

REPUBLIC OF MOLDOVA'S CROP SECTOR- DEVELOPMENT TRENDS AND ASSESSMENT OF COMPETITIVENESS AT THE INTERNATIONAL LEVEL

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Abstract

The agricultural sector of the Republic of Moldova is strongly relying on the crop production sector, which has been holding an average share of about 70% of the total agricultural output, being followed by livestock sector and services. Crop sector's importance is determined through its contribution to ensuring food security, provision of raw material for the food processing sector and also support to the livestock's sector development. Therefore, the paper aims to evaluate the current development trends of the sector, by emphasizing its achievements on the foreign markets through assessment of its competitiveness. The used methodology is based on the scientific research methods like comparative analysis, synthesis, sectoral SWOT analysis and calculation of several competitiveness indices like Revealed Comparative Advantage, Revealed Symmetric Comparative Advantage, Trade Specialization Index and Grubel-Lloyd Index. The results present a continuous development of the sector with the need for production diversification and a competitive advantage on external markets for mostly raw material products like oil seeds, edible fruits and nuts, cereals, etc.

Key words: agriculture, crop sector, competitiveness, Republic of Moldova

INTRODUCTION

The crop sector of the Republic of Moldova represents an important asset of the entire agrifood sector, as it accounts for about of 70% of the total value of agricultural output. Its significance is confirmed by the great contribution to ensuring food security, provision of raw material for the food processing sector and also support to the livestock's sector development. At the same time, the economic impact of the crop sector is also noteworthy, especially with respect to the added-value crops such as fruits, vegetables and grapes [13].

The crop sector of the Republic of Moldova can be divided in several categories, based on the added-value of production. Therefore, the first group to be analysed is represented by cereals and technical crops in which the country has a direct specialization, with high amounts of production volumes, consumption, export and self-sufficiency level, but which are low added-value. The second group is

represented by the horticultural subsector, meaning fruits, grapes and vegetables, which is considerably developing, but is lacking, at the same time, in market access, competitive labour force and injection of investments and innovation.

Assessing competitiveness of the crops sector is based on the assumption that the crop sector of the Republic of Moldova is capable of continuous development and maintenance of a good competitive ranking or position at the international level.

The competitiveness of Moldovan agri-food products has been analysed through the following aspects: competitiveness with respect to EU countries for all product groups [15], with respect to all countries by [4, 3, 5, 10].

[8] have assessed the competitiveness of the livestock sector, while Golban selected the horticultural production for assessment of competitiveness [6, 7]. Therefore, the crop sector with emphasize on certain important products has been poorly assessed within

existing studies has a room for additional evaluations.

In the framework of the recent evolutions at the regional level, climate changes, numerous crises like pandemic and humanitarian ones, increased prices for inputs and low prices for production, it is of particular importance to pay attention to the further development of the crop sector, by its modernization and increase of competitiveness at the international level.

In the framework of DCFTA and the recent status of a candidate country to EU, as well as due to the Russian Federation frequent embargoes on Moldovan horticulture products, Moldovan exports with cereals, technical crops, fruits, nuts, vegetables and grapes have a trend to be directed towards EU market, other countries and declining volumes to CIS countries.

Therefore, the paper aims to evaluate the current development trends of the crop sector, by emphasizing its achievements on the foreign markets through assessment of its competitiveness.

MATERIALS AND METHODS

The paper results and conclusions are based on the application of a series of scientific research methods aimed at achieving the main aim of the article. The analytical framework of the Moldovan crop sector is based on the following methods: analysis and synthesis, comparison, induction and deduction, etc. The main data sources with respect to output, production, self-sufficiency levels are represented by the Annual reports (2015-2024) and the database of the National Bureau of Statistics of the Republic of Moldova (2015 – 2024) [12].

In regard to the assessment of the competitiveness of the sector at the international level, a set of methods have been used, among which can be mentioned calculation of the Revealed Comparative Advantage (RCA), Revealed Symmetric Comparative Advantage (RSCA), Trade Specialization Index (TSI) and Grubel-Lloyd Index (GLI).

The following RCA formula has been used to evaluate the competitiveness degree of certain products or a group of products:

$$RCA = \frac{\frac{X_{ij}}{X_{it}}}{\frac{X_{nj}}{X_{nt}}} = \frac{X_{ij}}{X_{nt}} \cdot \frac{X_{it}}{X_{nj}} \dots \dots \dots (1)$$

where: X represents exports, i – a country, j – a commodity or an industry, t – a set of commodities or industries, and n – a set of countries [1]. If $RCA > 1$, it means that the analysed country holds a comparative advantage in a specific sector in which the country is specialized in terms of exports [11].

Taking into account that RCA indicator is a bit incomparable, the symmetric index is used for allowing certain comparisons (RSCA), which has been calculated based on the formula:

$$RSCA = \frac{RCA_{ij-1}}{RCA_{ij+1}} \dots \dots \dots (2)$$

Moreover, the interpretation of RSCA is similar with that of RCA. RSCA greater than 0 implies that country i has comparative advantage in good j. In contrast, RSCA less than 0 implies that country i has comparative disadvantage in product j [14].

