The Scientific Journal of Cahul State University "Bogdan Petriceicu Hasdeu"
Economic and Engineering Studies
№. 1 (5), 2019
http://jees.usch.md/ e-mail: journal.ees@usch.md

LAND PRODUCTIVITY IN AGRICULTURE IN THE REPUBLIC OF MOLDOVA: REGIONAL ASPECT

Parmacli Dmitrii,
doctor habilitatus of economics, professor,
Comrat State University, Moldova
e-mail: parmad741@mail.ru

Ianioglo Alina,
PhD, leading researcher,
National Institute for Economic Research of Moldova
e-mail: ellcy@mail.ru

Abstract. *The article reveals the importance of land for the agricultural sector, as well as the state of weather and climatic conditions and their influence on the cultivation of agricultural crops. At the same time, it is reasonably emphasized that natural factors represent key factors affecting the economic viability of enterprises. The agricultural sector is more dependent on the climatic conditions than other industries and has a pronounced seasonal nature. It is noted that a significant part of the country's territory is located in the zone of unsustainable farming. The stability of crop yields is decreasing from north to south of the country. That is why the southern zone of the country, including ATU Gagauzia, is located in the epicenter of unsustainable agriculture. This is evidenced by the indicators of yields of cultivated crops in various regions of the country. There are presented the yields of grain crops, sunflower and fruits in the whole country and in the regions for 2009-2017. Comparative yields of grain crops and fruits on average in the southern zone of the republic and ATU Gagauzia, located in the epicenter of high-risk farming, are also given. The material is presented in tables and graphs. There was conducted an analysis of the instability of the yield of these crops for the analysed period.*

Keywords: *land, yield, instability, regions, grain crops, sunflower, fruits.*

JEL Classification: Q13, Q15
UDC: 338.43(478)

Introduction. In the Republic of Moldova, soil is the main type of natural resources, the most important criterion for determining the productivity of the main factor of production in rural areas. The efficiency of land use largely depends on soil fertility, their rational and purposeful use, protection from adverse natural and anthropogenic impacts, scientifically based amelioration and chemicalization of agriculture [1, p.233].

The results of agricultural production are significantly influenced by the fertility of the land, the temperature of the air and the soil, the amount of precipitation, sunny days and other natural conditions. In favourable years, in this respect, the yield and the volume of gross output increase, in unfavourable years, they are significantly reduced. Consequently, depending on the quality of the land and the weather, the farms receive different quantities of products for equal expenses of labour and funds, all other conditions being the same. In this regard, the analysis of production efficiency should be made taking into account the quality of the land for a long period of time: 3-5 years or more. This will allow objectively identifying trends and patterns of development, to a certain extent, smoothing the influence of weather conditions on the result of production [2, p.30].

Analysis of recent research and publications. Issues of stability and steady growth in the production of grain and other types of products in the economic literature are considered from different perspectives. In particular, A.Rasskazova and R.Zhdanova in their publications introduce the concept of economic efficiency of sustainable land use [3, p.23-25]. S.Siptits examines the problems of combining the efficiency and sustainability of functioning agro-food systems [4, p.56-59], and I.Romanenko and N.Evdokimova - sustainability and efficiency of the location of crop production in the territory, which ensures a high degree of use of the bioclimatic potential of the territory [5, c.60-63].

Among Moldovan authors it is worth mentioning the works of doctors habilitat of economic sciences A. Stratan, V. Doga and E. Timofti, who in their studies developed and proposed their

variants of the economic mechanism for increasing the efficiency of production of grain, sunflower, fruits and grapes based on the rational use of land [6, 7, 8]. The studies of doctors of economic sciences L. Todorich and T. Dudoglo are of great importance, they aimed respectively at studying the problems of the sustainability of agricultural production [9] and assessing the level of stability in the productivity of the regions' lands [10].

