

Methodology for Assessing the Competitive Advantages of Agriculture in the Northern Regions of Kazakhstan

Metodología para evaluar las ventajas competitivas de la agricultura en las regiones del norte de Kazajstán

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ABSTRACT:

This paper outlines the goals and objectives of an integrated assessment of the competitiveness of agricultural production, presents a general approach to the development and implementation of a methodology for such an assessment, and suggests a specific procedure that can be used to assess the competitiveness of regions of Kazakhstan. The relevance of the topic of the article is related to the insufficient study of the assessment of agriculture in the regions of Kazakhstan and Asia, the lack of developed monitoring systems for its condition. However, the development of rural agriculture is impossible without an effective update agricultural potential for agricultural enterprises. The purpose of this article is to study methods for assessing the competitiveness of agriculture and their application for a particular region of the Republic of Kazakhstan. The main objective of the proposed analysis and assessment of the level of competitiveness is to determine the competitive advantages of agricultural production located in a certain geographical area. An assessment of the competitiveness of agriculture should be considered in the context of two of its phases (region's resource potential (RRP), results of agriculture in the region (RAR)), taking into account their composite structures. Therefore, the assessment of the competitiveness of agriculture was carried out for the Northern regions of Kazakhstan for 2006-2015. The authors found that special attention should be given to the effective use of resource potential. It has been found that Akmola, Kostanay and North Kazakhstan regions agriculture has higher resource potential than agriculture in Pavlodar region, however, regions do not use their resource potential to the full extent.

Keywords Competition; competitiveness; assessment; resource potential; agriculture.

RESUMEN:

Este documento describe las metas y objetivos de una evaluación integrada de la competitividad de la producción agrícola, presenta un enfoque general para el desarrollo y la implementación de una metodología para dicha evaluación, y sugiere un procedimiento específico que puede utilizarse para evaluar la competitividad de las regiones de Kazajstán. La relevancia del tema del artículo está relacionada con el estudio insuficiente de la evaluación de la agricultura en las regiones de Kazajstán y Asia, la falta de sistemas de monitoreo desarrollados para su condición. Sin embargo, el desarrollo de la agricultura rural es imposible sin una actualización efectiva del potencial agrícola de las empresas agrícolas. El propósito de este artículo es estudiar métodos para evaluar la competitividad de la agricultura y su aplicación para una región particular de la República de Kazajstán. El principal objetivo del análisis y la evaluación propuestos del nivel de competitividad es determinar las ventajas competitivas de la producción agrícola ubicada en una determinada área geográfica. Debe considerarse una evaluación de la competitividad de la agricultura en el contexto de dos de sus fases (el potencial de recursos de la región (RRP), los resultados de la agricultura en la región (RAR)), teniendo en cuenta sus estructuras compuestas. Por lo tanto, la evaluación de la competitividad de la agricultura se llevó a cabo para las regiones del norte de Kazajstán para 2006-2015. Los autores encontraron que se debe prestar especial atención al uso efectivo del potencial de recursos. Se ha encontrado que la agricultura de las regiones de Akmola, Kostanay y el norte de Kazajstán tiene un mayor potencial de recursos que la agricultura en la región de Pavlodar, sin embargo, las regiones no utilizan su potencial de recursos en toda su extensión.

Palabras clave Competencia; competitividad; evaluación; potencial de recursos; agricultura.

1. Introduction

A characteristic property of a market economy is competition, defined as rivalry, including, for the best conditions of production and sale of products. In the current situation, characterized by the condition of competitive struggle, including due to the arrival of foreign commodity producers on the Kazakhstan market, the strengthening of its competitive positions, the formation of competitive production, is a necessary condition for the dynamic development of agriculture.

For effective management of the agricultural production system, it is necessary to have an objective tool in order to obtain its quantitative estimates, including assessing competitiveness. To date, there is no single generally accepted methodology for assessing the level of competitiveness in Kazakhstan. In the literature (Russian and English), there are relatively few papers devoted to assessing the competitiveness of agriculture in Kazakhstan and its individual regions, the authors of these works using different methods, the composition of the indicators used for analysis, as well as methods for obtaining an integral or general assessment of the level of competitiveness are different (A. Moldashev (1999), A. Ageev (2007), A. Temyrbekova (2015), M.N. Kazybayeva (2015), I. Dubina and T.Ostashchenko (2006), R. Fatkhutdinov (2005)).

