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SUPPORTING THE SOYBEAN PRODUCTION AND PROCESSING SECTOR IN THE CONTEXT OF CONCERN FOR SUSTAINABLE DEVELOPMENT

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Abstract

This investigation is focused on the following objectives: a) synthesizing the theoretical approaches of soybean cultivation, elucidating the multiple economic and ecologic benefits of the soybeans; b) analyzing the trends of the soybean production and consumption in the world and, distinctly, in the Republic of Moldova, elucidating the related problems and possible solutions. In order to achieve the stated objectives, the following research methods were used: the synthesis of theoretical approaches to the subject; analysis of the indicators that reveal soybean production and consumption trends; generalization of the problems related to soybean cultivation and consumption in the world and in the Republic of Moldova; synthesis of strategic provisions regarding the soybean sector in the world and, distinctly, in the in the EU and the Republic of Moldova; formulation of conclusions and proposals regarding the necessary measures to be taken to facilitate the achievement of the proposed strategic objectives. The authors' proposals concern a number of legal and organizational aspects needed to be improved in the Republic of Moldova in order to facilitate the development and increase the performance of the soybean production and processing sector.

Key words**:** *environmental problems, soybean production, sustainable development, Republic of Moldova*

INTRODUCTION

Originally from East Asia, soybeans have been grown for over 3000 years. Currently, over 3,500 varieties of soybean are used throughout the world.

Soybean was imported into Europe over 150 years ago. It is considered that Professor Friedrich Haberlandt, director of the University of Natural Resources and Life Sciences in Vienna, was the one who, during the Austro-Hungarian Empire, initiated the first extensive studies on soybean cultivation in Europe. At the 1873 Vienna World Fair, Haberlandt presented a variety of soybean suitable for cultivation in Central Europe. Starting with 1875, Haberlandt carried out experimental research on the soybean in parallel with the work on his famous book "Die Sojabohne - Ergebnisse der Studie und Versuche new field culture deserves to be cultivated." Haberland`s work, considered a masterpiece, was published in 1878. Although in Europe the interest in growing the soybean disappeared with Haberlandt`s death, in the United States the research initiated by him continued and led to an impressive expansion of soybean plantations [14].

The significance of the soybean, the need to pay particular attention to the respective culture is argued by its following benefits:

- soybean represents food and feed crop of undoubted value due to the high content of protein substances, this being 38.5%, while other similar crops such as peas and beans, respectively, have a protein content of 27.8 and 24.6% [24]. Soy proteins contain all the essential amino acids. In the composition of the seeds and the green soybean mass there are also carbohydrates, mineral salts, vitamins, ferments and other substances. Soybean hay and flour have a high nutritional value: one kg of soybean hay contains 1.51 g of nutrients, 96g of protein, 15.6g of calcium, 2.2g of phosphorus and over 50g of carotene. Soybean albumin is characterized by a high degree of dissolution in water, which simplifies its use in the food and technical industry [5];

- due to the successful combination of precious chemicals, soybean is widely used as a raw material in the cosmetics, chemical and pharmaceutical industries [14];
- soybean has an essential contribution to increasing soil fertility. Thus, as a result of the symbiotic activity, soil accumulates about 108-120 kg/ha of biological nitrogen, the contribution of the beans being 78-80 kg/ha and of the peas - 48-50 kg/ha [3, 7, 23].

The multiple benefits of the soybean along with other legumes led the UNO to declare 2016 the International Year of Pulses [25].

MATERIALS AND METHODS

The objectives of this investigation have been achieved using the following methods: the synthesis of theoretical approaches to the subject; analysis of the statistic indicators revealing the evolution of soybean production and consumption; generalization of the problems related to soybean cultivation and consumption in the world and in the Republic of Moldova; synthesis of strategic provisions regarding the soybean sector in the world and, distinctly, in the EU and the Republic of Moldova; formulation of conclusions and of proposals regarding he necessary measures to be taken to facilitate the achievement of the proposed strategic objectives.

The research was carried out within the EU project "Increasing the competitiveness of the agri-food sector by integrating it into the internal and global value chains, especially the soybean crop sector". To achieve the established objectives, the available statistical data on the evolution of the sector were used, as well as a series of strategic documents and analytical studies.

