IMPROVING THE EFFICIENCY OF USE OF AGRICULTURAL LAND IN THE REPUBLIC OF KAZAKHSTAN

Elmira Mursalimova[1]; Aigul Shaimerdenova[2]; Ayaulym Nurymbay[3]
[1]Candidate of Biological Sciences, Associate Professor at the Department of «Land resources and cadastre» of the Kazakh National Agrarian University, Kazakhstan1
[2]Eurasian technological university, Ph.D. candidate, Kazakhstan
[3]Kazakh National Agrarian University, Faculty of Forest, Land Resources and Phytosanitary, postgraduate student, Kazakhstan

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Introduction

The agricultural lands have a special legal regime and are subject to the protection aimed at limiting the seizure of these lands, preserving and increasing their fertility. The area of lands of this category in the structure of land Fund accounts for 100.8 million ha, or 38.6% of used land. Their share in the land Fund of the regions ranges from 70-75% (North-Kazakhstan, Akmola region) to 10-20% (Kyzylorda, Atyrau region). It is mainly related to different climatic conditions and vast areas of desert and semi-desert rangelands.

The implementation of the doctrine of food security of Kazakhstan in modern conditions requires an increase of the efficiency and sustainability of agricultural production. Of course, without a balanced policy in respect of agricultural land, which would ensure their conservation and sustainable use is impossible.

In this task, a special role acquires land supervision. One of the priorities in the process of increase of efficiency of use of agricultural land is the work of local authorities with unclaimed land shares. Land inspectors to this day are working to bring back to life unclaimed land.

The diversity of the soil cover of Kazakhstan, due to various climatic and geological conditions determined the development of a wide range of fields of agricultural production. Effective use of soil resources in agriculture requires a fundamental knowledge about the nature of the soil, soil-forming process based on the study of the genesis, geography, soil cover of the country.

The distribution of soils on the territory of the Republic subject to the laws of horizontal and vertical soil zonation.

Plain territory of the Republic of Kazakhstan in the direction from North to South is presented in four soil zones of temperate-humid forest steppe zone of gray forest soils; leached black soils and meadow-black soils; moderately arid steppe zone of the black soils and southern soils; dry steppe and desert-steppe zone of chestnut soils and the desert zone of brown and gray-brown soils (Fig.1).

The geographical boundaries of the natural zones correspond to the range of the zonal soil type gray forest, black soils, chestnut and brown desert. On the severity of bioclimatic conditions, and imposing manifestation of the basic processes of soil formation and natural soil zones are divided into subzones with their corresponding subarea subtypes of soils.

Temperate-humid forest steppe zone of gray forest soils, leached black soils and meadow- black soils included in the limits of Kazakhstan, its southern suburbs, is relatively small, with an area of about 800 thousand ha in the Northern part of the North-Kazakhstan region.

The soil cover is heterogeneous and depends on the conditions of drainage of the terrain. Zonal soils occur rarely large uniform arrays and form a complex mosaic of soil combinations – combinations, complexes and spots of meadow- black soils, solonetz soils, soloth and meadow soils.

Forest-steppe zone of gray forest soil and leached black soils is characterized by the highest percentage of tilled agricultural land, which makes up 48.6 %, while the average for the country – 11.6%.

In the current bioclimatic and soil conditions in this zone the main activity of agriculture is rain-fed farming for cultivation of spring grain crops.

Moderately arid steppe zone of black soils and stretches South through the territory of Kazakhstan from Trans-Ural plateau in the West to the Irtysh plain, on the East to a distance of 2.2 thousand km. Total area of the steppe zone is 26.5 million ha or 9.7 % of the territory of the Republic.

