whole arable land of the oblast, it is a good indicator, although the oblast is not a leader in grain production in the republic. An average grain yield reached 26,1 centner from one hectare, which is more 2,1 times than in republic level. This is stable production condition. Whereas production of open ground vegetables has a growth tendency. By comparison we notice significant growth from 10,7 centner from one hectare in 1992 up to 24,5 centner in 2014. What attracts our attention is the fact that production of open ground vegetable sharply increased up to 291,9 centner from one hectare land in 2015.

All agriculture enterprises produced more than ever – for instance, production of open ground vegetable indicates that agricultural enterprises produced 367,5 centner, farmers– 293,1 centers, households – 271,9 centner from one hectare. This tendency is demonstrated in the figure 5.

One of the crucial factor for crop production is an amount of precipitation. From 2011 to 2017, the amount of precipitation varied between 565 - 459 mm per year in the Almaty region.

Model 2.

Second model depicts dependence of gross output of agriculture product (Y) on potato yield, centner form ha (X6), open ground vegetables yield, from one hectares (t/ha) (X7).

This regression model is adequate and reliable model. It is indicated by coefficients such as Fisher coefficient (F=40,99), t-student (tb6= 6.64, tb7=2.74). And R^2=86% means, that gross output of agriculture product in Almaty oblast depends on these two indicators. So, regression model is next:

$$Y = - 1126201,13+687.53*X7+8125.24*X6$$

Model 3.

Third model depicts dependence of gross output of agriculture product (Y) of Almaty oblast on open ground vegetables yield, from one hectares (t/ha) (X7) and number of number of agricultural enterprises all types of ownership, units (X11).

This model is also adequate, reliable model. All coefficient indicate it reliability F=14,47, t-student coefficients (tb11=3.49, tb7=3.98), and R^2=69%, that means gross output depends on indicators X7 an X 11 for 69% and regression model is next:

$$Y = - 244164,44+9.000*X11+1359.92*X7$$

In order to confirm reliability of these models where the main role plays indicator – open ground vegetables yield, from one hectares (t/ha) (X7). If have a look to the insight of this indicator, we can notice that cultivated open ground vegetables such as carrot, sugar beet, onion, tomatoes, cucumbers, cabbage. They share was 81.7% from all cultivated gross vegetable of the oblast. According to the official site of the oblast (zhetysu.gov.kz) nowadays there is around 800 enterprises (different forms: big, small) implement vegetable processing.

What was the aim of the conducted research by analyzing current situation is to identify Almaty oblast's agricultural potential in order to support correctness of decision making in locating new enterprise. Therefore we would like to show current condition which is demonstrated in a table 4. The table includes information regarding only crop production.

SOUTH KAZAKHSTAN OBLAST

As was mentioned above, the same indicators were analyzed for South Kazakhstan oblast. Among chosen 11 factors the most interconnected indicators only one model was relevant – Gross output of this oblast (Y) depends on vegetable yield of open ground, from one ha (X7), fertilized area with mineral fertilizers (agricultural enterprises), thousand hectares (X8) and Investment into agriculture, million tenge (X10).

Regression model of dependence of gross output of agriculture on vegetable yield of open ground, from one ha (X7), fertilized area with mineral fertilizers (agricultural enterprises), thousand hectares (X8) and Investment into agriculture, million tenge (X10) is adequate and reliable model and coefficients also justify it. Coefficients such as Fisher ((F=38,53), t-student tb7=3.66, tb8=3.62. and tb10=4.98), Also R^2=90% means, that gross output of agriculture products depends on these three indicators. Therefore, regression model is

$$Y = -318532.04+1641,79*X7+2999,13*X8+20,81*X10$$

Forecasting for period 2018-2020 was developed according to the regression model and by using trend model the that period of gross agricultural product of agriculture.

Table 5 – Forecasting of indicators by regression model for 2017-2019 in South Kazakhstan oblast

	2018	**2019**	**2020**
X7 forecasting	208.90	212.99	217.09
X8 forecasting	87.75	91.125	92.475
X10 forecasting	7278.7	7411.04	7940.4
У forecasting by regression analysis	439090.091	458691.2208	480481.773
У forecasting by trend model	389867	413250	436633

Forecasting by factor X7 (vegetable yield of open ground, from one ha) based on 2% for 2017, 2018, 2019; by factor X8 (fertilized area with mineral fertilizers (agricultural enterprises), thousand hectares) based on 3% for these mentioned period of time; and last for factor X10 Investment into agriculture, million tenge forecasting based on 10% for 2017, 12% for following period. The graph depicts the forecasting.