In general, researchers and practitioners are increasingly turning to the topic of assessing the competitiveness of the region's agriculture, and the number of publications on the assessment of the competitiveness of the region's agriculture is continuously growing. In the foreign and domestic scientific literature, a large number of methods are presented, with the help of which it is recommended to determine the level of competitiveness of the region and industry (Assessment of the competitiveness of the regions of the Republic of Kazakhstan 2006).

Our analysis has shown that in international scientific databases (such as EBS CO Research, Scopus, Web of Science) more than 100,000 publications related to agricultural competitiveness have been indexed in scientific journals in the open database of Google Scholar, including monographs, reports and conference proceedings registered more than 600 thousand. About 15-20% of these publications affect the methodological issues of assessing the competitiveness of the region's agriculture.

Approximately the same ratio among the works indexed by RINC. At the time of the completion of this article (end of March 2017), 1608 relevant (search by keyword in the title and annotation) articles on "competitiveness of agriculture" (24 with the mention of Kazakhstan), 281 on "competitiveness of rural economy" (2 - with the mention of Kazakhstan). It should be noted that among these 281 publications, 183 works were published for the period 2011-2017, and only 98 publications - for the period from 2001 to 2010.

Google Scholar indexed 658 publications with the words "competitiveness" and "agriculture" in the title. Of these, 74 works were published before 1990, 142 - from 1990 to 2000, 289 - from 2001 to 2010, and 153 works have already been published in the last 6 years (2011-2017).

According to the results of studies of EBSCO databases, in the period 1996-2016, 3,658 publications were published (in the category Academic Journals - 2,758, Trade Publications - 320, Magazines - 238, Reports - 77), directly related to the competitiveness of agricultural production in the region and its assessment. As our analysis shows, the number of such publications has increased significantly over the past 25 years. Thus, in the 1970s, 16 articles were published on this topic. In the 1980s, the number of works on this topic was close to 60. In the 1990s, more than 70 studies were published on the topic of assessing the competitiveness of agriculture, including. According to the EBSCO database, in the period 2000-2016, was published 160 articles.

Analysis of the works of the above-mentioned authors allows us to conclude that there is no single approach to assessing the competitiveness of agriculture. Thus, the relevance and insufficient degree of elaboration of this problem served as the basis for choosing the topic and tasks of the study.

Whereas the competitiveness of any economic entity is a relative characteristic, the corresponding indicators can only be determined by comparing several entities. Four regions of the northern region of Kazakhstan (Akmola region, Kustanay region, Pavlodar region, North-Kazakhstan region) were chosen as the object of research.

To assess the competitiveness of agricultural production in these regions, assessments of the resource potential are conducted (the availability of production resources that ensure the possibility of achieving a certain level of competitiveness, taking into account a number of factors that affect the dynamics of the resulting production indicators). When analyzing the competitiveness, we proceeded from the fact that the indicators of the production component of competitiveness depend not only on the available reserves of production resources, but also on the possibility of preserving and using resource competitive advantages.

The aim of the work is to study methods for assessing and improving the competitiveness of agriculture in the northern region of the Republic of Kazakhstan, as well as developing theoretical and practical recommendations for its improvement.

2. Method

In the literature, there are quite a few (several dozen) different methods for assessing the competitiveness of the region's agriculture, differing mainly in the systems of indicators or indices used, their aggregation methods, and the methods of comparison (Gelvanovsky et al. 1998; Khasanova and Fazullina 2015; Fatkhutdinov 2005; Porter 1990; 1993). The sets of indicators used vary depending on the nature of the research (focus, goals, objectives, methods used, etc.), the regions studied, the available data.

Nevertheless, it is possible to identify some general points of assessing the competitiveness of regional agriculture, reflecting in general the general approach of the theory of socio-economic dimensions to the design and application of valuation techniques (Dubina 2016).

First of all, the assessment of competitiveness is carried out as a comparative one, based on bringing the available indicators to a single relative scale (standardization or standardization procedure)

.Standardization of the initial data is also carried out because the values of the selected indicators for assessing the competitiveness of the region's agriculture may have different units of measurement for example, interest, monetary units, quantitative units) and different scales, so they must be brought to a comparable view, to a single scale.