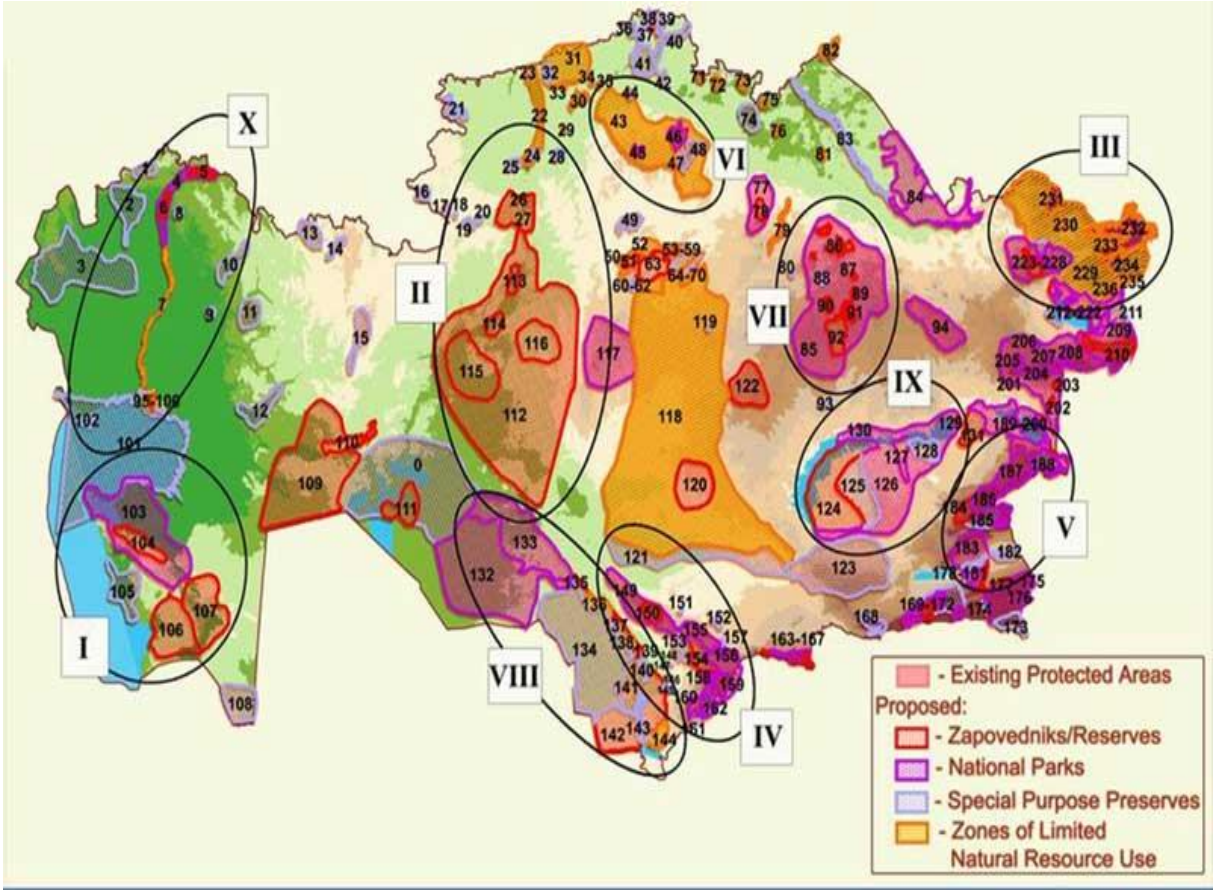

Fig. 1. Geographical map of Kazakhstan

For the black soil zone in Northern Kazakhstan belongs to the southern part of the West Siberian lowland, the Northern part of the Kazakh uplands, mainly Kokshetau lofty district, and a significant part of the Turgay plateau.

Soil parent rocks are predominantly yellow-brown clay and loam, overlying a relatively thin layer and underlain at shallow depth of the salt of tertiary clays. In Irtysh and on the upper terraces of the rivers Ishim and Tobol soil formation takes place in the ancient alluvium of light mechanical composition.

The steppe zone of black soils is divided into subarea of moderate-arid steppe of the black soils (medium humus) and the arid steppes of the southern black soil (low-humus).

Qualitative condition of soils in large areas in the Republic is complicated by the presence of symptoms that adversely affect their fertility. To account for the quality of agricultural land reclamation, the following groups of soil with the general thrust and nature of reclamation activities:

I – uncomplicated negative signs; II – highly rubbly ; III – saline; IV – solonetz; V – washed away; VI deflated; VII – affected by water and wind erosion; VIII – waterlogged; IX – wetland; X – other.

Each of these reclamation groups, excluding "uncomplicated negative traits" and "jointly exposed to water and wind erosion", according to the degree of severity of the process is divided into three grades: soft, medium, hard in group " highly rubbly soils" is added to the gradation – very much. The group "waterlogged" consists of alluvial and outside alluvial.