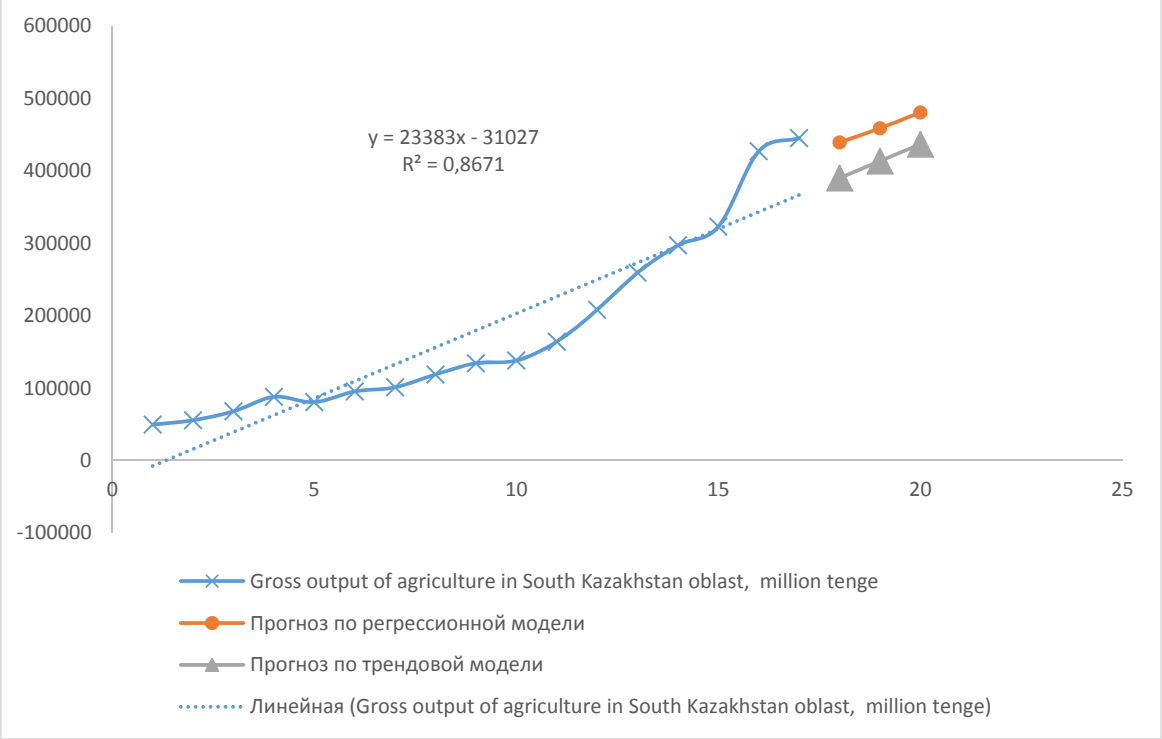

Figure 6 – Forecasting of gross agriculture product in South Kazakhstan oblast by applying regression and trend analysis for 2018-2020 years [12]

In the graph X-axis the data 0-20 shows 20 years (2000-2019) and further interval between 20 – 25 (for 5 years) produced automatically by program. Y-axis shows gross output of crop production of the given oblast.

ZHAMBYLL OBLAST

Analysis of gross output of agriculture in Zhambyl region depicts connection of different indicators then those two oblasts. The same indicators were analyzed Among chosen 11 factors the most interconnected indicators only one model was relevant – Gross output of this oblast (Y) depends on Fertilizing of mineral resources,

thousand hundredweight, in recalculation to 100% nutrients (X9), Investment into agriculture, million tenge (X10) and number of agricultural enterprises all types of ownership, units (X11).

Regression model of dependence of gross output of agriculture on Fertilizing of mineral resources, thousand hundredweight, in recalculation to 100% nutrients (X9), Investment into agriculture, million tenge (X10) and number of agricultural enterprises all types of ownership, units (X11) is adequate and reliable model and coefficients also justify it. Coefficients such as Fisher ((F=50,72), t-student tb9=4,10; tb10=8,98 and tb11=3.96), R^2=92% means, that gross output of agriculture products depends on these three indicators. Therefore, regression model of dependence gross output on three factors (X9, X10, X11) is

$$Y = 4984.42+711.67*X9+28.55*X10+1.07*X11$$

Forecasting for period 2018-2020 was developed according to the regression model and by using trend model the that period of gross agricultural product of agriculture.

