



Research Article

# Aspects Regarding The Certified Seed Production In Romania

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Received date:17 October 2017; Accepted date:19 September 2018; Published date: 26 July 2019.

Academic Editor: Silviu Beciu.

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## Abstract

Seeds; the genetic material used for sowing is responsible for the quality and quantity of crops, the food security of the region and, in some cases, the safety and health of the population. The main factors underlying agricultural production are: seeds, soils, and technologies used (agricultural works, irrigation, chemical treatments against diseases and pests, etc.). The paper proposes a national assessment of the production of seed certificates obtained in 2014-2017. The assessment of the concentration of the seed market in Romania, by calculating the GS Index, revealed high values of the indicator and a high degree of concentration of the market. The information obtained has led to interesting results on the development of this segment of the agricultural products market, helping farmers and the national business environment

**Keywords:** agriculture, certified seeds, production, Gini Struck Index

## Introduction

Obtaining certified seeds represents the basis for modern agriculture. The availability, access and use of quality seeds of adaptable crops are essential elements for increasing the agricultural productivity, ensuring the food security and improving the farmers' source of income (Bishaw, Niane and Gan,

2007). In many countries, seed production and trade are important elements in rural employment, generating important sources of income for farmers (Organization for Economic Cooperation and Development, OECD, 2012). Investments in competitive agriculture, increased productivity and high yields can be optimized by giving farmers access to high-quality seed for the

agricultural crops. The quality of the seed material is one of the main factors that can affect the plant production potential. The quality of certified seeds used as a basis for the consumer production is given by the key attributes of the basic varieties (genetic quality, physical and physiological characteristics, health status), by the environmental conditions in which crops are developed, the agricultural production practices, or even by the storage conditions. Maintaining high seed quality is essential because the variety must meet the expectations of farmers and consumers. Seed growers should be aware of the technical requirements and regulations needed to develop a crop intended to obtain certified seeds and ensure that all operations are carried out strictly in accordance with specific and timely regulations. The limited choice of improved seed varieties, the lack of sufficient seed quantity, mechanization problems, and high seed production costs are some of the main constraints that hinder the development of an efficient and effective seed production industry (Bishaw, Niane, and Gan, 2007).

### Materials and Methods

The information on certified agricultural areas, the production of seeds and seedlings obtained and the number of producers authorised in Romania in the last 4 years were selected from the database of the National Inspection for Seed Quality INCS; an authorised national institution in the field,

subordinated to the Direction General for Control and Inspections of the Ministry of Agriculture and Rural Development - MARD. For local statistics in this domain, we have used the county databases of the Territorial Inspectorates for the Quality of Seed and Seedling (ITCSMS). The databases of the International Seed Testing Association (ISTA), the International Association for the Protection of New Varieties of Plants (UPOV), the International Seed Federation ISF have been used for illustrating the international transactions with seeds. The relevant national legislative provisions (normative acts, rules and technical regulations in force) have been consulted from the MARD database. For the international norms, we used the Regulations of the Organisation for Economic Co-operation and Development OECD (especially the OECD Seed Schemes), the current regulations of the United Nations Food and Agriculture Organization (FAO), or the European rules available on the European Specialized Site Commission (Food Safety-Plants-Plant reproductive material). Where necessary, data from the literature or from the Romanian profile journals, with appropriate quoting, were selected and used. The data collected were analysed, statistically processed and plotted. In order to analyse the concentration of the seeds market at the national level, the Gini Struck method was applied, with the calculation of the Gini-Struck Index, GSI (formula 1), recommended by Săvoiu, Crăciuneanu and Ţaicu (2010).

$$GSI = \sqrt{\frac{n \sum gi^2 - 1}{n-1}} \quad (1),$$

where - n represents the number of terms of the series under study,  
 - gi represents the weight factor of i variety products/producer/certified area, related to the total registered products/producers/area.