There are several procedures for rating data (Dubina 2010). To solve the problems of assessing the competitiveness of the regional agriculture, data rationing based on linear scaling is most often used (Dubina 2016):

$$R_n = \frac{(R_{current} - R_{min})}{(R_{max} - R_{min})} \quad (1)$$

where R_n is the normalized value of the indicator for the analyzed region in the group under consideration;

$R_{current}$ - the initial value of the indicator for the analyzed region;

R_{min} - the minimum value of the indicator among the regions in the group;

R_{max} - the maximum value of the indicator among the regions of the group.

In this case, all current values are given to the interval [0; 1], with the region with the minimum initial value having a normalized value of 0, with a maximum of 1. Interpretation of the results of the agricultural competitiveness assessment in such a scale is obvious (comparison with the region having the maximum the value of the indicator), but the results will depend on the sample (in this case, the group of regions), besides, the variability of the values by the indicator is not taken into account. Other procedures may be more convenient (Dubina 2016).

Then, the distribution of indicators that determine the level of competitiveness of the region's agriculture is divided into groups. In this case, for each group, the definition of a generalized group indicator (index) is assumed. For this purpose, the method (method) for calculating generalized indicators is chosen and the analysis of the results on the competitiveness of the regional agriculture is carried out for both individual and generalized indicators. On the basis of such an analysis, it is possible to assess the level of agriculture in the region, identify factors that positively or negatively affect the level of competitiveness of the region's agriculture, and conduct interregional comparisons.

At this stage, as a rule, levels of competitiveness of the region are introduced, for example, "high" ($0,66 < R_{current} < 1,0$); "Sufficient" ($0,33 < R_{current} < 0,65$), "insufficient (low)" (низкий)» ($0,00 < R_{current} < 0,32$). There may be a larger (4-5) number of gradations, each of which corresponds to a certain interval of change in the value of the competitiveness index.

When developing or choosing a "model" for assessing the competitiveness of the region's agriculture and the corresponding indicators, it is necessary to take into account the conditions of agricultural production. North Kazakhstan includes North Kazakhstan, Pavlodar, Akmola and Kustanai regions (Figure 1), as well as the current capital of the Republic of Kazakhstan - Astana, located in the south of the Akmola region. The length of the territory of the region from west to east is 1,300 km, and from the north to south - about 900 km. The population of the region is about 3.8 million people (including about 800 thousand residents of the capital). All areas have roughly the same natural and climatic conditions of agriculture. The climate of the region is sharply continental with fluctuations in temperatures from -45°C in winter to $+45^{\circ} \text{C}$ in summer. For a long time the region remained sparsely populated and underdeveloped economically and economically. With the beginning of systematic development of virgin and fallow lands in the 1950s and 60s.the mass population of the region began and the development of agricultural, first of all, grain production. In the region, grains and fodder crops, potatoes and vegetables are grown. The leading branches of agriculture in all regions of the region are the meat and dairy industry. Poultry farming is developed near large cities.

