G. Nakipova
O. Lemechshenko

Karaganda University of Kazpotrebsoyuz, Karaganda, Kazakhstan
(E-mail: nakipovage@mail.ru, lemolvit1992@gmail.com)

Sustainable development of agro-industrial complex and rural areas: regional and applied aspect

Abstract. *The article considers categories of development level and sustainability on the example of agro-industrial complex and rural areas. The triple bottom line audit approach and the methods for assessing sustainable development based on identical performance indicators are shown. The article presents the experience of the European Union countries and member states of the Eurasian Economic Union in implementing state support programs for agriculture and rural areas, on the basis of which two approaches to managing these development programs are identified.*

The study is applied by nature and contains analysis results of indicators, describing trends of sustainable development for agro-industrial complex and rural areas on the example of the Almaty region for years. The identified trends demonstrate that agriculture development is a priority for sustainable rural development and rural cluster formation of the region. The necessity of transforming the approach to developing and implementing state programs in the given areas towards coordinated public administration has been confirmed. We have proposed to include target indicators and cross-cutting measures for rural development in the "State Development Program of Agro-Industrial Complex in the Republic of Kazakhstan for 2022-2027" with the aim of their subsequent reflection in regional development programs.

Keywords: *sustainable development, agro-industrial complex, rural areas, agriculture, state support programs, salary, GDP, correlation and regression analysis.*

Introduction

Modern economic practice increasingly uses categories of "level" and "sustainability" to analyse specific quantitative and qualitative indicators and justify development trends. At present time, "level" category has a general interpretation. However, there has been extensive scientific discussion about the "sustainability" category.

This research paper examines content of categories "level" and "sustainability" in relation to agro-industrial complex (hereinafter referred to as AIC) and rural areas. A level is defined as their state at a certain point in time, described by statistical data. Definition of "sustainability" describes trends and dynamics of development in the long term, which, as a rule, coincides with economic cycles [1, p. 352].

Before assessing the level and sustainability of AIC and rural development, we selected quantitative and qualitative indicators, which are grouped and shape certain development factors. At the same time, the set of indicators for evaluating research objects is identical in most methods used. This is explained by the fact that the triple bottom line audit approach (hereinafter the TBL) is gaining more and more popularity.

This approach, originally used to assess the sustainability of projects and businesses, was taken as the basis for the development of the United Nations Sustainable Development Goals in 2015, and is now being introduced in the field of public administration.

From the perspective of this study, an adaptation of TBL to the sustainable development of communities seems to be interesting as a process of evaluating performance, focusing on the integration of social well-being, environmental protection, and economic viability goals [2, p. 281]. Thus, we suppose that AIC sustainable development, pursuing mainly economic goals, and sustainable rural development, focusing on social capital, only with coordinated public administration can achieve goals in the field of environmental protection.

However, despite this, when developing and implementing state support programs by countries from the European Union (hereinafter the EU) and member states of the Eurasian Economic Union (hereinafter the EAEU), including the Republic of Kazakhstan, two completely opposite approaches are used. Thus, the EU countries recognize the interconnection and interdependence of developing AIC and rural areas, presented in their development programs. The EAEU countries practice a differentiated approach to developing these programs. A chosen approach to development and implementation of state support programs fundamentally changes the process of goals harmonization and target indicators selection.

Given that, the purpose of this work is to analyse and establish correlations between indicators of sustainable development of AIC and rural areas on the example of the Almaty region of the Republic of Kazakhstan, which will allow us to conclude on effectiveness of approach applied to developing and implementing state programs.

Methodology

The research information base has been made up of monographs, dissertations, articles of Kazakhstan›s and foreign authors› in specialized scientific journals, program documents of the Ministry of Agriculture and the Ministry of National Economy of the Republic of Kazakhstan, data of information and analytical system "Taldau", collected by the Bureau of National statistics of the Agency for strategic planning and reforms of the Republic of Kazakhstan.