### Legislative Regulations

At the level of the international commerce, the quality of the seed traded is regulated mainly through the OECD Seed Schemes,

applicable to the certification of the seed lots (OECD, 2017)

FAO has a series of attributions on the quality of the seeds, assisting a number of countries in developing their national seed strategy

and legislation by improving their technical expertise, strengthening their capacities and facilitating the process of formulating and negotiating agricultural policies (FAO, 2017). Thus, the harmonisation of the legislations of the Member States is currently one of the main concerns of the organization; FAO is supporting some economic cooperation organizations in developing cooperation and in harmonising public or private regulations on seeds, which currently hinder the international trade. The International Treaty on Plant Genetic Resources for Food and Agriculture, entered into during the Thirty-First Session of the Conference of the Food and Agriculture Organization of the United Nations (November 3, 2001), aims at the conservation and sustainable use of all plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits deriving from the use thereof, in line with the Convention on Biological Diversity for Sustainable Agriculture and Food Safety (FAO, 2001).

At the European level, a particular attention is paid to seed quality standards; the European Commission is adopting specific marketing regulations and rules on the conservation of the genetic background and of the variety of plants. According to the review of EU legislation on the marketing of seed and propagating material (SPPM), 12 basic acts are applied in the field, most of them from the 1960s and 1970s. Taking into account the new requirements on food safety, traceability, new technologies and the increased importance of environmental issues or the EU enlargement, the European Commission has proposed to modernise the European legislative system and adapt it to the new market-specific requirements (European Commission, 2008). The process included the public consultation (May 2011) and the elaboration of a regulation proposing the rescission and replacement of 12 directives that are no longer adapted to the current needs of the community (the European Parliament and the Council of Europe, 2013).

At the national level, the regulations on the functioning of the seed and propagating material market are elaborated by MADR, the vast majority was harmonised with the European legislation in the field. Since 1999, a series of norms have been elaborated to regulate the organization and the functioning of the Inspectorate for Seeds and Seedlings (GD no.716/1999), the authorisation of the genetically modified plants (MAPDR Order no 237/2006), the registration of the operators (MAPDR Order no.769/2009, MADR Order no.57/2011), the organization of the quality and phytosanitary control on the import and export of seeds and seedlings (MADR Order no.34/2011) or the designation of the authorised representatives for the application of the legislation on the production, processing, control and certification of quality, the marketing of seeds and seedlings, as well as the testing and registration of plant varieties. The complete list of the existing or repealed legislative regulations is presented on the site of the profile institution (National Inspection for Seed Quality, 2017a)

### **The International background on the seeds and seedlings market**

Worldwide, there are a number of international organisations, conventions and treaties that regulate the seed and seedlings market, from access to seed material to the delivery of quality seed to growers. In conjunction, they provide an international framework for regulating the seed and certified seedlings market in order to monitor the interests of both producers and consumers. The most important organizations in the field are the OECD, the International Seed Testing Association (ISTA), the International Association for the Protection of New Varieties of Plants (UPOV), the International Seed Federation ISF, the United Nations Food and Agriculture Organization (FAO) and the European Commission.

OECD has set up the OECD Seed Schemes, updated on a regular basis, which are

recognised and applied worldwide for the certification of seed traded on the international market. The objective of the OECD Schemes for Certification of Seed varieties is to encourage the constant use of high quality seed ascertained for the participating countries. The schemes authorise the use of labels and certificates for seeds produced and processed for international trade, complying with the agreed principles (OECD, 2017).