RESULTS AND DISCUSSIONS

Today, worldwide, soybean plantations occupy more than 50% of the areas cultivated with oilseeds, which constitutes about 6% of agricultural land [14].

According to official data, in 2018 global soybean production worldwide accounted for over 360 million tonnes [17]. Thus, in comparison with the year 1960 when about 17 million tonnes were obtained annually [14], we find that for 6 decades the volume of production increased 21 times. By 2030 it is expected to increase soybean production by a further 28% and reach a level of approximately 434 million tonnes, and by 2050, according to the FAO forecast, annual soybean production will amount to around 515 million tonnes [15].

Almost 80% of the total quantity of soybean produced worldwide is provided by 3 countries: the USA, Brazil and Argentina. The contribution of different countries to the production of the soybean is shown in Figure 1.

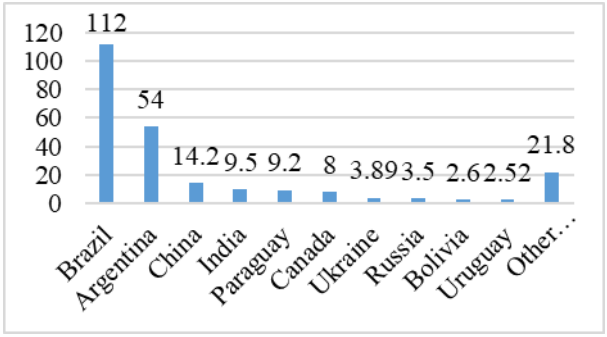

Fig. 1. The contribution of different countries in the production of the soybean in 2018, thousand tonnes
Source: Elaborated by authors based on [17].

The largest soybean user in the world is China, followed by the US, while the EU ranks third. The data on the consumption of soybean by country are shown in Figure 2.

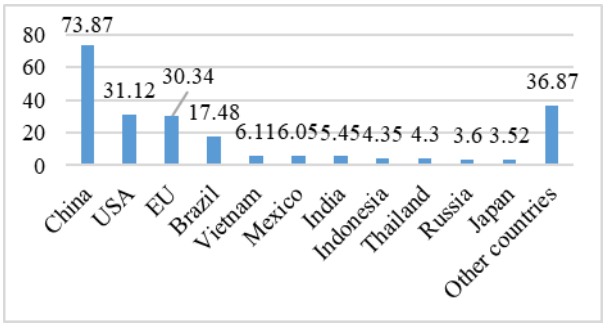

Fig. 2. Soybean consumption by countries in 2018, thousand tonnes
Source: Elaborated by authors based on [17].

The expansion of soybean production has caused many problems. Thus, the extension of the areas cultivated with soybean to millions of hectares, especially in countries such as

Brazil, Argentina and Paraguay, has led to the loss of considerable resources of forests, savanna and grasslands, to the destruction of communities, biodiversity and ecosystems, making a detrimental contribution on climate change. Today soybean plantations continue to endanger the primary and tropical forests of Amazonia, the Atlantic Forest and the Dry Forest of Chiquitano, the tropical savanna of Cerrado, etc. [23].

Genetically modified soybean requires large quantities of herbicides, thus affecting the quality of soil, surface water and groundwater. Implicitly, human and animal health problems are generated. The environmental problems were not the only ones that were caused by the extension of the cultivated areas with soybean. There were also major problems of human rights violations through forced land acquisition and even the murder of a large number of small farmers [2]. As a result, soybean production and trade, as well as related issues of the environment, indigenous peoples and rural workers have become an important element of political discourse in South America [13].