Research results. The indicators of agricultural efficiency are experiencing the special and direct impact of the natural quality of land resources and the climatic conditions of the territories. The Republic of Moldova is distinguished by a variety of natural features with pronounced zonality. The climate is moderately continental, characterized by relatively short moderately warm winters and long hot summers. Positive climate factors are the abundance of light and heat, the long duration of the warm period and relatively mild winters, the negative factors are droughts and the great variability of weather, especially in spring. The duration of the warm period (with a positive average daily temperature) averages 260-270 days in the north, 270-285 days in the central part and 280-290 days in the south of the republic. The duration of the cold period (with temperatures below 0°C) is on average 95-105 days in the north, 80-95 days in the central and 75-85 days in the southern regions. The Republic of Moldova is in the zone of insufficient moisture. The average annual rainfall is about 380-550 mm. The height of the place, the shape of the relief, the presence of reservoir, woodlands and river valleys have a great influence on the distribution of precipitation. The amount of precipitation decreases from northwest to southeast. The highest amounts of annual precipitation (500–550 mm) are observed in the northwest of the republic (Briceni and Edinet districts). In the southern and south-eastern parts of the republic, as well as in the valleys of the Prut and Dniester rivers, the annual precipitation mostly constitutes 400-450 mm. The minimum precipitation (up to 400 mm) is observed in the south of the republic - in ATU Gagauzia, Taraclia and Cahul regions [11, p. 54].

Thus, natural factors are a key factor affecting the economic viability of enterprises. The agricultural sector is more dependent on the climatic conditions than other industries and has a pronounced seasonal nature. Table 1 presents the indicators of yields of grain crops in the Republic of Moldova by region for the last 9 years. It clearly confirms the dependence of land productivity on natural factors. For example, in an exceptionally unfavourable year 2012, the yield of grain per hectare of sowing area was 12.7 q/ha, and in the favourable year 2017, it was more than 2.7 times higher. In this regard, the industry is experiencing a high instability of crop production. During this period, the coefficient of variation reached almost 30%, which relates grain production to an unstable industry.

Table 1. Indicators of grain yield by regions of the country for 2009-2017 (q /ha)

Year	Republic of Moldova	North	Centre	South	ATU Gagauzia
2009	19,5	23,2	17,1	17,9	15,3
2010	22,6	26,4	20,4	20,6	19,2
2011	25,8	28	23	25,8	22,9
2012	14,7	20,3	11,3	10,9	10,2
2013	31,5	33,1	32,6	30	28,3
2014	34,9	42,2	30,7	31,1	28,2
2015	25,9	27,0	24,5	26,0	24,7
2016	35,7	36,8	34,6	36,0	33,3
2017	40,0	41,1	35,8	42,3	37,5
Average	27,8	30,9	25,6	26,7	24,4
Standard deviation	8,3	7,8	8,5	9,5	8,6
Coefficient of variation, %	29,8	25,2	33,1	35,6	35,3

Source: Statistical Yearbook of the Republic of Moldova 2010-2018

In addition, it should be noted that a significant part of the country's territory is located in the zone of unsustainable agriculture. The stability of the crop yield is decreasing

from north to south of the country. That is why the southern zone of the country, including ATU Gagauzia, is located in the epicenter of unsustainable agriculture. This is evidenced by indicators of yield of grain crops in various regions. Thus, the coefficient of yield variation in the central and southern zones is respectively 1.3 and 1.4 times higher than in the northern.

In dry years, low yield of grain crops cause a sharp drop in product profitability, and this in turn affects the sustainability of the enterprise and its economic viability. In this regard, one of the important tasks of land users is to ensure a higher stability of land resource productivity, using for this purpose agronomic, organizational, economic and other instruments. Indicators of grain crops yield in the regions of the Republic of Moldova are presented in Figure 1, and their dynamics - in Figure 2.

The data in Figure 1 shows that the agricultural enterprises in the central and southern zones, as well as in ATU Gagauzia, on average for the 9 years, had grain crops yields lower than in the northern zone. This circumstance confirms more favorable conditions for the cultivation of grain crops in the northern zone.