Research methods are determined on the basis of the goal set, including general-economic methods, methods of statistical data processing, regression and correlation analysis. From the group of general-economic research methods, monographic and abstract-logical methods have been applied to analyse the categories of "level" and "sustainability" of the AIC and rural development, as well as to highlight the approaches used for developing and implementing state programs in given areas. Statistical processing of indicators, describing trends in sustainable development of the AIC and rural areas of the Almaty region, has been carried out using the methods of grouping statistical data and constructing time series. Using regression and correlation analysis, the relationship between individual indicators for sustainable development of AIC and rural areas of the region has been assessed.

Literature review. For this study, we studied various interpretations of specific categories "AIC sustainable development" and "sustainable development of rural areas". In our opinion, methodological analysis of the first category is most fully presented in studies by D.V. Khodos and S.G. Ivanov. The author's vision of the category "AIC sustainable development" is the ability of all spheres to maintain the proportions of effective development of the entire AIC dynamically,, to conduct expanded reproduction, and to shape the country's food security [3, p. 27]. The second category is described in detail in the monograph of Kazakhstan's authors "Analysis and assessment of investment attractiveness of rural areas (on the example of Almaty region)". From their point of view, the following definition seems to be the most acceptable: "sustainable development of the rural area" is a long-term, economically efficient development of rural community while preserving natural resources,

historical, cultural, spiritual, and moral potential of the rural area [4, p. 7].

Having decomposed these definitions, we concluded the interconnection of the considered categories. First, it is obvious that the basis for rural development in agrarian regions is precisely a strong AIC. Secondly, the ability of the AIC for expanded reproduction directly depends on production factors available in rural areas. Our point of view is supported by other leading scientists, therefore the outstanding economist N.V. Maltsev notes: "Agricultural production and the rural areas, where it is located, should develop in interconnection, and the first one grows and develops most effectively with program-targeted approaches, and the second one requires systemic, intersectoral, integrated approaches" [5, p. 249].

An additional parameter, indicating the interconnection between the categories under consideration is the identity of the performance indicators, underlying the existing methods for assessing projects and programs for sustainable development of AIC and rural areas [6,7,8, etc.]. These indicators are usually grouped into four blocks, the first two reflect economic and technological efficiency and have a direct effect, the second two demonstrate the environmental and social prospects of sustainability and have an indirect effect.

Along with this, the study of the EU experience shows that there is a close relationship between agriculture and rural development. On the one hand, improving agriculture competitiveness is included in the European Rural Development Policy [9]. On the other hand, one of the main focuses in rural development is placed on structural transformation of the agricultural sector [10].

In contrast to these trends, program document of the Republic of Kazakhstan "State Program for Regional Development for 2020-2025" emphasizes the following: "According to the results of static analysis, 'population' is considered as the most significant parameter for assessing the priority of rural settlements, instead of previously used indicators of agriculture". However, it further says that «Industrial and agricultural specialization of

the Almaty region suggests that in the future its economy will be based on agriculture and food production...» [11]. Also, "State Development Program of Agro-Industrial Complex in the Republic of Kazakhstan for 2017-2021" mentions rural areas only indirectly [12]. Accordingly, regional AIC development programs are created on its basis, and they also overlook the importance of coordinated management in the field of sustainable development of the AIC and rural areas.

Results and discussion.

In this regard, to justify the importance of a coordinated approach, based on the data of information and analytical system "Taldau", collected by the Bureau of National statistics of the Agency for strategic planning and reforms of the Republic of Kazakhstan [13], over the five years, from 2015 to 2019, indicators were selected and analysed, which accurately described trends and correlations of sustainable development of AIC and rural areas in the Almaty region.

Dynamics have been analysed in the average annual number of the urban and rural population in the Almaty region. The share of rural population from total number has varied between 75-76% or from 1510843 to 1530786 people over the five years. During the same period, urban population made up only a quarter of the total population in the region, or 469585 people. Consequently, demographic situation in rural areas can be described as sustainable, stable, and favourable for the rural development.

The article analyses one of the main indicators, characterizing living standards of urban and rural population, which is average monthly nominal salary. In the Almaty region, there is a reduction in the gap between level of salary for agriculture, forestry, and fisheries in comparison with other economic activities. Thus, over the five years, the gap decreased from 17.59% to 4.06%, i.e. in 2019, the level of salary in the agricultural sector lagged behind the average level of salary in the economy by 4.06% (see table 1). Furthermore, this table shows that level of salaries in the the agriculture sector for the urban population in 2018 and 2019

in nominal terms exceeded the level of salaries in the economy by 9.97% and 3.19% respectively.