In EU countries, soybean provides 40% of the plant protein used in animal feed. However, 95% of the required quantity of soy is imported by them. In 2013-2015 the EU imported on average 36.1 million tonnes per year: 12.7 million tonnes for the production of soybean oil and flour and 18.5 million tonnes of soybean meal (the equivalent of 23.4 million tonnes of grain soybean). About 95% of the soy import is intended for animal feed. On the other hand, the EU represents one of the largest consumers of meat, with an annual consumption per capita of 68.6 kg (according to data of 2017). By 2030, it is expected to produce 47.5 million tonnes of meat per year, which will also involve increasing the amount of the soy required for animal feed. Under these conditions, the European Union's concern for stimulating the production of plant proteins is natural, determined both by increasing demand for the product and by such important circumstances, as the poor quality of imported soybean (most of which is produced from genetically modified seeds) as well as the adverse impact on the environment [15]. An important step in solving this problem is the European Soya Declaration signing by 14 countries in December 2017 [4]. The objective of increasing the production of leguminous crops for food and feed is examined in the context of concern for sustainable agriculture. At the same time, it is mentioned that, by focusing attention on supporting the growth of soybeans and other legumes, it will contribute to the achievement of two important objectives of the 2030 Agenda for Sustainable Development [22], namely: objective 2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" and objective 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

The relevance of the concern for stimulating the production of soybean and other legumes is also argued for by contributing to the objective of the EU Sustainable Development Strategy adopted in 2001, which aims at increasing prosperity, improving the quality of life now and for future generations and capitalizing on the innovative potential of the economy in the environmental and social field.

The signatories of the declaration highlighted the following elements in supporting the stated objectives:

- developing sustainable production of soybean and other legumes in appropriate areas of Europe, taking into account the availability of resources;
- integrating the production of soybean and other legumes into well-planned crops rotations;
- ensuring the integrated protection of crops following the principle "as much as necessary and as little as possible", giving priority to the use of resistance of host plants and tolerant varieties;
- maintenance of traditional landscapes, landscape features and protection of biotopes with high natural value in agricultural landscapes;

- developing sustainable markets for soybean and other legumes in Europe that balance and respond to the needs of growers, processors, livestock breeders and consumers within the transparent value chains [4].

The actions taken by EU countries have led to the pattern of continuous growth trends in soybean production. Thus, according to the data of the European Commission [6], starting with 2012 the annual global production of soybean has been rising (Figure 3), noting a high growth rate especially in the period 2012-2014 (Figure 4). Even though the growth rate of annual global soybean production in the European Community slowed down after 2014, it is important that the volume of production continued to increase, which proves the effectiveness of the measures taken to support the production of soybean.

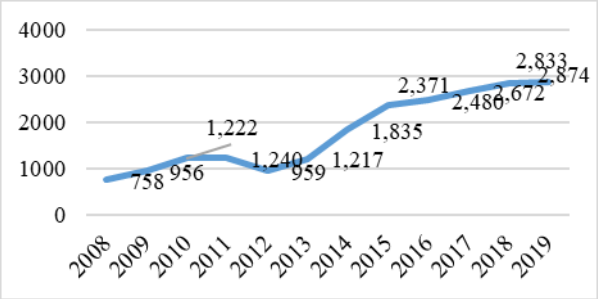

Fig.3. Evolution of soybean production in the EU between 2008-2019, million tonnes
Source: Elaborated by authors based on [6].

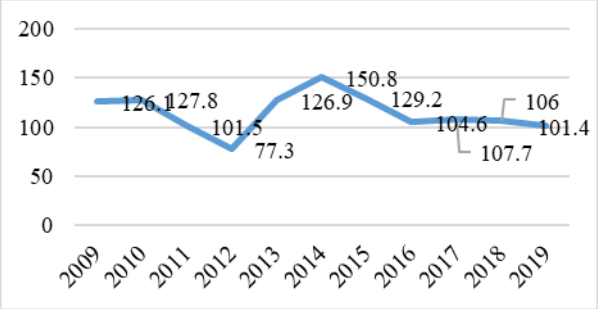

Fig.4. The growth rate of soybean production in EU countries between 2009-2019, %
Source: elaborated by authors based on [6].

At European level, the largest quantity of soy is produced in such countries as Ukraine, Russia, Italy and Serbia, followed by Romania, France, Hungary and Austria [14].