Characteristic of agricultural land, non-irrigated and irrigated arable land on these characteristics, taking into account the changes in the structure and areas of these lands in subsequent years and are shown in tables 1,2,3.

I-group of uncomplicated negative signs.

It includes the soil profile which is not complicated by any adverse properties (solonetzicity, smitest, etc.), therefore they do not require special farming techniques and land reclamation, the performance of their high.

This group of soils is in Kazakhstan 41.5 million ha or 19.3 % of the total area of agricultural land. In the composition of arable land, this group is 16.1 million ha or 64.7 % of the total area of agricultural land (24.9 million ha). Of the total area of definitely suitable, 15.9 million ha or 63.9 % is composed of arable land. A significant area of land (17.9 million ha) without the negative features that affect soil fertility, cannot be used in agriculture due to lack of atmospheric moisture, lack of water for irrigation and terrain conditions.

Definitely suitable for agriculture soils occupy 23.6 million ha or 11.0 percent of all agricultural land. The largest area is definitely suitable for soil quality requiring conventional zoned farming or in need of a simple reclamation actions used in the composition of arable land identified in Kostanay 5.4 million ha, Akmola – 5.0 million ha, North-Kazakhstan – 4,2 million ha of fields. In other areas, these areas range from 200 to 900 thousand ha in each, with the exception of Atyrau (0.4 thousand ha) and Mangistau regions.

II group – highly rubbly. These are the areas with underdeveloped and featuring poorly developed soils, bedrock outcrops, and others. Total area of 43.1 million ha or 20.1% of agricultural land. The greatest distribution the group received in the territory of the hill and between, mostly in foothill and mountain areas of East Kazakhstan – 12.1 million ha, Zhambyl – 4.0 million ha Asia 3.1 million ha areas, as well as hill and between Karaganda – 13.1 million ha, Pavlodar – 2.8 million ha, Akmola – 2.4 million ha and Aktobe 1.8 million ha of areas. The largest area in this reclamation group is very much highly rubbly soil is 26.4 million ha, medium and weakly rubbly soils are, respectively, 8.3 million ha and 8.4 million ha.

In the composition of arable land highly rubbly soils listed 1.5 million ha.

Square of highly rubbly soils involved in the cultivation, the areas are unevenly distributed. So in Zhambyl there are 28,6 % of the arable land area, in Karaganda – 23,5 %, in Almaty – 14,4 %, in Akmola, North Kazakhstan and Kostanay regions – from 2.2 to 5.6 %. In other areas the area of land in arable land is negligible. The presence of a weak highly rubbly (1.2 million ha), does not preclude their use in the composition of arable land. Medium, strong and very rubbly (0.3 million ha), and undeveloped soils it is better to use as pasture.

Group III – saline. In the Republic the number of saline soils is 35.3 million ha or 16.4 % of the total area of agricultural land.

Depending on the soil salinity and the content in the complexes of salt marshes, the team divided into three grades:

- slightly saline, which includes all of saline soils and their complexes with saline to 10 %, cover an area of 11.0 million ha
- moderately saline include all saline soils together with the salt marshes from 10 to 30 %, their area of 7.3 million ha
- include all strongly saline soils together with the saline from 30 to 50 % or more, the area of 14.2 million ha
- salines separated and occupy 2.8 million ha.

Saline are available in all zonal soil types, of which more than 58% is part of brown and gray-brown soils, particularly in medium and strong degree 64 % of the total number. In the area brown and gray-brown soils have more than 50% of the area of all salt marshes. In the black soil zone of saline identified 1.6 million ha, in a zone of dark-chestnut and chestnut soils – 6.2 million ha, light chestnut – 2.7 million ha.

Table 1

Characteristics of agricultural land on the grounds that affect their fertility on November 1, 2015, thousand ha