As part of studying salary growth trends in agriculture, forestry and fisheries in the Almaty region, structural analysis was carried out. The absolute leader in this indicator is 'fishing and fish farming' industry. The level of employee salaries for the period from 2017 to 2019 exceeded the average level for other types of economic activity by 2.2, 1.4 and 1.6 times or by 245417 KZT, 166667 KZT, and 216972 KZT, respectively. The most paid industry is livestock in the category 'crop and livestock' as of 1.01.2020, which is 148423 KZT, and mixed agriculture - 137404 KZT. For the same period, the least attractive economic activity by salary is for 'auxiliary activities in growing crops, breeding animals, processing crops' - 77406 KZT.

As a result of salary growth in rural areas, as well as reduction of salary gap in agricultural sectors, there is a tendency to reduce the level of unemployment in rural areas. Thus, the unemployment rate in rural areas of the Almaty region decreased to 4.5% in 2018 and 2019, which is lower than the unemployment rate in cities by 0.7% and 0.5% for the same period. This trend

in the long term will prevent the outflow of population from rural areas and thus contribute to the sustainable development of rural areas.

Having studied the employment structure of the Almaty region population, we have concluded that agriculture, forestry, and fisheries occupy key positions in the employment ranking. Even though the largest number of the economically active population is involved in agriculture, there is a tendency to reduce their share from 28.44% (280251 people) in 2016 to 20.63% (204396 people) in 2019 relative to the total number of people employed in the economy. Sectors of education (11-13%), trade and repair (11-13%), public administration and defence (7-8%), health and social services (6-7%), and construction (6%) remain stable and static in the employment ranking.

The basic indicator, characterizing the level of economic development in general and agriculture in particular, is gross domestic products (services) (hereinafter referred to as GDP). The GDP structure is studied by main categories of agricultural establishments as well as in the context of livestock and crop production industries. Livestock production

Table 1

Average monthly nominal salary in the Almaty region

Indicator	2015	2016		2017		2018		2019	
	thousand KZT	thousand KZT	Growth rate, %	thousand KZT	Growth rate, %	thousand KZT	Growth rate, %	thousand KZT	Growth rate, %
For all types of economic activity									
Urban area	92124	105838	14.89	111537	5.38	113532	1.79	132953	17.11
Rural area	88897	104065	17.06	109377	5.10	116427	6.45	138951	19.35
Total	90445	104903	15.99	110387	5.23	115101	4.27	136212	18.34
By agriculture, forestry and fisheries industry									
Urban area	52359	61608	17.66	107631	74.70	124849	16.00	137188	9.88
Rural area	79526	89515	12.56	100091	11.81	110452	10.35	129293	17.06
Total	74536	84073	12.80	100883	19.99	112550	11.56	130679	16.11
Ratio of indicator for industry agriculture to general economic level, %									
Urban area	56.84	58.21	2.41	96.5	65.78	109.97	13.96	103.19	-6.17
Rural area	89.46	86.02	-3.85	91.51	6.38	94.87	3.67	93.05	-1.92
Total	82.41	80.14	-2.75	91.39	14.04	97.78	6.99	95.94	-1.88
Note - Compiled by the authors based on [13]									

farms are leaders, as they produced and sold 223127.4 million KZT or 58.7% of gross livestock production in total only in 2019. The largest share of crop production is accounted for by individual entrepreneurs and peasant or farm enterprises and amounted to 237912.4 million KZT or 59.1% of gross crop production in 2019 (see figure 1).

Thanks to state support tools for the agricultural sector, one can observe a steady increase in gross output (services) for all categories of agricultural establishments throughout the analysed period.

It should be noted that state policy in the field of developing agro-industrial complex focuses on consolidation of agricultural establishments. So, by 2022, 20 'digital farms' and 4000 'advanced farms' will have been founded, half of which will specialize in precision farming, and the remaining equal part will be concentrated on Smart farming to produce meat and dairy products.