ISTA was established in 1924, becoming a global network of member laboratories in more than 70 countries/distinct economies worldwide. ISTA members work together to achieve "uniformity in global seed quality assessment". ISTA develops internationally recognised standards for seed sampling and testing, accredits laboratories, promotes research, provides international seed certification and training and disseminates knowledge in the field of seed science and technology. The International Certificates for seed tests, issued in accordance with the current ISTA standards, are only available for accredited ISTA laboratories. For non-ISTA members, the certificates can be purchased from the ISTA Secretariat, with restrictions on the number and price of certificates. The ISTA's activity facilitates seed marketing at the national and international level, thus contributing to improving global food security (ISTA, 2017). According to the latest report available on the organization's website, at the end of 2016, 58 organizations were affiliated as associate members (115% more than in the reference year 2008) and 222 laboratory members (nearly 20% more than in 2008). Du Pont Pioneer, Dow Agro Science, Monsanto SAS, Bayer and Hem Zadem are Industry Members (ISTA, 2017b).

UPOV is an intergovernmental organisation based in Geneva (Switzerland), created by the International Convention for the Protection of New Varieties of Plants. The Convention was adopted in Paris in 1961 and revised in 1972, 1978 and 1991. The mission of UPOV is to provide and promote an effective plant variety system in order to

encourage the development of new plant varieties, for the benefit of the whole society. In 2016, there were 74 states/organizations affiliated to ISTA (UPOV, 2017). Applicants have at their disposal the Plant Variety Database, the Genie Database and the Plant Variety Protection Data and Statistics (PVP) databases containing the information provided by the competent authorities of 55 Union members and an intergovernmental organisation. In addition, on the organisation's website, there is a collection of legislation in force in the field.

ISF, established in 1924, is a non-profit non-governmental organization representing the interests of over 1,000 international seed companies spread throughout the globe. The Seed Statistics database provides information on international seed transactions conducted internationally (ISF, 2017).

Worldwide, international conventions/treaties are applicable at the United Nations Food and Agriculture Organization (FAO), providing the international regulatory framework for seed trade issues, including phytosanitary measures, access to and sharing, as well as use of plant benefits of germplasm.

The European Union focuses on the traditional production, with an increasing interest in agro-food products of certified origin obtained in certain well-defined geographic areas (Stanciu, 2014). The EU regulates the marketing of the reproductive material of plants of the agricultural, plant, forest, fruit, ornamental and vine species, ensuring the compliance with the European criteria for health and quality. The Commission shall establish the rules in cooperation with the national experts of the respective permanent committees. The European legislation applies to important plant and vegetable species for the internal market, focusing on the registration of varieties and planting material, and on the certification or inspection of pre-commercial seed lots and propagating material,

respectively (European Commission, 2017). Seeds from the third countries must meet the equivalence criteria and those states that guarantee that they meet these criteria can be listed as acceptable to export to the European market. Under certain conditions, strictly specified by European organisations, such as reduced seed germination in the domestic production, the European Member States may temporarily market seed lots which do not fully meet the Community criteria. The European database has two sections: Plant variety database, comprising 109 agricultural species, from potatoes to beans and beets, approved at the Community

level and Vegetables, which includes 37 vegetable varieties, with many varieties of crop (European Commission, 2017).

### The International Market

The global exports of seeds reached a global quantity of 3,865,063 tonnes in 2015 and a value of over USD 10 billion (Table 1). Although the import volume exceeded exports by 2,288 tons, the value of the international transactions was positive, with a surplus of USD 352 million.