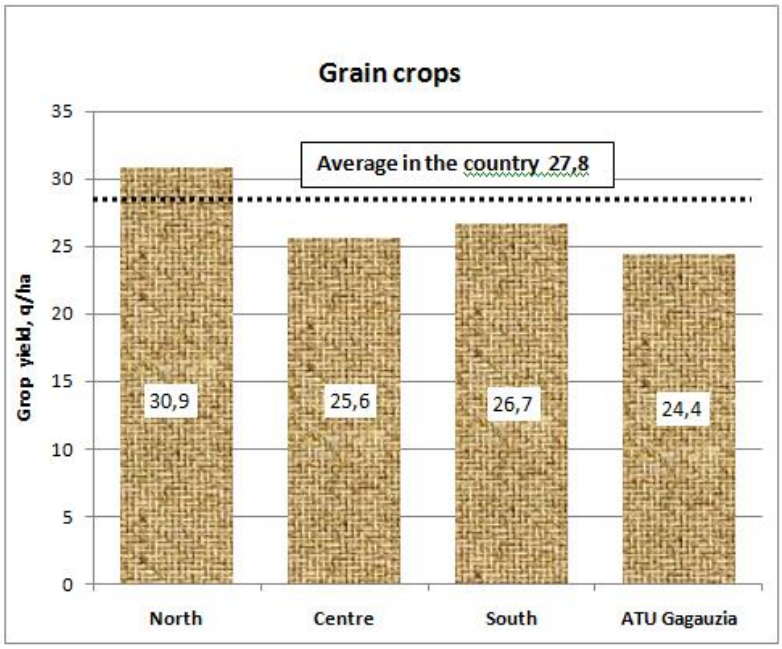

Fig.1. Indicators of grain crops yield in the regions of the Republic of Moldova for 2009-2017
Source: developed based on the Table 1

Figure 2 shows that during the analysed period, the yield of grain per unit area had a pronounced upward trend. If in the southern zone as a whole, this indicator increased on average over a year in accordance with the trend equation by more than 2.7 q/ha, in ATU Gagauzia - by 2.5 q/ha. In the northern and central zones, the increase in yield was 2.0 q/ha and 2.3 q/ha, respectively.

A brief analysis of indicators of sunflower production in the regions of the country (Table 2) confirms higher yield stability than the cultivation of grain crops (the coefficient of variation was 22.1%). However, as can be seen from the table in the southern regions, the average annual sustainability exceeds 30%, which also confirms the higher natural vulnerability compared with the indicators of the northern and central zones.

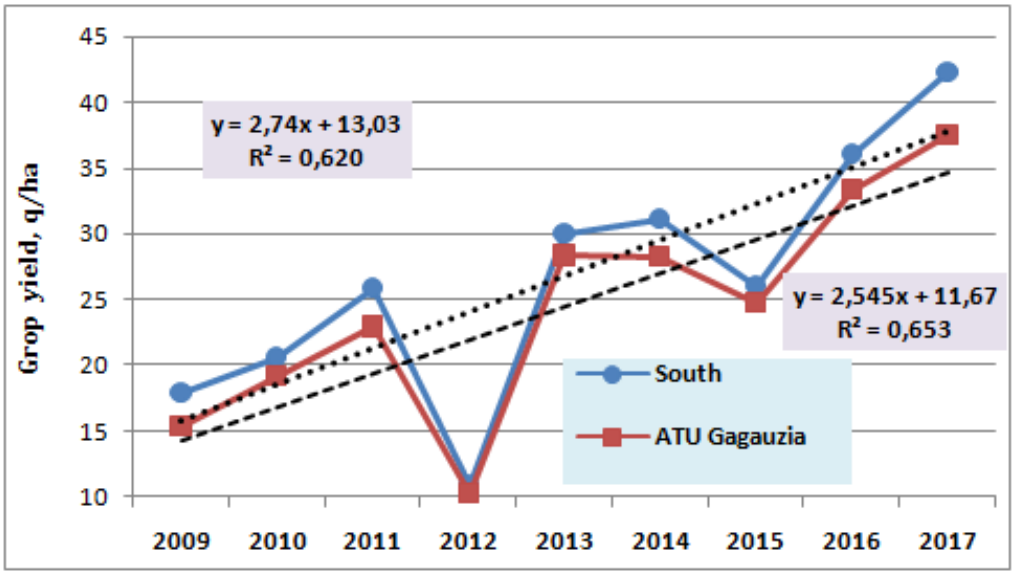

Fig.2. Dynamics of grain crops yield in ATU Gagauzia and the southern zone of the Republic of Moldova for 2009-2017

Source: developed based on the Table 1

Table 2. Sunflower yield by regions of the country for 2009-2017 (q /ha)

Year	Republic of Moldova	North	Centre	South	ATU Gagauzia
2009	13,0	16,2	11	10,2	9,6
2010	16,7	17	14,2	15	14,5
2011	15,8	18,1	14,1	14	14,4
2012	10,6	13,6	8,2	8,6	7,7
2013	20,9	23,7	19,9	18,6	17,2
2014	18,8	21,2	16,1	18,2	16,9
2015	15,9	15,8	14,0	16,9	16,6
2016	20,1	18,8	19,4	22,0	21,1
2017	22,2	22,0	19,6	23,8	23,3
Average	17,1	18,5	15,2	16,4	15,7
Standard deviation	3,8	3,3	4,0	5,0	4,9
Coefficient of variation, %	22,1	17,7	26,6	30,7	31,5