The Republic of Moldova is listed among the states that have adhered to the 2030 Agenda for Sustainable Development, assuming responsibility for the established sustainable development objectives [12]. At the same time, the data on the total areas cultivated with soybeans in the Republic of Moldova in the period 2008-2018 denote the absence of constant trends in their evolution (Figure 5). The largest area cultivated with soy in the analyzed period was recorded in 2015, but subsequently, it was reduced continuously, registering a level of only 28 thousand ha in 2018.

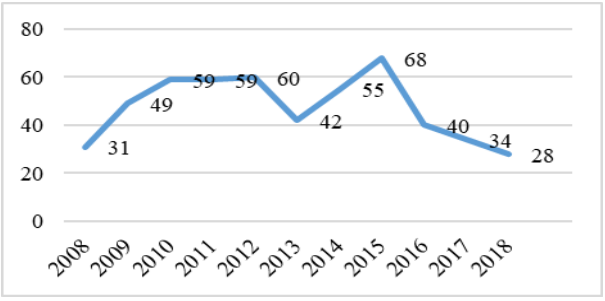

Fig.5. Evolution of the total area cultivated with soybean in the Republic of Moldova in the period 2008-2018, thousand ha
Source: Elaborated by authors based on [11].

The studies of the cultivation of the soybean in territorial profile indicate that most of the areas are located in the North region of the country, especially in Briceni, Edineț and Drochia districts. According to the data of 2017, 97% of the soybean plantations were concentrated in the respective area [16].

While soybean plantations were reduced during the investigated period, crop productivity had less alarming trends, the highest level of the indicator (21q/ha) being reached in 2014 and 2018 (Figure 6).

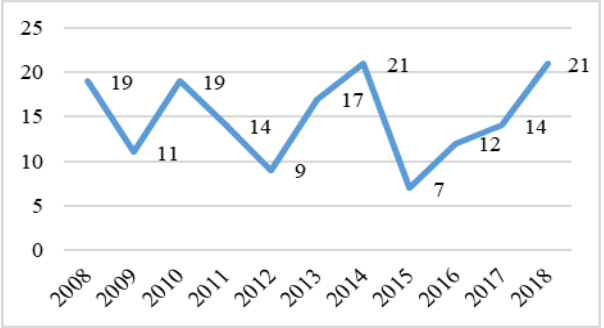

Fig. 6. Evolution of the average productivity of the soybean in the Republic of Moldova in the period 2008-2018, q/ha
Source: Elaborated by authors based on [11].

Even though the areas cultivated with soybean have reduced, increasing the productivity of the crop has ensured an increase of the global soybean production during the last 3 analyzed years (2016-2018, Figure 7). However, the level reached by the indicator in 2018 of 58 thousand tonnes is below the level of 2010, when the Republic of Moldova had a global harvest of 111 thousand tonnes of soy. An almost similar performance was obtained in 2014, 109 thousand tonnes of soy being produced. Thus we find that the volume of soybean production obtained in 2018 is 1.91 times lower than in 2010 and 1.87 times lower than in 2014.

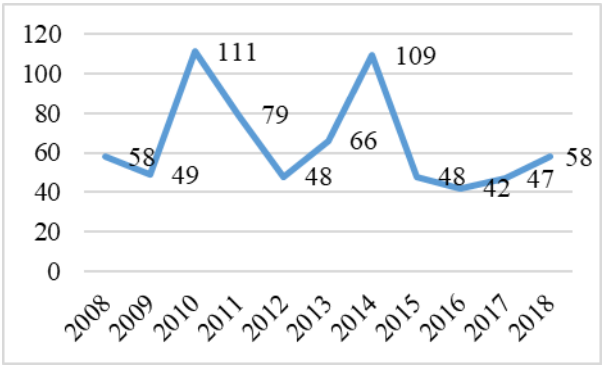

Fig. 7. Evolution of the global soybean harvest in the Republic of Moldova in the period 2008-2018, thousand tonnes
Source: Elaborated by authors based on [11].

The data related to export of soybean also show unstable trends. In the last decade, the largest quantity of exported soybean was registered in 2015 (69 thousand tonnes). Subsequently, there is a continuous decline in soybean exports. In 2018, 12.8 thousand tonnes were exported in the amount of $5.2 million [16], which is 56.2 thousand tonnes less than in 2015.