**Table 1 : International transactions with seeds (2014-2015)**

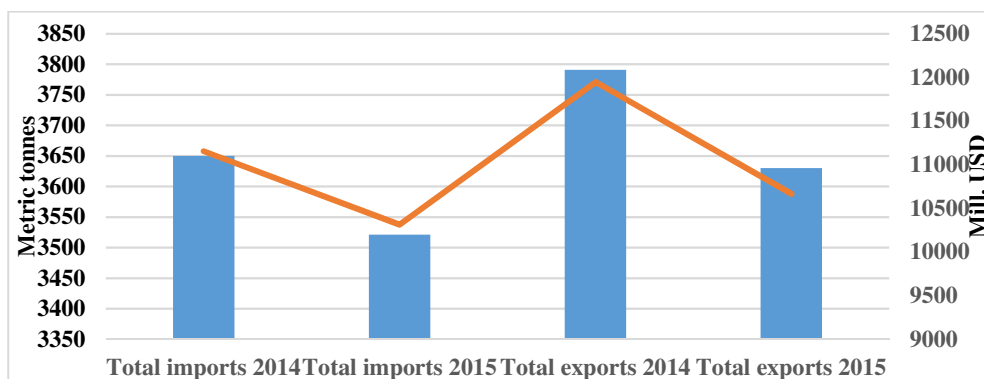
Seed	2014				2015			
	Exports		Imports		Exports		Imports	
	Quantity (MTo)	Value (USD Mill.)	Quantity (MTo)	Value (USD Mill.)	Quantity (MTo)	Value (USD Mill.)	Quantity (MTo)	Value (USD Mill.)
Vegetable crops	117,854	3,791	135,869	3,650	15,747	3,630	133,395	3,521
Flower seed	6,084	308	7,341	291	5,181	281	5,702	261
Field crops	3,386,225	7,848	2,992,579	7,213	3,744,135	6,754	3,728,254	6,531
<b>Total</b>	<b>3,510,163</b>	<b>11,947</b>	<b>3,135,789</b>	<b>11,154</b>	<b>3,865,063</b>	<b>10,665</b>	<b>3,867,351</b>	<b>10,313</b>

Source: the authors, by using ISF Data (2017)

The most important transactions, covering over 96.87% of the total quantities exported in 2015, were recorded for the seeds of the field crops category. Compared to this, the vegetable crops cover only 2.99% of the exports; the difference is covered by the flower seeds.

Compared to 2014, in 2015 there was a decrease in global seed transactions on the

international market, both in terms of quantity and value (Figure 1). Thus, 2015 brought a reduction in imports of 141 tons of seed, worth 793 million USD, along with a reduction in exports of 109 tons (\$ 352 million), as compared to the previous year. Decreases were recorded in two of the three categories of seeds, the field crops is the only one with a positive evolution in the transactions on the international market.



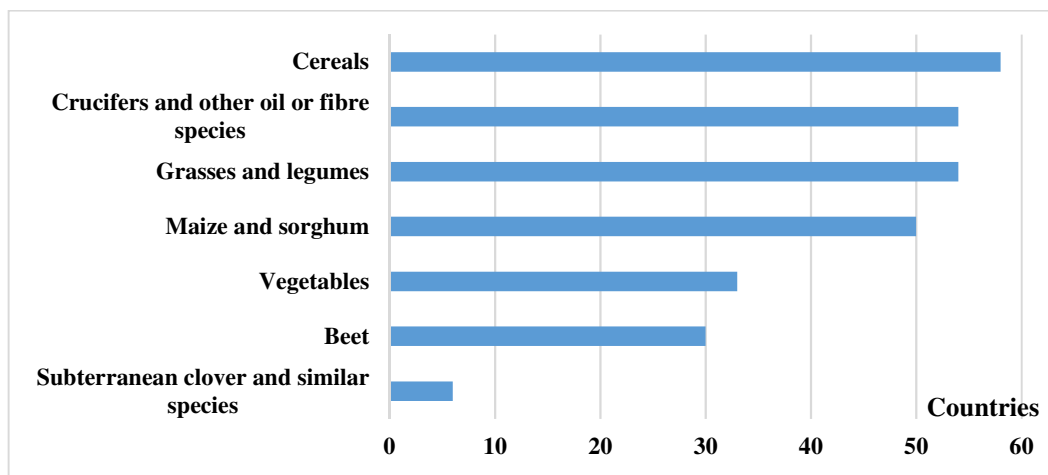
**Fig. 1: Global transactions with seeds (2014-2015)**

Source: the authors, by using ISF Data (2017)

The ISF statistics used in the presentation of the data include only seed exports worth more than \$ 1 million, flower seeds include herbaceous and non-herbaceous plant seeds mainly grown for flowers; field crop seeds include pulse seeds, cereals, industrial crops and fodder crops; and vegetable crop seeds

include seeds from all vegetable crops and do not include potato and mushroom seeds.