Source: Statistical Yearbook of the Republic of Moldova 2010-2018

The average sunflower crop yields for 9 years in the regions also confirm higher rates in the northern zone. Thus, in the agricultural enterprises of Briceni, Edinet and other areas of the northern zone, the yield of sunflower seeds per unit area was higher than in the central and southern farms and ATU Gagauzia by 21.7%, 12.8% and 17.8% respectively (Table 2 and Fig.3). Comparative indicators of the dynamics of the yield of sunflower in the northern and southern zones (Fig. 4) show that the enterprises of the southern zone are increasing the growth rates of land productivity and over the past 3 years even exceeded the values of the northern zone. On average, for 9 years the farms of the southern zone ensured an average annual increase of yield by 1.5 q/ha, which is 3 times higher than in the northern zone.

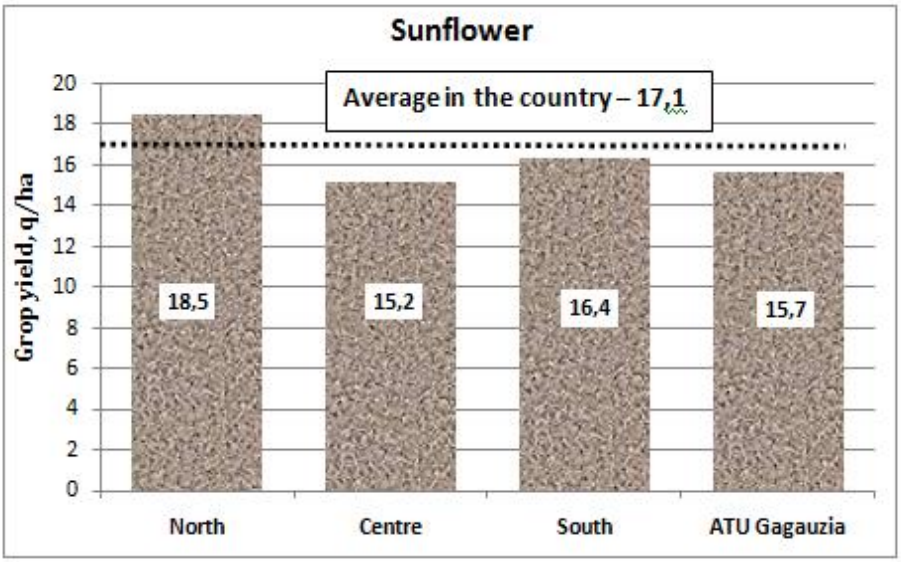

Fig.3. Indicators of sunflower yield in the regions of the Republic of Moldova for 2009-2017
Source: developed based on the Table 2

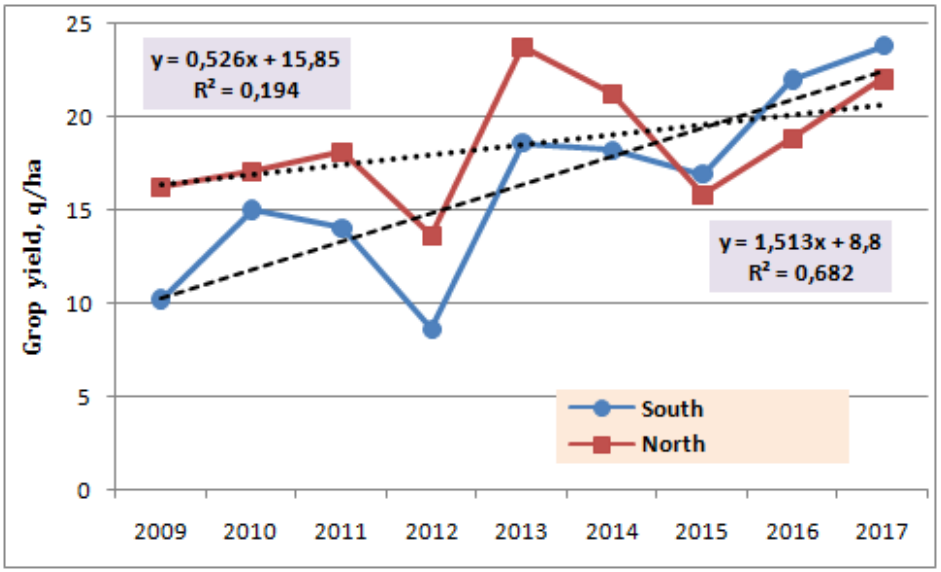

Fig.4. Dynamics of sunflower yield in the northern and southern zones of the Republic of Moldova for 2009-2017
Source: developed based on the Table 2