Figure 1

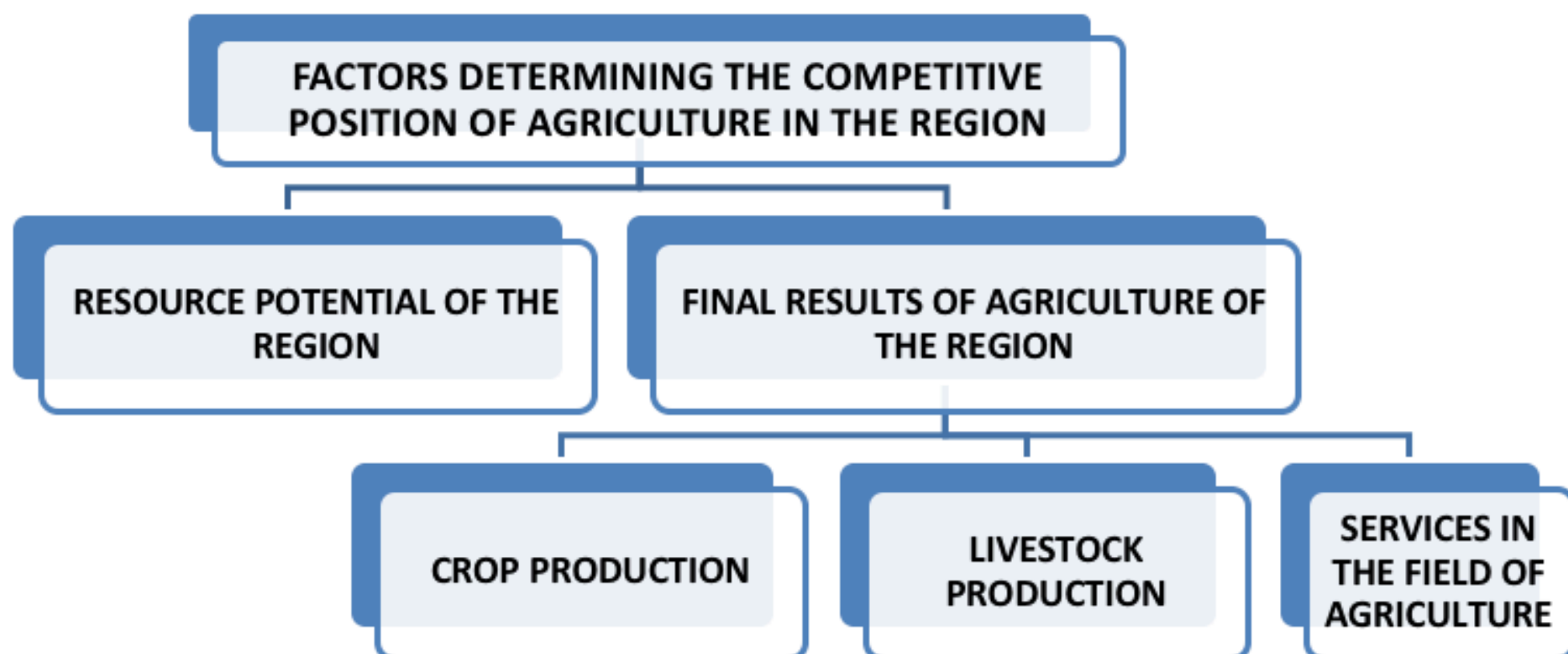
Areal map of the northern region of Kazakhstan.



Our study, we proceeded from the fact that the resource potential of the region (opportunities and conditions) and the final results of agricultural production (crop production and animal husbandry) in the region can be factors determining the competitiveness of the agricultural production of the selected region (Figure 2).

Figure 2

Factors determining the competitive position of agriculture in the region



Source: Compiled by the authors

Selection criteria of indicators identifying agricultural competitiveness of the region used in our research area) the specificity of the region, b) similar subject research experience (Andreev 2000), c) soundness, reliability, and visibility of the available statistics. According to the second and the third criterion parameters must be taken from reliable data sources with reasonable costs of data acquisition under the research budget. According to these criteria using Kazakhstani and foreign statistical databases (Ministry of the National Economy of the Republic of Kazakhstan, Committee on Statistics, etc.) is a viable option. On the basis of made analysis of existing methods of the agricultural region competitiveness assessment, we have noted a range of indicators of the region's resource potential, and final indicators characterizing the results of agriculture in the context of interregional comparisons possibility and visibility of these data in open statistical database.

So we've noted the following indicators characterizing the region's resource potential (RRP):

- cropland acres>;
- investment in agriculture;
- population size;
- the proportion of personnel employed in agriculture;
- number of employees performing scientific research and development by oblasts.

Indicators characterizing the results of agriculture in the region (RAR):

gross output of plant growing products (service);

gross output of cereal crops, oil-plant, potatoes, and vegetable in total;
 cereal crops, oil-plant, potatoes, and vegetable productivity in total, hundred kilograms per hectare;
 gross output of animal husbandry products (service;
 the number of large and small animals, and birds;
 slaughter or sale for slaughter of all types of livestock and poultry, in live weight;
 slaughter or sale for slaughter of all types of livestock and poultry, in carcass weight;
 milk production (of all types);
 egg production (of all types);
 wool production (of all types)
 services in the field of agriculture.

To collect and prepare data according to the relevant indicators in 2007-2016 we used resources of Committee on Statistics of Ministry of Agriculture of the Republic of Kazakhstan, social and economic passport of Akmola region, etc.

Based on the average for 2007-2016. According to the formula (1), mentioned earlier, the subindex of the investment in agriculture is calculated.

Table 1
Investments in agriculture in 2007-2016.