According to the OECD (2012), the quality of the seeds can only be ensured by applying a combination of key technical procedures and regulatory measures (Figure 2).



**Fig. 2: Countries participating in the OECD Seed Schemes (2016)**

Source: the authors, using OECD Data (2016)

The quality assurance system which establishes administrative regulations and technical procedures has a supervisory role for the proper functioning and implementation of the program and for the application of regulatory measures to maintain the quality of the seeds produced.

At the international level, according to OECD data, Grain Seed Schemes represent the quality assurance system to which most of the OECD member countries have adhered.

### The national production of certified seeds

Romania's integration into the EU has also led to an increase in the interest of farmers in buying quality inputs and in a higher demand for certified seeds of qualitatively and qualitatively superior varieties.

Thus, in the last period, the Romanian cultivators have been convinced that the high quality seeds with biological and genetic value, as well as the varietal purity, the high health and germination indices, bring a significant contribution to the increase of the agricultural production. The certified seed preserves the full potential of the crop, has good sanitary quality and increases the agricultural productivity, through a superior germination power and a good adaptation to the cultural conditions in our country, also having an ecologically reduced environmental impact (Agrimedia, 2012).

Depending on the culture, farmers can earn 2-3 times more if they use seed lots than in case of conventional crops. If the farmer can decide each year to cultivate a particular species, depending on the weather conditions of the year in question, the seed company must plan seed production for a minimum of 4-5 years. According to Văduva (2016), in 2016 the largest areas for seed material were used for cereals. In 2007-2012, maize occupied an area of 10-25%, the rest was allocated to the cultivation of straw cereals. On average, using the seeds obtained from the production of a hectare of a batch of grain cereal seeds, 20 hectares of cereals for consumption can be sown. Compared to grain cereals, in the case of maize, the production obtained per hectare of maize hybrid batch can be used to cultivate much larger areas, reaching up to 170 hectares of commercial corn. In the analysed period, the multiplication of oil plant seeds was made on 5-10% of the total area of seed lots. Of these, the multiplication of sunflower was between 33 and 66% of the total oilseed area, and the rape multiplication plots occupied between 5 and 20% of the oleaginous plant multiplication area. For the other cultures,

the areas on which multiplication lots were established were marginal (5 or less than 5% of the total).

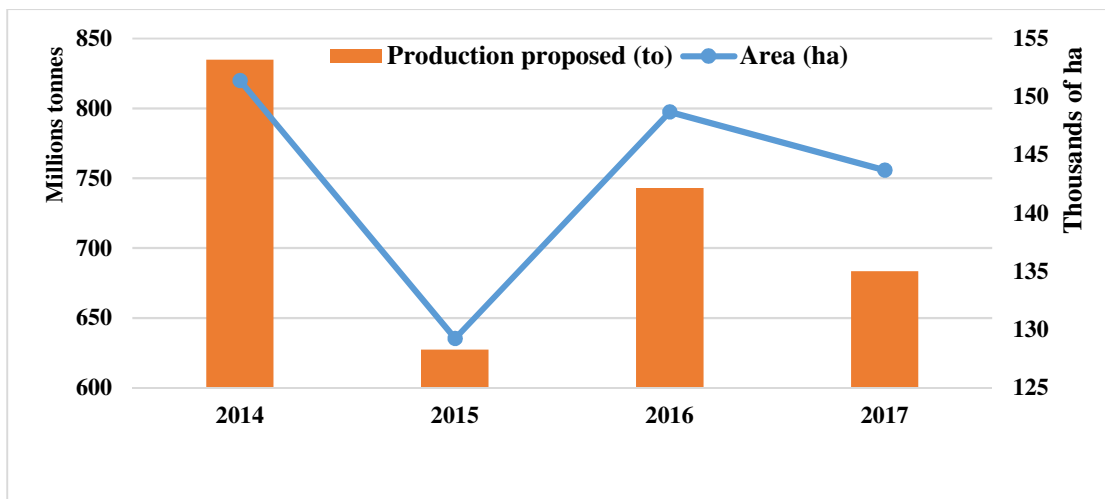
The seed production in Romania is usually achieved on the basis of a contract between the seed company and the farmers, and the tendency of the international seed marketing companies to be marketed locally. The main counties where the seed is multiplied at the national level are Brăila, Iași and Călărași. The advantages of multiplication in these areas are the farmers' experience regarding seed multiplication technology, the possibility to provide secluded lots, equipping the farmers with specific machines (castration machines), the existence of a functional irrigation system or microclimates suitable for securing the production of seeds.