The processing of soybean in the Republic of Moldova is carried out by producing vegetable oil and soybean meal. Because of a whole series of technological and financial difficulties, in the Republic of Moldova the mechanical processing method is applied, based on the partial pressing of the oil through the screw press [16], while the chemical method is more efficient.

Estimating the evolution of soybean meal production, we also see fluctuating trends (Figure 8). At the same time, we can positively estimate the level reached in 2018, being higher than the indicators of previous examined years.

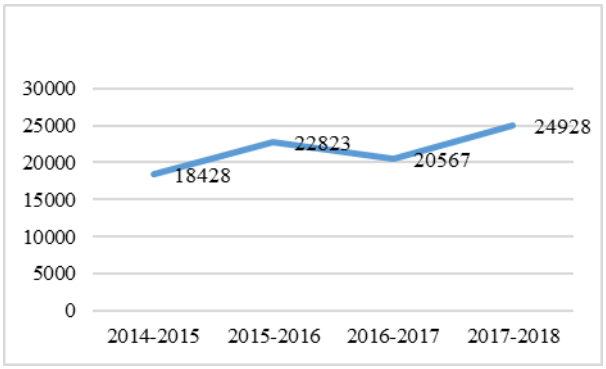

Fig. 8. Evolution of soybean meal production in the Republic of Moldova in the period 2014-2018, tonnes
Source: Elaborated by authors based on [16].

By generalizing the above, we deduce that in the evolution of the soybean cultivation and processing sector in the Republic of Moldova there are no visible and constant positive tendencies, a wide range of disturbing factors being identified:

- most of the necessary means of production are imported, and prices are constantly rising. As a result, costs are affected where only herbicides and seeds have a weight of over 44%;
- most of the producers face the problem of the absence of the storage spaces. As a result, they have to sell the production immediately after harvesting, at an unfavourable price;
- the access of the soybean to the elevators is limited, because the lots of soy brought to the elevators are too small and do not allow the optimum use of the processing capacity;
- there is lack of certified organic transport. As a result, cross-contamination of annual organic crops with conventional ones occurs during transportation;
- there is a reduction in the number of operators producing soybean meal under the pressure of increasing the import of genetically modified soybean meal, as well as reducing the VAT from 20% to 8% for cereal products (which was not accompanied by the reduction of the purchase price of the soybean and, respectively, diminished the profit of the processors) [16].

Based on these we find out that more active and effective measures are needed regarding the promotion of soybean culture among Moldovan producers, as well as the creation of a stimulating framework for the entire value chain. In this context, we can mention a whole series of factors that should facilitate the interest for the cultivation of the soybean:

I. Existence of favourable natural conditions for cultivation;

I. The growing need for quality soybeans, especially for the nutrition of humans and animals;

II. Recognizing the value of the crop as a remedy in solving environmental problems;

III. Efficiency of soybean cultivation.

According to the experts in the related field, the Republic of Moldova has natural soil and climate conditions, heat and light regimes favourable for cultivating the soybean, the only problem being the lack of precipitations especially in the central and southern areas.

On the other hand, at present in the Republic of Moldova there is a protein deficit of about 30-35%, the children and elderly population health being damaged. We also mention the growing need for soybean meal for the livestock sector which cannot be covered from internal resources. For example, total domestic consumption of soy in 2017 was double compared to 2014 and constituted 81.4 thousand tonnes. As a result, if in 2013 the Republic of Moldova imported 10.5 thousand tonnes of soybean meal, in 2017 the imported quantity constituted 39.5 thousand tonnes, while in 2018 34.5 thousand tonnes were imported. The largest source of imports is Romania (62%), followed by Ukraine (29.5%) and Brazil (8.5%). According to the importers' data, soybean meal purchased from Romania has its origin in Brazil or Argentina [16].

Last but not least, the issue of importing genetically modified soybean meal for animal and poultry feed should also be mentioned. According to ANSA's data, about 61% of the total volume of imported soybean meal contains genetically modified organisms [16]. In the absence of accurate data on the import of other genetically modified raw materials, it is difficult to accurately assess the adverse impact of the import of "food waste" on human health [18].