The name of the regions	Total area	I. uncomplicated negative signs		II. 3highly rubbly	III. saline	IV. solonetz	V. outwash	VI. deflated	VII. affected by water and wind erosion	VIII. waterlogged	IX. wetlands	X. other
		in total	including definitely suitable									
Akmola	13187,9	4995,5	4995,5	2412,1	1601,9	3169,5	562,0	9,6	-	164,5	111,6	161,2
Aktobe	26225,2	7872,9	1447,0	1815,4	1483,8	11453,6	473,1	2101,1	8,3	269,0	25,9	722,1
Almaty	15848,0	2958,6	781,1	3048,4	2907,4	573,8	815,5	4952,4	-	199,7	187,6	204,6
Atyrau	9114,0	537,9	0,4	136,9	1744,0	3396,0	-	3133,9	-	45,7	3,1	116,5
West-Kazakhstan	22645,2	3230,1	1424,6	12121,3	1587,2	3744,3	426,6	864,5	1,5	437,7	111,7	120,3
Zhambyl	9347,8	669,7	333,8	4050,4	1358,1	406,3	222,7	2414,0	-	124,0	87,0	15,6
East-Kazakhstan	12777,3	1528,2	1073,2	301,9	1343,2	7109,5	274,5	1409,5	191,9	326,4	72,5	219,7
Karagandy	33007,2	3654,3	1174,2	13085,9	2604,6	11443,7	200,4	759,7	-	574,6	61,8	622,2
Kyzylorda	12156,8	1127,2	4,3	263,8	7066,5	641,6	2,9	2846,7	-	94,5	79,1	34,5
Kostanay	18129,3	5898,1	5403,4	590,4	3133,1	6846,5	158,7	611,2	-	294,5	183,6	413,2
Mangystau	12655,9	1600,9	-	932,5	6870,0	1635,4	800,0	656,3	-	-	-	160,8
Pavlodar	11167,6	1606,5	1596,5	2824,4	775.6	3943.8	0,9	1296,3		157,9	34,8	527,4
North-Kazakhstan	8404,3	4180,2	4180,2	410,2	573,2	2790,4	56,0	-	-	144,5	115,6	134,2
South-Kazakhstan	10129,4	1629,7	1138,5	1068,8	2232,5	1007,5	956,9	3112,9	-	112,3	7,7	1,1
Almaty sity	30,4	25,6	0,8	4,4	-	-	0,1	-	-	0,3	-	-
Astana sity	12,2	3,0	3,0	0,6	2,4	2,5	-	-	-	2,0	1,6	0,1
Total area	214838,5	41518,4	23556,1	43067,4	35283,5	58164,4	4950,3	24168,1	201,7	2947,6	1083,6	3453,5

Note: the line "total area" no lands used by other States.

Table 2

The characteristic of arable land on signs affecting her fertility on 1 Nov 2015, thousand ha

The name of the regions	Total area	I. uncomplicated negative signs		II. highly rubbly	III. saline	IV. solonetz	V. outwash	VI. deflated	VII. affected by water and wind erosion	VIII. waterlogged	IX. wetlands	X. other
		in total	including definitely suitable									
Akmola	5 699,9	3 789,7	3 789,7	303,1	596,7	636,9	351,3	0,9	-	12,7	1,3	7,3
Aktobe	541,1	417,9	417,9	13,9	19,7	45,8	34,2	-	-	9,2	-	0,4
Almaty	1 085,1	595,8	548,8	155,8	155,2	25,5	58,2	40,0	-	51,5	3,1	-
Atyrau	5,1	0,8	0,8	-	3,9	0,1	-	-	-	0,3	-	-
West-Kazakhstan	1 451,5	927,8	927,3	144,1	33,4	85,2	235,1	12,2	0,6	12,8	-	0,3
Zhambyl	836,4	333,1	176,4	239,4	178,9	3,4	52,7	1,6	-	23,8	2,5	2,0
East-Kazakhstan	538,1	259,8	259,8	15,1	23,0	62,8	72,6	4,4	95,6	3,9	0,5	0,4
Karagandy	1 130,1	428,1	426,9	266,0	84,2	225,3	83,2	28,1	-	12,0	0,6	2,6
Kyzylorda	160,9	-	-	-	151,0	-	-	-	-	-	9,9	-
Kostanay	6 094,6	4 537,0	4 537,0	133,1	583,8	688,2	63,4	30,1	-	42,6	3,3	13,1
Mangystau	0,5	0,3	-	-	0,1	0,1	-	-	-	-	-	-
Pavlodar	1 610,5	758,2	757,8	49,7	134,1	310,8	-	334,3	-	0,6	-	22,8
North-Kazakhstan	4 842,4	3 590,6	3 596,0	188,8	280,4	713,6	28,0	-	-	20,2	2,7	18,1
South-Kazakhstan	934,8	494,0	491,1	14,7	143,4	6,5	241,3	0,2	-	34,7	-	-
Almaty sity	1,9	1,6	0,6	-	-	--	-	-	-	0,3	-	-
Astana sity	1,9	1,5	1,5	-	0,2	0,2	-	-	-	-	-	-
Total area	24 934,8	16 136,2	15 936,1	1 523,7	2 387,0	2 804,4	1 220,0	451,8	96,2	224,6	23,9	67,0