Name	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average for 2007-2016 years.
Akmola region	11 392,4	14 540,2	19 959,6	18 348,4	21 984,2	21 721,7	22 102,0	26 851,1	24 762,2	51 632,9	23 329,5
Kostanay region	2 043,9	19 902,4	19 545,3	14 540,2	24 914,6	25 922,6	19 423,9	19 103,8	27 262,2	34 495,3	20 715,4
Pavlodar region	656,9	832,9	987,0	1 478,0	3 994,4	4 916,5	6 526,3	8 889,9	7 152,4	17 091,6	5 252,6
Northern Kazakhstan region	10 708,4	12 804,8	14 759,9	13 138,7	28 821,4	39 490,3	44 076,9	48 951,8	44 040,6	56 305,6	31 309,8

Source: Compiled by the authors based on data by Committee on Statistics of the Republic of Kazakhstan (2016a)

According to the same scheme, the remaining indicators are calculated, and then the index itself is the resource potential of the region as the arithmetic mean of all sub indexes, on the basis of which, in turn, it is possible to make a rating of regions by the level of agriculture.

The example (for Akmola region) of collected data on 2 groups of indicators (region's resource potential (RRP), results of agriculture in the region (RAR)) is shown in the table 2. The data of three other regions of Northern Kazakhstan is shown in a similar vein.

Table 2
RRP and RAR Indicators in Northern Kazakhstan

Indicators	2007-2016		
	Akmola region	The minimum value is north. regions of Kazakhstan	The maximum value is north. regions of Kazakhstan

1	2	3	4
REGION'S RESOURCE POTENTIAL (RRP)			
Total crop area, thousand hectares	4 258,8	606,0	4 258,8
Investments in agriculture north. regions of Kazakhstan, thous.tenge	23 329 477,6	5 252 600,1	31 309 824,0
Population, people	738 380,7	597 448,5	885 099,8
The employed population in agriculture	144,9	87,4	184,8
Number of employees performing research and development by regions	743,1	184,9	743,1
RESULTS OF AGRICULTURE IN THE REGION (RAR)			
Gross output of crop production, million tenge	150 318,2	50 151,7	209 890,2
Cereals (including rice) and legumes, thousand tons	4 247,0	462,8	5 038,9
Potatoes, thousand tons	211,5	175,2	453,0
Oilseeds, thousand tons	79,0	56,5	269,6
Gross harvest of vegetables of open and closed ground, thousand tons	59,9	59,9	168,7
Cereals (including rice) and legumes, centners per hectare	10,2	7,9	14,3
Potato yield, centners per hectare	122,2	122,2	206,4
Yield of oilseeds, centners from one hectare	4,8	3,5	7,9
Productivity of open ground vegetables, centners per hectare	143,2	143,2	344,3
Gross output of products	67 609,8	55 536,6	89 802,7
livestock, million tenge	373,3	321,8	466,4
Number of cattle, thousand heads	420,1	304,4	527,4
Number of sheep and goats	151,4	77,0	228,1
Number of pigs, thousand heads	119,6	87,8	119,6
Number of horses, thousand heads	0,140	0,107	0,212
Camels, thousand heads	3 529,0	1 013,0	4 476,2
Number of birds, thousand heads	88,5	75,3	119,9
Cattle is slaughtered or sold for slaughter of	48,4	40,8	68,0

all kinds of livestock and poultry, in live weight, thousand tons			
Caught in the farm or sold for slaughter of all types of livestock and poultry, in slaughter mass, thousand tons	390,0	390,0	520,4
Milk of all kinds, thousand tons	478,7	137,6	499,4
Eggs of all kinds, million pieces	781,4	504,4	947,8
Wool of all kinds, tons	672,4	112,0	1 413,9

Source: Compiled by the authors based on data by Committee on Statistics of the Republic of Kazakhstan (2016b).

3. Results and Discussion

For benchmarking analysis of competitiveness indicators of agricultural production of Northern Kazakhstan regions all indicators were comparable by data standardization on the basis of linear scaling in accordance with the formula (1) i.e. we obtained the corresponding indices.

Then generalized indices of each group (RRP and RAR) were identified by assuming equality of “weights” of each index in the corresponding group is equal, i.e. on the basis of arithmetic mean calculation. In using arithmetic mean we assumed that indicators would tend to be used interchangeably as a result of their summation. In other words there is a possibility that low figures of achievement in one index can be linearly compensated by higher figures in another one (Dubina and Mkrtchyan 2017).

