

Dinara Molzhigitova<sup>1</sup>, Saule Igembayeva<sup>2</sup>

## THE WAYS OF INCREASING THE EFFICIENCY OF LAND RESOURCES CONSIDERING REGIONAL FEATURES

*The article considers the efficient use of land resources in the Republic of Kazakhstan. The ways to improve it on the basis of compliance with evidence-based approaches to rational agricultural production of crops and livestock are suggested.*

*Keywords: land resources; crop capacity; crops; humus content; region.*

Дінара Молжигитова, Саулі Ігембаєва

## ШЛЯХИ ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ВИКОРИСТАННЯ ЗЕМЕЛЬНИХ РЕСУРСІВ З УРАХУВАННЯМ РЕГІОНАЛЬНИХ ОСОБЛИВОСТЕЙ

*У статті розглянуто стан ефективності використання земельних ресурсів у Республіці Казахстан, а також запропоновано шляхи її підвищення на основі дотримання науково обґрунтованих підходів до раціонального сільськогосподарського виробництва продукції рослинництва і тваринництва.*

*Ключові слова: земельні ресурси; врожайність; сільськогосподарські культури; вміст гумусу; регіон.*

*Табл. 2. Літ. 12.*

Динара Молжигитова, Сауле Ігембаєва

## ПУТИ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ИСПОЛЬЗОВАНИЯ ЗЕМЕЛЬНЫХ РЕСУРСОВ С УЧЕТОМ РЕГИОНАЛЬНЫХ ОСОБЕННОСТЕЙ

*В статье рассмотрено состояние эффективности использования земельных ресурсов в Республике Казахстан, а также предложены пути ее повышения на основании соблюдения научно обоснованных подходов к рациональному сельскохозяйственному производству продукции растениеводства и животноводства.*

*Ключевые слова: земельные ресурсы; урожайность; сельскохозяйственные культуры; содержание гумуса; регион.*

### Problem statement

The need for efficient use of land resources is predetermined by the fact that they provide activity of population, creating raw materials for the processing industry. The income as well as well-being of society depends on the level of efficiency of land use by different entities. In addition, the efficient use of land resources forms the basis for country's food security. A large number of different kinds of soil is concentrated in the Republic of Kazakhstan, about 10% of them is black soil, the most fertile one in the world (Strategic Plan ..., 2011). Rational use of land resources in every region of the country with the application of the newest energy-and resource-saving technologies will become up to date over time. Search for possibilities of productive land use in the Republic of Kazakhstan should be carried out with a glance on the characteristics of each region, as different soils require special approaches to their treatment.

Independence of the country in today's world is primarily determined by the security of food resources; that can be achieved only if a continuous improvement of

<sup>1</sup> PhD student, Kazakh National Agrarian University, Almaty, Kazakhstan.

<sup>2</sup> Candidate of Economic Sciences, Associate Professor, Kazakh National Agrarian University, Almaty, Kazakhstan.

land resources use is provided. The economic state of the country depends on agricultural land, characterized by low efficiency because of imperfect approaches to land use, as well as poor management of this valuable resource.

In addition, in different regions of the country the areas of the most valuable land were excluded of the scope of agricultural production as a result of degradation, transfer of lands to be used for other purpose, but instead the land of predominantly low productive capacity were put into circulation. Land reform has not provided answers to the questions regarding the organization and management of land resources' use. Imperfect legislation, absence of clear requirements and criteria for rational land use, regulating the activities of land users, as well as harsh conditions of the transition period led to negative changes in all qualitative characteristics of agricultural land. Under such conditions, the problem of more efficient use of land resources with regards to regional peculiarities needs to be addressed.

#### **Recent publications analysis**

Theoretical and practical aspects of land use efficiency were studied by such scholars as M.J. Jumabekov (2012), V.A. Medynskiy (2011), M.D. Sultanov (2012), G.G. Teryaeva (2011), N.I. Follmer (2012), A.A. Shafranov (2009), V.Ts. Johnson (2011), D.G. Orlov (2011), J.K. Reuter (2012), A.O. Ridley (2012), and others. Despite a large number of publications, the topic of improving the efficiency of land use is not well studied since regional characteristics of the country and constant changes in land use options require to be revised and improved.