Note: the line "total area" no lands used by other States

Table 3

Distribution of agricultural land land reclamation groups on 1 Nov 2015

Reclamation group	Area, thousand ha	Specific weight, %
Total agricultural lands	214 838,5	100
Of them:		
Uncomplicated negative signs	41 518,4	19,3
Including course is suitable for agriculture	23 556,1	11,0
Highly rubbly	43 067,4	20,1
Saline	35 283,5	16,4
Solonetz	58 164,4	27,1
Washed away	4 950,3	2,3
Deflated	24 168,1	11,2
Together exposed to water and wind erosion	201,7	0,1
Waterlogged	2 947,6	1,4
Wetland	1 083,6	0,5
Other	3 453,5	1,6

The arable land is 2.4 million ha of saline lands, of which in Akmola region – 0.6 million ha, Kostanay – 0.6 million ha in North Kazakhstan – 0.28 million hectare, Zhambyl – 0.18 million ha in South Kazakhstan is 0.15 million ha, in other areas of saline arable land is negligible. In the non-irrigated part of arable land is used mainly slightly saline soils and their complexes (1.7 million ha). In irrigated agriculture in the composition of arable land uses slightly saline soils and complexes of non-saline and slightly saline soils with saline to 30% (190,1 thousand ha). These lands need to be simple measures on desalinization and leaching on the background of collector-drainage network. Rainfed and flushing partially at the expense of atmospheric precipitation and snow accumulation.

Moderately and strongly saline soils with saline to 30%, and the salt marshes with a total area of 630.4 thousand ha require a complex of reclamation actions in this regard, it is advisable to withdraw from the arable land and transformed into pastures.

IV group solonetz. Are one of the largest area of reclamation groups in the country, occupying 58.2 million. ha or 27.1 per cent of agricultural land. Solonetz soils are divided into three grades:

- weak solonetz soils, they are slightly alkaline, saline soils homogeneous contours or not solonetz with saline cortical, small, medium from 10 to 30% and deep 50 %. Their total area amounts to 18.2 million ha (31,3 %)
- moderately solonetz soils, which include moderately solonetz complexes and solonetzic soils with saline cortical, small, average 30 to 50 % and deep salt licks. The total area is 10.9 million ha (18,7 %)
- strongly solonetz soils, which include strongly solonetz soils, alkaline soils and complexes with their predominance (except deep). Total area of 29.1 million ha (50,0 %).

The greatest distribution of solonetz soils and their complexes have received in the desert zone of brown and gray-brown soils – 16.8 million ha, semi-arid zone of light-chestnut soils – 15.2 million ha and the dry zone of dark-chestnut and chestnut soils – 19,1 million ha.

In regional terms, the main area of solonetz lands in Aktobe (11.5 million ha), Karaganda (11.4 million ha), West Kazakhstan (7.1 million ha) regions. In Akmola, Atyrau, East Kazakhstan, Pavlodar and North Kazakhstan areas of land listed from 3 to 4 million ha In the southern regions of the Republic of solonetz lands are less than one million ha each.

Solonetz of the arable land is 2.8 million ha. Largest areas are used in North Kazakhstan – 713,6 thousand ha in Kostanay -688,2 thousand ha, Akmola – 636,9 million ha in Pavlodar – 310,8 ha and Karaganda – 225,3 thousand ha of fields. Mainly in the arable land used weak solonetz complexes in which the salt is up to 30 %.

Group V – exposed to water erosion (washed out). In structure of agricultural lands occupy an area of 4.9 million ha, of which arable land accounted for 1.2 million ha. The Largest area of eroded soils in the composition of arable land identified in Akmola, South Kazakhstan, East Kazakhstan and Zhambyl regions.

VI group–susceptible to wind erosion (deflated). Such soils, there are 24.2 million ha, including arable land 0.5 million ha, of which 74 % is in Pavlodar oblast.