In the context of the above said, soy is mentioned by specialists as an optimal and unique culture, in particular due to the ability to synthesize an increased amount of protein in only 3-4 months. Thus, at a productivity of 2,000 kg per hectare, about 700 kg of crude protein and 400 kg of oil are obtained [5]. The orientation of the production towards export could ensure even higher results, the export prices being much higher than the domestic ones.

As mentioned above, soybean is also required as a culture with beneficial contributions in improving ecological problems, in particular through its role in remedying soil fertility problems. Regarding the soils of the Republic of Moldova, we find a continuous reduction of their humic state. Thus, the annual humus losses because of mineralization exceed the level of 700 kg/ha, and the total deficit, taking into account the erosion losses, is equal to 1,100 kg/year [21].

The lack of crop rotations capable of preserving soil fertility is mentioned as the main factor which conditions the establishment of a negative balance of the organic matter in the soil, along with erosion and the insufficiency of the local organic fertilizers. Under these conditions, leguminous and perennial crops are recommended by the specialists in order to conserve and improve the humic state of the soil [1].

Soybean also represents an efficient crop for agricultural producers. Thus, it is estimated that the cultivation of the soybean can bring profit starting with a productivity of 1 ton per ha [5], therefore, under the conditions of an effective management, it can guarantee the producers to obtain high economic performances.

The need to pay more attention to supporting and stimulating the production of genetically unmodified soybeans in the Republic of Moldova is also argued for through a wide range of strategic documents and, implicitly, strategic objectives, to which soybeans could make an essential contribution (Table 1).

Table 1. Strategic objectives that justify focusing efforts on stimulating the production of genetically unmodified varieties in the Republic of Moldova

The name of the strategic document	Objectives set, the achievement of which could be facilitated by the expansion of soybean production
National Development Strategy "Moldova 2030" (project) [10]	Specific objective 1. Increasing revenues from sustainable sources and mitigating economic inequalities; Specific objective 10. Ensuring the fundamental right to a healthy and safe environment.
National Strategy of Agricultural and Rural Development for the years 2014-2020 [8]	Specific objective 2.1. Supporting agricultural land and water management practices; Specific objective 2.2. Supporting environmentally friendly production technologies, environmentally friendly products, including biodiversity; Specific objective 6.3. Improving the quality of soils and the ecological reconstruction of degraded lands, affected by landslides and 100% agricultural protection strips, as well as sustainable management and protection of useful mineral resources.
Environmental Strategy for 2014-2023 [19]	Specific objective 2. Integrating the principles of environmental protection, sustainable development and green economic development, adapting to climate change in all sectors of the national economy; Specific objective 4. Reducing the negative impact of economic activity on the environment and improving measures to prevent environmental pollution; Specific objective 5. Creating the integrated monitoring and quality control system.
National Strategy of Public Health for 2014-2020 [9]	Specific objective 3. Ensuring the protection of health by streamlining the control of behavioural and environmental risk factors.
The Program for the Conservation and Increase of Soil Fertility for the years 2011-2020 [20]	The main objective 3. Stopping the active forms of degradation of the soil cover on an area of 877 thousand ha arable land by the end of 2020.

Source: Compiled based on [8, 9, 10, 19, 20].

It is obvious that the list of normative acts that, more or less, concerns environmental issues, population health, efficiency of agricultural production, etc. (thus justifying the inclusion of soybean in the area of interest of the decision makers of various levels) is not limited to those mentioned in Table 1. In particular, the draft of a relatively new document can be emphasized –National Development Strategy "Moldova 2030" - that connects the interests and priorities of the Republic of Moldova to international concerns for sustainable development [10]. Thus, within the pillar "Sustainable and inclusive economy" we distinguish the objective "Increasing revenues from sustainable sources and mitigating economic inequalities". As mentioned above, soybean is a crop capable of contributing to profit under the conditions of effective management. In the same document, within the pillar "Healthy environment" we identify the objective "Ensuring the fundamental right to a healthy and safe environment". The application of good agricultural practices by the soybean producers in the Republic of Moldova, in particular through the ecological argumentation of crop rotation, is an important remedy to diminish the negative effects on the environment [5].