#### **The objectives of the study**

The paper aims at studying the state of efficiency of land resources' use in the Republic of Kazakhstan and finding the ways to improve it subject to specific regional features.

#### **Research findings**

The efficient use of land in the Republic of Kazakhstan is among the most important social and economic problems of the country, because the success of this process is proportional to food production, food security, social and economic support of population (Jumabekov, 2012). Rational use of land tracts provides agricultural enterprises with a high yield, forage supply for livestock, different products for workers and population and allows gaining monetary foundation for successful activity.

Over recent years of reforming land ownership, there emerged a huge number of business entities and users, having resulted in changes of approaches to the use of land, there are frequent cases of productivity slowdown and degradation of agricultural areas. The negative point is the productivity slowdown due to non-compliance with science-based approaches to agriculture, crop production without proper rotation, leading to a decrease in land use efficiency (Sultanov, 2012).

The level of land use efficiency in the agricultural sector is determined by several parameters, including crop production, gross production on 100 ha of arable land or 100 ha of farmland, cost of production per unit area. It should be noted that using these parameters is not always possible for a qualitative evaluation of the level of land use efficiency (Shafranov, 2009). Therefore, cost parameters can be applied: gross output of agriculture, gross or net income per 1 ha of agricultural land, as well as gross output per unit of production costs. Crop yields can point out to the low efficiency of land use in the Republic of Kazakhstan (Table 1).

**Table 1. Dynamics of crop production in the Republic of Kazakhstan during 1990–2012, centners/ha**

Year	Cereals and black crops	Oilseed crops	Sunflower	Potato	Field vegetables	Watermelons	Sugar beet
1990	12,2	...	9,2	113,0	154,0	84,0	239,0
1991	5,3	...	4,9	99,0	121,0	79,0	148,0
1992	13,2	...	3,3	104,0	114,0	72,0	136,0
1993	9,7	...	3,2	94,0	106,0	69,0	123,0
1994	7,9	...	3,4	94,0	104,0	59,0	77,0
1995	5,0	...	2,9	84,0	101,0	59,0	91,0
1996	6,5	...	1,9	88,0	96,0	58,0	105,0
1997	8,7	...	2,8	84,0	101,0	67,0	116,0
1998	5,6	...	4,2	77,0	114,0	78,0	143,0
1999	13,0	4,9	4,9	108,0	134,0	97,0	172,0
2000	9,4	3,9	4,0	106,0	153,0	119,0	154,0
2001	12,2	5,7	6,0	133,0	166,0	127,0	173,0
2002	11,5	6,3	5,9	139,0	172,0	135,0	207,0
2003	10,8	7,1	6,8	139,0	177,0	144,5	210,4
2004	8,8	6,2	5,9	134,0	186,0	153,2	197,4
2005	10,0	7,0	6,3	150,0	196,0	159,3	209,2
2006	11,7	6,6	5,9	153,6	201,0	167,1	240,8
2007	13,3	7,2	5,9	155,8	211,0	171,7	248,9
2008	10,1	5,5	4,1	143,7	204,0	158,9	204,3
2009	12,6	6,5	5,7	160,0	218,7	161,1	182,9
2010	8,0	5,0	4,4	143,0	214,4	177,0	174,3
2011	16,9	6,7	4,6	167,2	222,9	186,1	188,2
2012	8,6	6,1	5,9	165,9	234,0	206,8	168,2

Source: Developed by the author based on (Agency on Statistics ..., no date)

From the above data in Table 1 it's obvious that the average yield of grain and leguminous crops in the Republic of Kazakhstan in 2012 amounted to 8.6 centner/ha, the yield of sunflower – 5.9 centners/ha and sugar beet – 168.2 centner/ha. Since 1990, productivity has not changed greatly, testifying its low level throughout the study period. The highest yield of grain and leguminous crops was observed in Almaty (20.7 centners/ha), Kyzyl-Orda – (42.2 centners/ha), South Kazakhstan – (13.4 centners/ha), North Kazakhstan (12.9 centners/ha) regions. Comparing the yield of the Republic of Kazakhstan with its value in other countries, one can see that European countries grow crops with an average yield of no less than 60 centners/ha, for all that the technology of cultivation provides for a significant level of chemicalization (Ridly, 2012). This in turn deteriorates the quality of soils and products affecting food reserves of the country. In general, low productivity affects other performance indicators of land use in the country, hence it's necessary to seek for a way out of this situation.