As the analysis of fruit production in the Republic of Moldova shows, the yield of orchards can be quite comparable both in the southern and in other regions of the country (Table 3 and Figure 5). This is evidenced by the experience of gardeners of ATU Gagauzia, who in harsh conditions of unsustainable farming achieved the average annual yield 12.5% higher than in the central zone and more than 1/3 than in the southern zone.

Indicators of the dynamics of fruit yields for 2009–2017 show that, on average, the yield of fruit increased by 5.5 q/ha in the southern zone, and by more than 11 q/ha in ATU Gagauzia (Fig. 6). It is important to pay attention to the indicators achieved in ATU Gagauzia for the last 4 years, when the achieved average yield was equal to the indicators of the northern zone - 85 q/ha (Table 3).

Table 3. Fruit yield indicators by regions of the country for 2009-2017 (q/ha)

Year	Republic of Moldova	North	Centre	South	ATU Gagauzia
2009	38,1	53,3	27,6	14,8	2,1
2010	38,9	46,6	26	34,9	23,4
2011	47,8	61,5	36,1	22,9	24,9
2012	48,6	64,1	35,9	23,3	38,5
2013	69,2	77,3	64,5	49,3	58,4
2014	60,4	93,1	59,3	41,2	81,5
2015	48,2	66,7	49,0	48,9	77,1
2016	57,5	70,1	66,8	65,9	122,2
2017	69,7	110,1	66,1	55,9	57,4
Average	52,3	71,4	47,9	39,7	53,9
Standard deviation	11,8	19,8	16,8	17,0	36,6
Coefficient of variation, %	22,1	27,7	35,2	42,9	67,8

Source: Statistical Yearbook of the Republic of Moldova 2010-2018

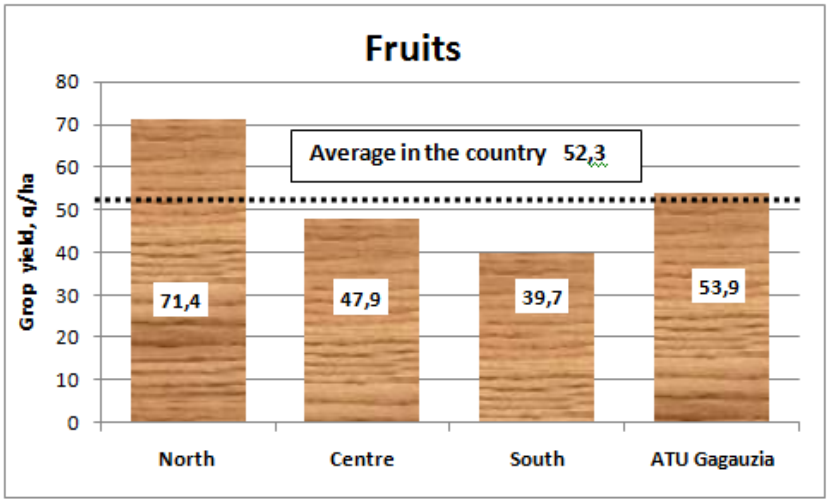

Fig.5. Fruits yield indicators in the regions of the Republic of Moldova for 2009-2017
Source: developed based on the Table 3