Since 2012, the Romanian Seed Industry Alliance (AISR), a private professional association, has aimed to promote and support the use of seed certified by farmers in order to increase agricultural production in Romania. AISR has as members 13 prestigious companies in the field of research, improvement, production and marketing of seeds with superior genetics, of which only two are Romanian (United Phosphorus Limited, India, the Porumbeni Institute of Phytosanitary Research, the National Institute of Agricultural Research and Development INCDA Fundulea, RAGT Semences, Procera Agrochemicals Romania, Bayer CropScience AG, Maisadour Semences) (AISR, 2012). INCDA Fundulea has been an honorary member of the AISR since 2016, which, with the addition of the institute has reached 70% of the national market for certified seeds (*The Agriculture Gazette*, 2016). The National Institute for Agricultural Research and Development Fundulea is the most important agricultural research unit in Romania, with very good results obtained in agricultural research on cereals, technical and fodder plants and the possibility of their valorisation to Romanian farmers.

In Romania, 143 thousand hectares have been cultivated on average for obtaining

certified seed in the last 4 years, the agricultural areas for this activity was between a minimum of 129 thousand hectares, registered in 2015, and a maximum of 151.4 thousand hectares in 2014.

The weight of the areas for the seed lots is almost 10% of the total agricultural area, i.e. about 15% of the arable land of the country.



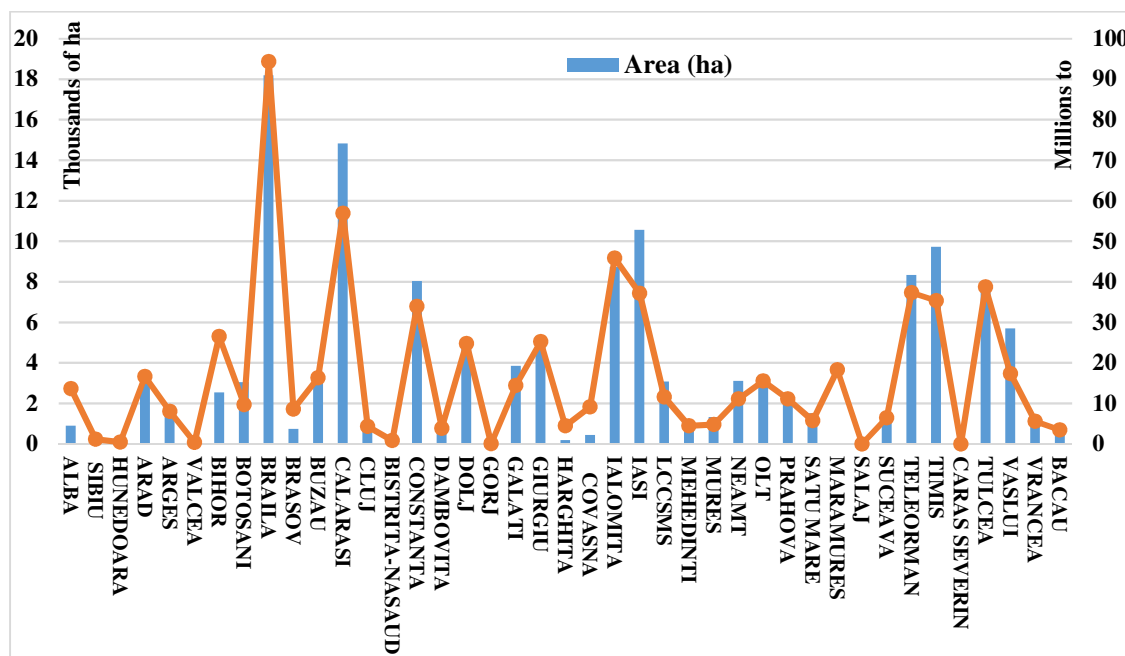
**Fig. 3: Evolution of certified seed areas and production in Romania**