To improve the efficiency of land use a large number of the most important factors should be taken into account, affecting the results of land management. The rational use of land resources is influenced greatly by such factors as climatic conditions, cropping technology, soil quality, level of agricultural chemicalization, seed quality, skill level of owners and workers. High efficiency of cropping can be provided through considering these factors and providing acreage with all necessary aid.

Under poor climatic conditions of a particular region of the country one needs to pay attention to the cultivation of resistant to negative weather conditions crops or

their particular varieties, to organize reclamation work as far as possible, to shift the timing of cropping. Technology in agricultural production is also important.

In the current market environment, it is advisable to use technology to reduce the cost for 1 ha of the area, while providing necessary production steps using large wide-cut units and high-capacity machinery.

Reduction of cattle population has led to a decrease in introducing organic fertilizers and replacing them with mineral ones. In addition, there are often excess application rates of plant protection products, degrading the soil quality. As a consequence, there is a decrease in humus content in the soil, which responsible for soil fertility. World farming experience shows that the amount of humus in the soil is an indicator for assessing the available tillage systems (Jonson, 2011; Orlov, 2011). High humus contents effects beneficially the soil properties, being less affected by pesticides, and has the potential to use mineral fertilizers more effectively (Reuter, 2012). The developed recommendations on the application of mineral fertilizers depending on a type of soil have their reference values (Table 2).

**Table 2. Recommended application rates of mineral fertilizers depending on soil type, reactant kg/ha**

Soil types	Region of the country with this type of soil	Reactant			Total
		NH <sub>4</sub>	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
Black soil	North Kazakhstan, Kostanai, northern parts of	71	50	58	179
Black soil with low humus content	Akmola, Pavlodar regions, Aktobe and West Kazakhstan regions	90	50	55	195
Light brown soil	Most part of Central Kazakhstan, Northern Caspian	91	42	42	175
Dark brown soil	lowlands, plains of East Kazakhstan regions	95	53	53	201
Brown desert soil	Southern part of Kazakhstan	98	41	47	186

*Source:* Developed by the author based on the data (Medynskyi, 2011; Teryaeva, 2011; Folmer, 2012).

Based on the data in Table 2 it can be stated that the greatest amount of mineral fertilizers should be inserted into brown desert soil and dark brown soil. In this case, the Southern regions of the country with brown desert soils (occupying about 44% of the country) (Strategic Plan ..., 2011) have unfavorable conditions for crop production, so these plots are used for developing the livestock sector. In general, it should be noted that the effective use of different types of land in addition to other important factors require paying attention to the regulatory-based amount of mineral fertilizers. Attention should also be paid to the development of the livestock sector, since it can provide agriculture with organic fertilizer into the soil, to usage of plant by-products as feed, to ensure the scientific validity of crop rotations.

### Conclusions

On the basis of the current research it is established that the efficiency of land use of the Republic of Kazakhstan is low, as evidenced by low crop yields in most regions compared to other countries, particularly to Europe. Under the circumstances, increased efficiency of land use can be achieved by taking into consideration the climatic conditions, crop cultivation technology, soil quality, the level of agriculture chemicalization, seed quality, skill level of owners and workers. In addition, fertile soil distribution in the Republic of Kazakhstan is not uniform, the most favorable soil conditions for crop production are in Northern regions of the country, where it is

advisable to incorporate best practices of commercial crops' cultivation, and in Southern regions of the country land tracts should be used for animal husbandry.

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