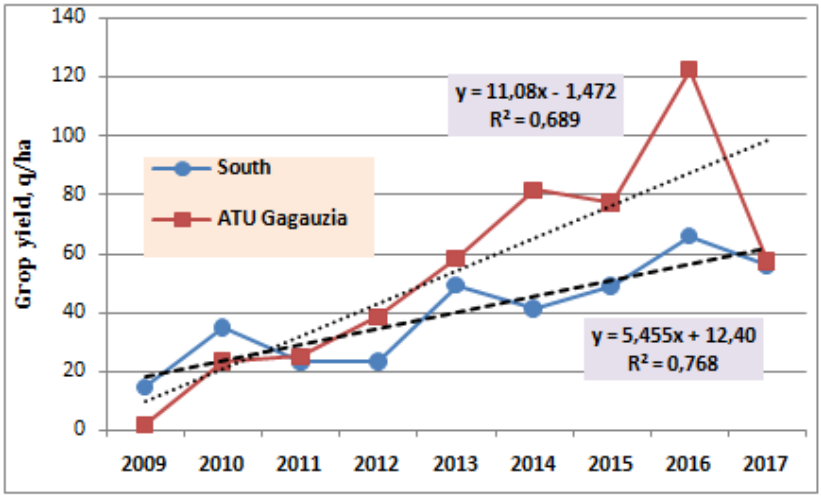

Fig. 6. Dynamics of fruits yield in ATU Gagauzia and the southern zone of the Republic of Moldova for 2009-2017

Source: developed based on the Table 3

Conclusions. In the practice of agriculture in developed countries, high-intensity technologies for crop production are widely used. The introduction of optimal doses of organic and mineral fertilizers, the acquisition of high-yielding varieties and hybrids, modern products for crop protection, the saturation of the industry with high-performance equipment that efficiently performs technological operations and significantly reduces losses during harvest, require ever-increasing amounts of capital investments per unit of land area. Nevertheless, the reality shows that the current state of land use in the republic has considerable reserves for increasing the returns of the main means of production. The existing low saturation of the industry with material and financial resources, the availability of labour force in the countryside can, with proper organization of production, competent use of scientific achievements and best practices, and with increased technical discipline, increase the impact of land resources used by 25-40%. And these are huge reserves.

REFERENCES:

1. Parmacli D.M., Todorich L.P., Dudoglo T.D., Ianioglo A.I. Jeffektivnost' zemlepol'zovanija: teorija, metodika, praktika: monografija/.- Komrat: B.i.. 2015 (Tipogr. «Centrografic»). – 274 s.
2. Parmacli D.M., Stratan A.N. Traktat o zemle. Monografija.- Chișinău INCE, 2016. – 351p.
3. Rasskazova A., Zhdanova R. Osnovnye ponjatija jekonomicheskoj jeffektivnosti upravlenija ustojchivym zemlepol'zovaniem // Mezhdunarodnyj sel'skohozjajstvennyj zhurnal #1 2017, s.23-25.
4. Siptic S. Metody proektirovanija jeffektivnyh i ustojchivyh variantov razmeshhenija sel'skohozjajstvennogo proizvodstva // Mezhdunarodnyj sel'skohozjajstvennyj zhurnal # 6 2017, s.56-59.
5. Romanenko I.A., Evdokimova N.E. Cenologicheskij podhod pri analize ustojchivosti razmeshhenija sel'skogo hozjajstva po regionam Rossii // Mezhdunarodnyj sel'skohozjajstvennyj zhurnal # 6 2017, s.60-63.
6. Stratan A. Moldovan agri-food sector dilemma: east or west? In: Economics of agriculture, Belgrade, Year 61, Nr.3 (553-828), 2014, p.615-632.
7. Doga V. si altii. 1 Strategia de dezvoltare a sectorului agroalimentar in perioada anilor 2006 - 2015 Economie si deyvoltare rurala imdrp n 2 ,4, p.74.
8. Timofti E., Popa D. Eficienţa mecanismului economic în sectorul agrar. Monografie. Chişinău : Complexul Editorial al IEFS, 2009, 343 p.
9. Parmacli D., Todorich L. Problemy jekonomicheskoj ustojchivosti sel'skohozjajstvennyh predprijatij Respubliki Moldova (monografija). – Komrat: B.i.,2013 (Tipogr- centrigrafic). - 207s.
10. Dudoglo T.D. Upravlenie zemel'nym potencialom regiona: voprosy teorii, metodiki, praktiki (monografija). – Komrat : B. i., 2017 (Tipogr. "Centrografic"). – 167 s.
11. Vronskih M.D. Reakcija sel'skohozjajstvennyh kul'tur na izmenenie faktorov vneshnej sredy.- Kishhinev : Notograf Prim, 2016.- 554c.
12. Statistical Yearbook of the Republic of Moldova, 2017. Ch. Statistică, 2018. – 384 c.

Received: 14.06.2019
Reviewed: 24.06.2019
Accepted to publishing: 27.06.2019