CONCLUSIONS

Soybean production is an area of strategic significance; this being recognized by the European community. Despite this fact, in the Republic of Moldova there are no stable growth trends of soybean production and processing, due to a wide range of economic and technological obstacles.

The Republic of Moldova imposes itself through a vast series of strategic documents that support the interest in the respective crop and facilitate concrete measures to expand the production of the genetically unmodified soybean. At the same time, given the existence of adequate strategic visions, we can identify a series of actions that would facilitate their attainment:

- connecting the existing normative framework to the needs of the sector, by creating favourable conditions for the

production, processing, export of the related products;
- more active promotion of soybean culture among agricultural producers, with a special emphasis on its multiple benefits, as well as on the ability of the crop to ensure an efficient economic activity. Implicitly, it is necessary to identify more effective communication tools with the producers so as to ensure a greater information of them, together with consulting on various issues related to the cultivation technology;
- more active highlighting of the variety in the context of the measures regarding education for the sustainable development of different categories of audience: students, participants of the continuous training activities, etc.;
- ensuring an adequate curricular framework in vocational education, as well as including topics related to soybean cultivation and processing in vocational training programs, so as to ensure the acquisition of professional skills capable of contributing to the growth of the soybean production and processing sector.

REFERENCES

[1]Andrieș, A., 2011, Agrochemistry of nutrients. Fertility and soil ecology, Chisinau (Agrochimia elementelor nutritive. Fertilitatea și ecologia solului, Chișinău), 232 p.
[2]Arantxa, G., 2013, The soy mirage. The limits of corporate social responsibility: the case of the company Desarrollo Agrícola del Paraguay. https://oxfamilibrary.openrepository.com/bitstream/handle/10546/299687/rr-soy-mirage-corporate-social-responsibility-paraguay-290813-en.pdf?sequence=1&isAllowed=y Accessed on December 12th, 2019.
[3]Beciu, S., Dinu, T.A., Ladaru, R.G., 2013, Soybean production in Romania: Study case on consventional and former HT soybean producers, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 13(4):49-52.
[4]Common Declaration of Austria, Croatia, Finland, France, Germany, Greece, Hungary, Italy, Luxemburg, The Netherlands, Poland, Romania, Slovakia and Slovenia. European Soya Declaration - Enhancing soya and other legumes cultivation https://www.donausoja.org/fileadmin/user_upload/Activity/Media/European_Soya_signed_declaration.pdf Accessed December on 28th, 2019.
[5]Donau Soja, 2017, Handbook of good cultivation practices in the Republic of Moldova. Chisinau. (Manual al bunelor practici de cultivare a soii în Republica Moldova. Chișinău).
[6]European Commission. Oilseeds and protein crops statistics, https://ec.europa.eu/info/food-farming-fisheries/farming/facts-and-figures/markets/overviews/market-observatories/crops/oilseeds-and-protein-crops_en#production, Accessed on December 28th, 2019.
[7]Ionel, I., 2017, Romania's soybean market and coupled subsidies, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 17(1):249-252.
[8]National Strategy for Agricultural and Rural Development For the years 2014 - 2020, the Official Monitor of the Republic of Moldova no. 152 of 10.06.2014 (Strategia Națională de Dezvoltare Agricolă și Rurală Pentru Anii 2014 – 2020, Monitorul Oficial al Republicii Moldova nr.152 din 10.06.2014).
[9]National Strategy for Public Health for 2014-2020, Official Gazette of the Republic of Moldova no. 304-310 of 27.12.2013 (Strategia Națională de Sănătate Publică pentru anii 2014-2020, Monitorul Oficial al Republicii Moldova nr. 304-310 din 27.12.2013).
[10]National Development Strategy "Moldova 2030" - Project, (Strategia Națională de Dezvoltare „Moldova 2030”- Proiect), https://gov.md/sites/default/files/document/attachments/intr40_12_0.pdf, Accessed on December 26th, 2019.
[11]National Bureau of Statistics, Moldova, www.statistica.md, Accessed on January 4th, 2020.
[12]Nationalization of indicators for the Sustainable Development Goals (Naționalizarea indicatorilor pentru Obiectivele de Dezvoltare Durabilă), 2017, http://www.md.undp.org/content/dam/moldova/docs/Publications/Indicators_ONU_RO.pdf Accessed on January 06th, 2020.
[13]Predatory agribusiness likely to gain more power in Brazil election: report, 2018 https://news.mongabay.com/2018/09/predatory-agribusiness-likely-to-gain-more-power-in-brazil-election-report/, Accessed on December 29th, 2019.
[14]Soya Bean History – Donau Soja. https://www.donausoja.org/en/research/agriculture/soya-bean-history, Accessed on December 29th, 2019.
[15]Soy Alert, 2018, How to increase the EU’s plant protein production in a sustainable and agroecological way? https://www.foeeurope.org/sites/default/files/agriculture/2018/soyalert_report_fv_web.pdf Accessed on January 02nd, 2020.
[16]Soybean Culture from Moldova: Analysis of the Value Chain. Analytical study carried out within the project "Increasing the competitiveness of the agri-food sector by integrating it into the internal and global value chains, especially of the soybean culture sector" (Part I of the EU Program "Development of rural areas in the Republic of Moldova (DevRAM)" (Cultura de