VII group–together exposed to water and wind erosion. Identified on the area 201,7 thousand ha. More detailed characteristics of soil erosion are outlined in section 2.4.1 of this Report.

Group VIII – wetlands. The country occupy 2.9 million ha, of which 224,6 thousand ha is arable land. This group is represented hydromorphic and half-hydromorphic soils. Floodplain land is 1.1 million ha, outside alluvial – 1.8 million ha.
The most significant areas of the soils in this group are in the Karaganda region – 0.6 million ha in Kostanay, West Kazakhstan, Pavlodar, Aktobe, Almaty regions listed 0.2-0.3 million ha of wetlands.
Lands this group, represented mainly the soils that occupy the floodplain and above-floodplain terraces of rivers and outside alluvial sinks and pits, including natural and artificial estuaries. The excess of melt water and duration of flooding affect the time of sowing, ripening and yield of crops. In this regard, soils in this group are better used as hay land.
IX group – wetlands. Distributed on the area of 1.1 million ha, of which arable land – 23.9 ha, of which 15.4 thousand ha are irrigated arable land. They were formed in conditions of excessive moisture and is represented mostly swamp and meadow-swamp soils. Distributed in all regions, except Mangystau, small areas. Their use in the composition of arable land is impractical, as they require complex land reclamation measures in the drainage.
X group – other. Cover an area of 3.5 million ha. In the group account of the soil, whose quality cannot be placed in any of the above reclamation groups. It is fused soil malt, plains, residual-carbonate, and sand without negative signs, automorphous, half-hydromorphic, stony placers, gravelly sediments, gullies and gully complexes, salt marshes, etc.
Distributed in all soil zones in small patches of them in the dry zone of dark-chestnut and chestnut soils listed as 2.0 million ha of semi-arid zone of light-chestnut soils – 0.3 million ha of desert zone of brown and gray-brown soils – 0.5 million ha. Regionally, the main area of the group other are in Aktobe (0.7 million ha), Karaganda (0.6 million ha), Pavlodar (0.5 million ha) regions. In the composition of arable land there 67,0 thousand ha, including in Pavlodar - 22.8 thousand ha, North-Kazakhstan – 18,1 thousand ha in Kostanay – 13.1 thousand ha areas.
In general, analyzing the distribution of agricultural land by reclamation group, it can be concluded that in the category of agricultural land are the highest quality in reclamation land. So in the composition of agricultural land this category of land reclamation the group with uncomplicated negative symptoms, including certainly suitable for agriculture, is 28 % (table. 50).
The proportion of other land reclamation groups with negative signs to a lesser degree, is about 24 %. On agricultural lands with negative signs in the middle and strong extent, account for 48 % of the total area. For comparison, in the Republic reclamation group with uncomplicated negative signs is 19 %, with negative signs in mild – 20 %, and in medium and strong degree - more than 60 %.
Compared to the last round of quality assessment of lands (2010) the area of arable land increased from 24.2 million ha to 24.9 million ha, including irrigated with 1 440.9 thousand ha to 1 ha. 597,9 Growth amounted to, respectively, 0.7 million ha and 157,0 thousand ha. In regional terms, the main increase in arable land occurred in North Kazakhstan (23.6 thousand ha), Akmola (341,0 thousand ha), East Kazakhstan (218,3 thousand ha), Kostanay (429,1 thousand ha), Pavlodar (213,7 thousand ha) areas.
As the result of transformation of agricultural land occurs qualitative change in the composition of arable land, mainly due to the low productivity part of semi-desert light brown areas and the development of new areas of arable land in the steppe and dry-steppe chestnut black soil zone and in the foothill regions of the Republic where the most productive land.

References

1. The land code of RK (20.03.2006) №442-II (with changes and additions on 20.02.2017)
2. Consolidated analytical report on the status and use of lands for 2015
3. Faizov K.S, Kenenbaev S.B, Mamutov Z.U, Esimbekov M.B (2006) Soil geography and ecology of Kazakhstan (Geografiya I ekologiya pochv Kazakhstana). Almaty, p 348 (in Russian)
4. Kazakhstan/issues of agricultural chemistry and ecology (Ekologicheskiye problemy pochvennogo pokrova Respubliki Kazakhstan//Problemy agrokhimii i ekologii). Sci-Theor j (nauchno teoreticheskiy zhurnal) 3:23–26 (in Russian)