Source: Author, by using INCS data (2017)

Cultivated areas and yields vary from region to region. In 2017, Brăila County, with a weight of 12% of the total area cultivated at the national level and a production of over 94 thousand tons of seeds and seedlings, occupies the first national position, followed, at a comfortable distance, by Călărași, with

14.8 thousand hectares, Iasi, with 10.6 thousand hectares, respectively. On the last positions are the counties of Bistrita, Hunedoara, Caraș Severin, Sălaj and Sibiu, which have not reported certified seed production this year.





**Fig. 4: Areas and production of seeds certified in Romania (2017)**

Source Author, by using INCS data (2017b)

According to the data presented in Figure 4, it can be noticed that out of the 41 regions analysed, only 6 counties exceeded the limit of 80,000 hectares cultivated to obtain seedlings. There are also significant differences in the average productivity for the hectare. Although the crop species are different, a summary of productivity shows a national average of 4.1 tons seed/hectare. The Alba, Vâlcea and Bihor counties have an average production per hectare of over 10 tons of seed, while most counties are in the range of 3-5 tonnes. For a proper analysis, the production should be differentiated by counties, by plant category, given the different productive characteristics.

#### **Concentration of the seed market in Romania**

The data on the cultivated areas and on the production of certified seeds in Romania provided by INCS (2017b) were statistically sorted and processed, with the calculation of the GSI index (Formula 1). The systematization of the data obtained is presented in table 2. The 41 counties of Romania, including Bucharest (n=41) were taken into consideration.

**Table 2 : GSI Values for the certified areas and for the authorised seed production**

Year	2014	2015	2016	2017
$\Sigma g^2$ (Areas)	611.798	566.255	583.785	604.071
GSI	24.735	23.796	24.461	24.577
<b>Market concentration</b>	<b>High</b>	<b>High</b>	<b>High</b>	<b>High</b>
$\Sigma g^2$ (Production)	548.341	525.535	575.216	561.887
GSI	23.416	22.925	23.983	23.704
<b>Market concentration</b>	<b>High</b>	<b>High</b>	<b>High</b>	<b>High</b>

Source: Author, own results obtained by processing INCS data (2017b)

The results obtained for GSI as a result of the research show relatively high values of this indicator and an average degree of concentration of the market. No significant differences were found between the values calculated over the four-year period or between the assessed values (areas or production). The national top of Romania's producing counties shows the existence of several regions with relatively high shares, respectively with quotas higher than 5%, and the national market of certified seeds has a high degree of concentration.

### Conclusions

The article proposes the evaluation of national agricultural products and propagating material in Romania, which is respectively an analysis of the international market. The article highlighted the main legislative regulations applicable at international and national level, as well as the bodies with special attributions in the field. As a Member State of the European Union, Romania has made progress in harmonizing national legislation with Community legislation on the production and marketing of certified seed. Applying the Gini Struck method to analyze the national seed market concentration, GSI index values were highlighted high as well as a high degree of concentration. Certified seed production in the country registered different values depending on region.

The production or multiplication of certified seed implies a rigorous but very cost-effective activity for farmers. Research

results are useful for farmers, but also for businesses, providing information on the seed market.

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