In our opinion, GDP per capita, including rural population as well as per 100 hectares of agricultural land, should be considered informative indicators for the agriculture sector (see table 2).

Initial analysis of GDP data for specified parameters confirms a moderate growth trend in indicators. In turn, the indicator of rural population per capita, exceeding the value of the total population per capita indicator on the average by 30%, indicates that the average

monthly wage of the rural population by industry should not be lower than the urban population. Thus, research results point to existing imbalances and violations of the fairness principle in the rural population salary system.

Planned increase in gross domestic product for every 100 hectares of agricultural land is proof of an increase in labor productivity.

This may be due to increase in government support, private investments, and industry digitalization.

The agricultural production profitability is the most important economic category that describes the level of industry competitiveness. Over the period from 2012 to 2019, melon production profitability decreased from 70.2% to 51.5%, production of cereals (including rice) and legumes - from 56.8% to 51.8%. The level of livestock product profitability in the category of sheep and goats is quite high and at least 43%. Livestock and poultry productivity in live weight has been recorded recently. In 2019 this indicator recorded the lowest level of profitability, equal to 18.2% [13].

Assessing GDP per capita, the question arises about the relationship between indicator and level of average monthly nominal salary in the Almaty region. Since it follows from macroeconomic laws that GDP per capita shows the economic well-being level of the country,
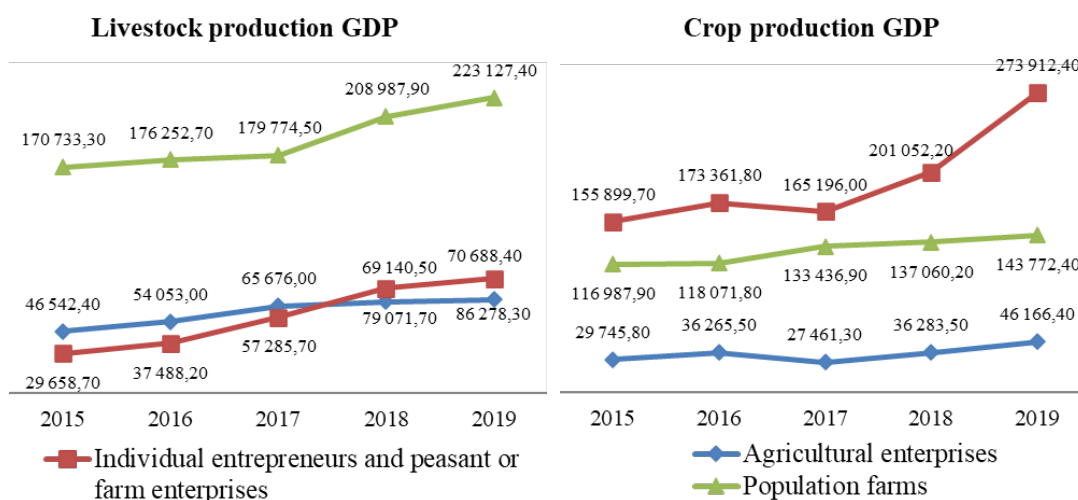

Figure 1 – Structure of agricultural GDP by farming categories in the Almaty region, mln. KZT
Note – Compiled by the authors based on [13]

social status of the population ultimately depends on it. Based on this, the present study established interconnection between GDP per capita (explanatory variable, X) and the average monthly nominal salary (response variable, Y) for agricultural sector using correlation and regression analysis.

Based on variables and values of indicators selected and shown in tables 1 and 2, correlation analysis was performed in Excel, using the built-in package "Data Analysis" and "Autocorrelation" tool. The value of correlation coefficient was 0.97, indicating close relationships between variables.

According to variable regression analysis results, the coefficient of determination – R-squared is 0.94, and hence 94% salary growth is explained by GDP growth per capita. The resulting regression equation is as follows: Y = -40015 +418x. According to the equation, projected increase in GDP per capita by 1000 KZT

will lead to salary increase by 418 KZT. However, actual salary growth over the analysed period was 30% from GDP growth per capita.