For example, indicator characterizing RRP was identified as formula,

$$I_{RRP} = \frac{(I_{ca} + I_i + I_n + I_p + I_{prd})}{5}$$

where I_{RRP} – an average index characterizing RRP of northern regions of Kazakhstan;

I_{ca} – an index characterizing position of the region by cropland acres indicator;

I_i – an index characterizing position of the region by investments in agriculture;

I_n – an index characterizing the position of the region by the number of people, people;

I_p – an index characterizing position of the region by the staff proportion engaged in agriculture.

I_{prd} – an index characterizing the position of the region in terms of the number of workers performing research and development.

Similar calculations were done on two other aggregated indices. The corresponding calculations for each group show that leader in providing resource potential in 2007-2016 Kostanay region (0,781) heads the list, followed by Akmola region (0,755) and North Kazakhstan region (0,457). Pavlodar region’s index is 0,196 and it’s the fourth. It has such negative factors as low share of cropland acres and low share of fixed investments in agriculture.

On the final result of the agriculture of the region (RAR), Akmola region (0,41) takes the third place. Its figures were negatively affected by such factors as cereal crops, oil-plant, potatoes, and vegetable productivity shares, hundred kilograms per hectare.

The leader is the Kustanai region (0.65), then the North Kazakhstan region (0.64) and the Pavlodar region (0.28) in 4th place.

Overall (complex) indicator characterizing RRP and RAR in total was defined by formula of geometric mean:

$$I_c = \sqrt[2]{I_{RRP} * I_{RAR}}$$

Where I_c – overall indicator characterizing RRP and RAR of Northern Kazakhstan regions;

I_{RRP} – an index characterizing of RRP of Northern Kazakhstan regions;

I_{RAR} – an index characterizing of RFR of Northern Kazakhstan regions.

When choosing the way of calculation of overall indicator we were guided the following arguments. As one of the criteria of forming indicator’s system is preference of relative values, it’s better to use geometric mean for analysis of their gross variation because it is a form of mean inherent in relations and products.

The advantage of choosing geometric mean for calculation of overall competitiveness index is that this way of averaging allows keeping contribution of each aggregated indices by excluding effect of their complete interchangeability (Mkrtchyan et al. 2017).

We've done RRP and RAR development rating of Northern Kazakhstan regions in 2015 on the basis of the calculations (table 2).

Table 3
RRP and RAR development rating of Northern Kazakhstan regions in 2007-2016

Northern regions of Kazakhstan	The value of the integral indicator	Place in the rating
Kostanay region	0,715	1
Akmola region	0,580	2
Northern Kazakhstan region	0,550	3
Pavlodar region	0,238	4