Soia din Moldova: Analiza Lanțului Valoric. Studiu analitic efectuat în cadrul proiectului "Creșterea competitivității sectorului agroalimentar prin integrarea acestuia în lanțurile valorice interne și globale, în special a sectorului culturii de soia" (Partea I a Programului UE "Dezvoltarea zonelor rurale în Republica Moldova (DevRAM)").

[17]Soybean Bean Meal Infor Center https://www.soymeal.org/soy-meal-articles/world-soybean-production/, Accessed on January 2nd, 2020.

[18]Taran, A., 2015, Moldova is transformed into a food waste dump (Moldova este transformată într-o gunoiște a produselor alimentare), http://ecology.md/md/page/moldova-este-transformata-intr-o-gunoishte-a-produselor-alimentare, Accessed on January 4th, 2020.

[19]The environmental strategy for the years 2014-2023, the Official Monitor of the Republic of Moldova no. 104-109 of 06.05.2014 (Strategia de mediu pentru anii 2014-2023, Monitorul Oficial al Republicii Moldova nr. 104-109 din 06.05.2014).

[20]The soil fertility conservation and enhancement Program for 2011-2020 approved by Government Decision no. 626 of 20.08.2011, the Official Monitor of the Republic of Moldova no. 139-145 of 26.08.2011 (Programul de conservare și sporire a fertilității solurilor pentru anii 2011-2020 aprobat prin Hotărârea Guvernului nr. 626 din 20.08.2011, Monitorul Oficial al Republicii Moldova nr. 139-145 din 26.08.2011).

[21]The program for capitalization of new lands and for increasing soil fertility (part II Increasing soil fertility) approved by Government Decision no. 841 of 26.07.04, Official Monitor no. 138 of 13.08.04 (Programul de valorificare a terenurilor noi și de sporire a fertilității solurilor (partea a II-a Sporirea fertilității solurilor) aprobat prin Hotărârea Guvernului nr.841 din 26.07.04, Monitorul Oficial nr. 138 din 13.08.04).

[22]The 2030 Agenda for Sustainable Development, 2015, https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf , Accessed on January 3rd, 2020.

[23]The Growth of Soy. Impacts and Solutions. http://awsassets.panda.org/downloads/wwf_soy_report_final_feb_4_2014_1.pdf Accessed on January 3rd, 2020.

[24]Vozian, V., Avădănii, L., Iacobița, M., 2016, New varieties of pulses crops elaborated by the ICCC "Selection", Academos 1, p.72-75.(Soiuri noi de culturi leguminoase elaborate de ICCC „Selecția", Academos 1, p.72-75).

[25]UN launches 2016 International year of Pulses, celebrating benefits-legumes, https://news.un.org/en/story/2015/11/515012-un-launches-2016-international-year-pulses-celebrating-benefits-legumes, Accessed on January 4th, 2020.