Conclusions and recommendations

The analysis of literature sources and program documents, as well as trends in the sustainable development of the AIC and rural areas in the Almaty region allows us to conclude that the agriculture development is a priority importance for sustainable rural development and rural cluster formation for several reasons:
- industrial and agricultural specialization of region;
- 75% concentration of population in rural areas;
- leading position of agriculture in the employment structure of population (over 20% of the economically active population);

Table 2

Indicators for gross output of agricultural products (services) in the Almaty region

Indicators	2015	2016		2017		2018		2019	
	thousand KZT	thousand KZT	Growth rate, %	thousand KZT	Growth rate, %	thousand KZT	Growth rate, %	thousand KZT	Growth rate, %
Per capita (total population)									
Livestock production	127.6	136.3	6.82	151.3	11.01	176.1	16.39	185.7	5.45
Crop production	156.4	166.7	6.59	163	-2.22	184.6	13.25	226.6	22.75
Total	284.8	303.9	6.71	315.4	3.78	361.9	14.74	413.5	14.26
Per capita (rural population)									
Livestock production	168.4	179.4	6.53	197.8	10.26	227.9	15.22	238.6	4.70
Crop production	206.4	219.6	6.40	213	-3.01	238.9	12.16	291.2	21.89
Total	375.8	400.2	6.49	412.2	3.00	468,3	13.61	531.5	13.50
Per 100 hectares of agricultural land									
Livestock production	2927.4	3657.8	24.95	3571.4	22.00	4381.0	22,67	4802.8	9.63
Crop production	3587.7	3357.0	-6.43	3846.9	7.22	4592.0	19,37	5861.1	27.64
Total	6533.3	7019.8	7.45	7443.1	13.93	9002.2	20.95	10697	18.83
Note - Compiled by the authors based on [13]									

- salary growth in rural areas;
- reduction of salary gap in agricultural sectors;
- the unemployment rate in rural areas decreased to 4.5%;
- steady increase in GDP for all categories of agricultural establishments;
- generated GDP per capita of the rural population exceeds the value of total population per capita indicator on average by 30%;
- planned increase in GDP for every 100 hectares of agricultural land and growth in labour productivity;
- high level of agricultural production profitability, ranging from 18% to 52%;

As a result of correlation and regression analysis of the most important macroeconomic indicators, describing the level of economic development and social well-being, namely, GDP per capita and average monthly nominal salary for the agriculture sector, the authors came to the following conclusions:

- the presence of close correlation between the indicators confirms the scientific assumption that the issues of sustainable development of the AIC and rural areas should be resolved under coordinated public administration;
- issues of environmental protection as one of the main criteria for sustainable development of AIC and rural areas remain unresolved. Thus, the current trend to increase GDP for every 100 hectares of agricultural land from the long-term perspective may lead to the degradation of rural areas in regions with unregulated issues of environmental protection;

- there is an actual lag in the growth of average monthly nominal salary per capita from forecast values, obtained using regression analysis. Disproportions in the rural population salary system, employed in the agricultural sector, have been also established. These also underline the need to transform the approach applied to the developing and implementing of development programs in the given areas.

Based on the foregoing, taking into account the experience of the EU countries, we propose to include target indicators for rural development in the "State Development Program of Agro-Industrial Complex in the Republic of Kazakhstan for 2022-2027" with the aim of their subsequent reflection in regional development programs. In our opinion, this can be achieved by including into the program cross-cutting measures, such as:

- promoting the development of ecological agriculture and agrarian tourism;
- involvement of agribusiness entities in the process of rural development through the use of incentive measures of state support;
- to include in the section "Program Implementation Management": a consultative and advisory body responsible for coordinating measures in the field of sustainable AIC and rural development; procedure for conducting public monitoring and control over the implementation of program measures, focused on developing rural areas.

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Г.Н. Накипова, О.В. Лемещенко

Қазтұтынуодағы Қарағанды университеті, Қарағанды, Казақстан

**Агроөнеркәсіптік кешенінің және ауылдық аумақтардың
тұрақты дамуы: аймақтық-қолданбалы аспект**

Аннотация. Мақалада агроөнеркәсіптік кешен мен ауылдық аумақтарды мысалға алып, олардың даму деңгейі мен тұрақтылығының санаттары қарастырылған. Аудиттің triple bottom line тәсілі және бірдей нәтижелік көрсеткіштеріне негізделген тұрақты дамуды бағалау әдістері көрсетілген. Еуропалық Одақ елдерінің және Еуразиялық экономикалық одаққа мүше мемлекеттердің ауыл шаруашылығы мен ауыл аумақтарын мемлекеттік қолдау бағдарламаларын іске асыру жөніндегі тәжірибесі ұсынылды, соның негізінде даму бағдарламаларын басқарудың екі тәсілі анықталды.