Table 6– Forecasting of crop production indicators in Zhambyl oblast based on regression model for 2018-2020

	2018	2019	2020
X9 forecasting	26.78	27.82	28.08
X10 forecasting	7540	7656	7830
X11 forecasting	16871.76	17344.8	17660.16
Y forecasting by regression analysis	257566.699	262129.8659	267624.069
Y forecasting by trend model	187190	198652	210114

Forecasting X9 by increasing for 3% in 2018, 7% in 2019 and 8% in 2020 respectively. This forecasting is adequate as far it based on data that developed in government document – Industrialization map of the oblast. Forecasting X10 factor by increasing it for 3% in 2018 and 3,2% in 2019 and 3,5% in 2020 respectively. Forecasting X11 factor by increasing it for 7% in 2018 and 10% in 2019 and 12% in 2020 respectively. These forecasting data is also relevant because of Development program of the oblast for the period 2016-2020. Also forecasting based on trend model is given for the period. Zhambyk oblast has strong position in agriculture development, its proportion in gross regional product of the oblast is 11.9% in 2017, and 29% of the working population are employed in agricultural sector.

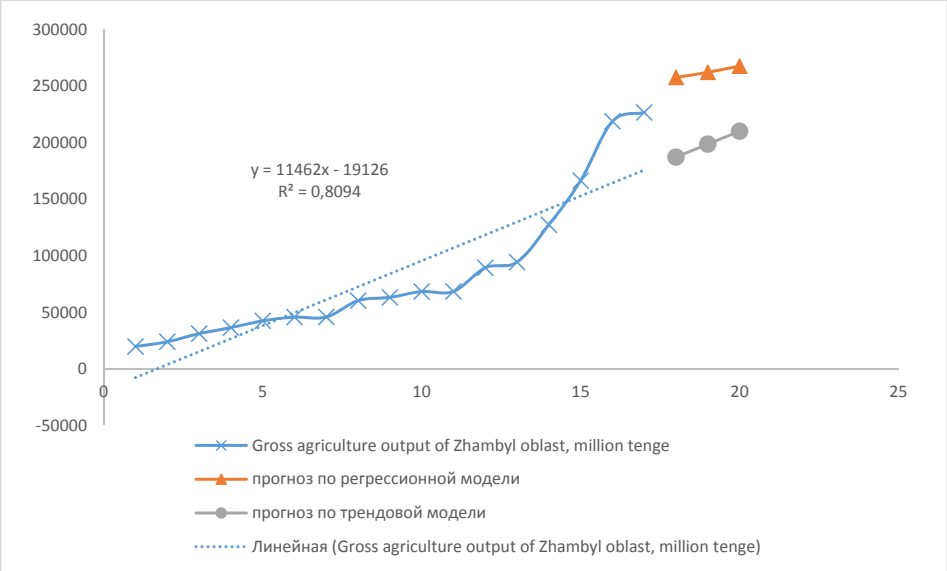

Figure 7 - Forecasting of gross agriculture product in Zhambyl oblast by applying regression and trend analysis for 2018-2020 years [13]

Oblast is a leader in production by following crops: on production of sugar beet safflower and melon crops, it takes 2nd place, on vegetable crops and corn 3rd place, wool 3rd place, meat 6th place.

In the graph X-axis the data 0-20 shows 20 years (2000-2019) and further interval between 20 – 25 (for 5 years) produced automatically by program. Y-axis shows gross output of crop production of the given oblast.

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Түйін

Мақалада еліміздің Оңтүстік макроаймағы құрамына енетін үш ірі облыстың ауыл шаруашылығы өндірісінің экономикалық көрсеткіштеріне талдау жүргізілген және облыстарда ауыл шаурашылығы өнімін өңдеу мен сақтау барысы қарастырылған.

Резюме

В статье анализируются экономические показатели сельскохозяйственного производства в трех областях, которые входят в Южный макрорегион страны, также рассматриваются процессы, переработки и хранения сельхозпродукции.