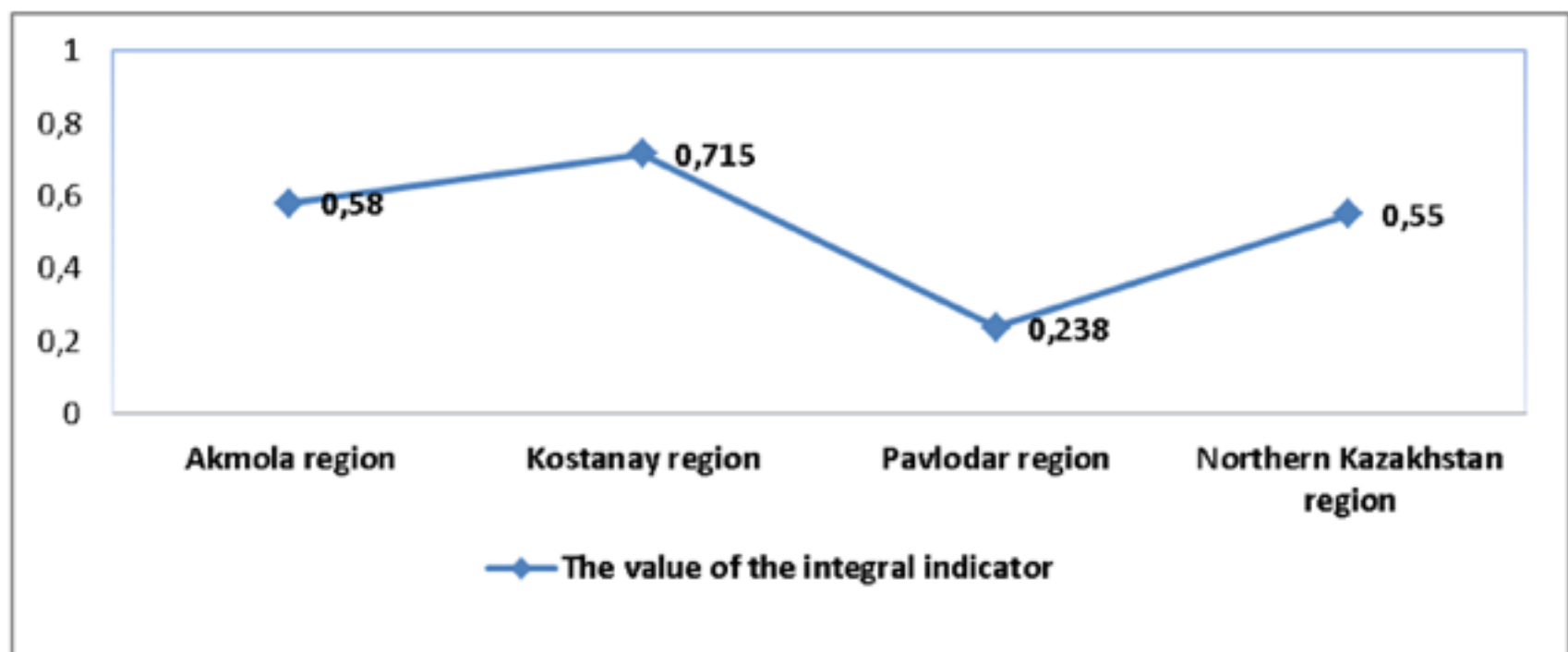
Source: Compiled by the authors

By analyzing results we can classify regions according to the various level groups of competitiveness:

- 1) high level of competitiveness(0,66 – 1,0): Kostanay region;
- 2) sufficient level of competitiveness(0,33 – 0,66): Akmola region and Northern Kazakhstan region;
- 3) insufficient (low) level of competitiveness(0, – 0,32): Pavlodar region (Picture 3).

Figure 3

Competitiveness rating of Northern Kazakhstan regions on RRP, PGFI, and AHFI development in 2007-2016



Source: Compiled by the authors

According to the overall indicators of agricultural competitiveness both of Akmola and Kostanay regions tie for first place advancing the other north regions of Kazakhstan (North Kazakhstan region and Pavlodar region) (Regions of Kazakhstan 2017). Generally the obtained results of benchmarking analysis based on the developed approach corresponds to the results of competitiveness assessment of Kazakhstan regions commissioned by Committee on statistics of the Republic of Kazakhstan (2016) based on the other system of indicators and assessment methodology, that can be a confirmation of validity and reliability of the obtained results and approach developed within the research.

4. Conclusion

Assuming the work done differentiations and definitions of the region's resource potential, plant growing and animal husbandry indicators indices, and taking into account the analysis of existing methods of agricultural competitiveness assessment, we have done benchmarking assessment of agricultural production competitiveness of northern regions of Kazakhstan.

Comparing levels of resource and production components of agricultural production competitiveness we can conclude resource competitive position is most effectively used Akmola region and Kostanay region.

The main factor of comparatively low agricultural competitiveness of Pavlodar region is low performance indicators of plant growing and animal husbandry. Agriculture of North Kazakhstan region is the least competitive, but assuming the number of its human resources and land area the region has the potential of increasing its competitiveness. In particular an increase in the equipment of agriculture with modern machinery and reduction of dependence on food imports from abroad by providing own national food products is necessary to increase agricultural competitiveness of northern regions of Kazakhstan .

The advantage of suggested and used methodology of regional agriculture competitiveness assessment is in combination of simplicity with sufficient reliability confirmed by the fact that the other more complex methodologies have similar assessments and conclusions.

More general assignment in the context of enhanced studying of agricultural competitiveness, its formation, management, and assessment mechanisms is the development of methodological tool for componentwise and integral criterion of the region's agricultural competitiveness based on application of economic and mathematical methods and software tools. This assignment can be solved by using methods of social and economic dimensions theory, correlation-regression and economic-statistical analysis, factor analysis, economic and mathematical modeling, mathematical methods of expert assessment collection and integration (Dubina 2010; 2016).

Comparison of region's agricultural competitiveness indicators with regional economic development indicators (GDP, labor productivity, growth rates, etc.) is important from both theoretical and practical points of view, and also for assessment of importance ("weight") of individual components of competitiveness as well as for assessment of "delayed effect" of regions competitiveness increase impact on its social and economic development (Dubina and Ostashchenko 2016).

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