Зерттеу қолданбалы сипатқа ие және бес жылдық кезеңдегі Алматы облысын мысалға алып, аймақтың агроөнеркәсіптік кешені мен ауылдық аумақтарының тұрақты даму тенденцияларын сипаттайтын көрсеткіштерді талдау нәтижелерін қамтиды. Анықталған тенденциялар ауылдық аумақтарды тұрақты дамыту және аймақтағы ауылдық кластерді қалыптастыруда ауыл шаруашылығын дамытудың басым мәнге ие екенін көрсетеді. Берілген салаларда мемлекеттік бағдарламаларды әзірлеу мен іске асыру тәсілін үйлестірілген мемлекеттік басқару жағына трансформациялау қажеттілігі негізделді. Кейіннен Өңірлік даму бағдарламаларында көрсету мақсатында ауылдық аумақтарды дамыту жөніндегі нысаналы индикаторлар мен тоғыспалы іс-шараларды «Қазақстан Республикасының агроөнеркәсіптік кешенін дамытудың 2022-2027 жылдарға арналған мемлекеттік бағдарламасына» енгізу ұсынылды.

Түйін сөздер: тұрақты даму, агроөнеркәсіптік кешен, ауылдық аумақтар, ауыл шаруашылығы, мемлекеттік қолдау бағдарламалары, жалақы, ЖІӨ, корреляциялық-регрессиялық талдау.

Г.Н. Накипова, О.В. Лемещенко

Карагандинский университет Казпотребсоюза, Караганда, Казахстан

**Устойчивое развитие агропромышленного комплекса и
сельских территорий: регионально-прикладной аспект**

Аннотация. В статье рассмотрены категории уровня и устойчивости развития на примере агропромышленного комплекса и сельских территорий. Отражены подход к аудиту triple bottom line и методики оценки устойчивого развития, построенные на идентичных показателях результативности. Приведен опыт стран Европейского союза и государств-членов Евразийского экономического союза по реализа-

ции программ государственной поддержки сельского хозяйства и сельских территорий, на основании которого выделены два подхода к управлению данными программами развития.

Исследование носит прикладной характер и содержит результаты анализа показателей, описывающих тенденции устойчивого развития агропромышленного комплекса и сельских территорий региона на примере Алматинской области за пятилетний период. Выявленные тенденции демонстрируют, что развитие сельского хозяйства имеет приоритетное значение для устойчивого развития сельских территорий и формирования сельского кластера региона. Обоснована необходимость трансформации подхода к разработке и реализации государственных программ в заданных областях в сторону скоординированного государственного управления. Предложено ввести целевые индикаторы и перекрестные мероприятия по развитию сельских территорий в «Государственную программу развития агропромышленного комплекса Республики Казахстан на 2022-2027 годы» с целью их последующего отражения в региональных программах развития.

Ключевые слова: устойчивое развитие, агропромышленный комплекс, сельские территории, сельское хозяйство, программы государственной поддержки, заработная плата, ВВП, корреляционно-регрессионный анализ.

Information about authors:

Nakipova G. – **The main author,** Doctor of Economic Sciences, Professor, Vice-Rector for Research and Integration Activities of the Karaganda University of Kazpotrebsoyuz, Akademicheskaya Street 9, Karaganda, Kazakhstan.

Lemechshenko O. – Ph.D. student in State and Local Government, Karaganda University of Kazpotrebsoyuz, Akademicheskaya Street 9, Karaganda, Kazakhstan.

Накипова Г.Н. – **негізгі автор,** э.ғ.д., профессор, Қазтұтынуодағы Қарағанды университетінің ғылыми-зерттеу және интеграциялық қызмет жөніндегі проректор, Академическая көшесі 9, Қарағанды, Казақстан.

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