One more indicator used in the paper is the trade specialization index. It aims to analyse the relation between the net flow of goods and the total flow of goods.

$$TSI = \frac{X-M}{X+M} \dots \dots \dots (3)$$

In this case, X is being defined as exports, while M – as imports.

This indicator is considered to be more appropriate in the identification of the real producers of certain goods, or a category of goods, as it extracts the large exports values that result from activities related to re-export [10].

And the last index - Grubel-Lloyd is entitled to measure the intra-industry trade of a particular product, being introduced by Herb Grubel and Peter Lloyd in 1971. It is calculated as

$$GLi = 1 - \frac{|X_i - M_i|}{X_i + M_i} \dots \dots \dots (4)$$

where: X_i denotes the export, and M_i - the import of the good i. In case when $GLi = 1$, it points on the existence of only intra-industry

trade, with no inter-industry trade identified. Overall, the explanation is that the given country is exporting the same amount of a certain good as it is importing. Nevertheless, when $GLi = 0$, it signifies the lack of intra-industry trade, with the presence of only inter-industry trade, meaning that a certain good is either imported, or exported [10].

The data used for assessing the crop sector's competitiveness at the international level is based on the statistical data provided by UN Comtrade database (2024) [16]. WITS database (2024) [17] and National Bureau of Statistics of the Republic of Moldova (2015 – 2024) [12].

RESULTS AND DISCUSSIONS

During the period of 2000 – 2022, the share of crop production in the total agricultural production has varied between 58% in 2012 to 81.1% in 2021.

The average share accounts for about 70%, which indicates on the great role of the crop sector within the total agricultural output (Figure 1).

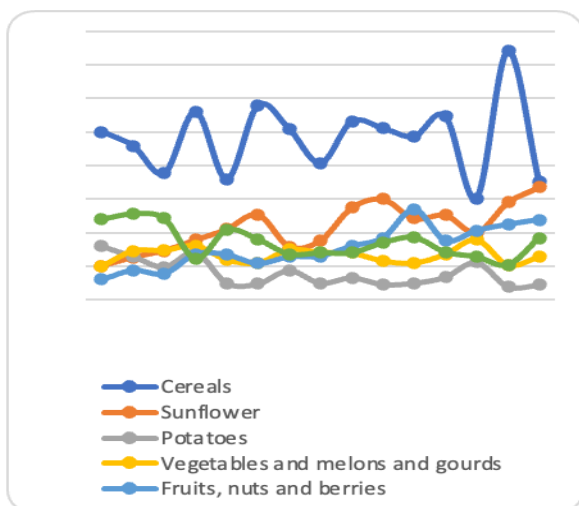


Fig. 1. Share of the main crop products in the agricultural output, %
Source: National Bureau of Statistics of the Republic of Moldova, 2023 [12].

In order to achieve the aim of the paper, the crop sector of the Republic of Moldova has been separated in several sub-sectors, mainly: cereals and technical crops, vegetables, fruits, nuts and grapes.

Cereals and technical crop shave a significant

share in the total agricultural output. During 2000 – 2022, their share fluctuated between 25.1% in 2020 to 51.5% in 2021. The average share during the analysed period accounts for 35%. Therefore, the largest share of the agricultural output is occupied by low added-value crops like wheat, maize and sunflower (Figure 2).

At the same time, most of the sown areas of arable land is occupied by cereals and technical crops, which indicates on a certain level of specialization of the country for this type of production.

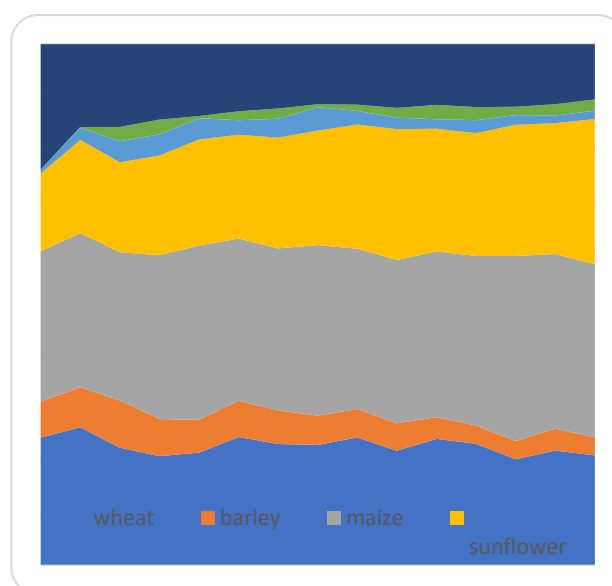


Fig. 2. Share of cereals and technical crops in the total sown area, %
Source: National Bureau of Statistics of the Republic of Moldova, 2023 [12].

Production of cereals and technical crops is marked by important fluctuations due to severe droughts have been affected the country recently. Therefore, there are noted significant decreases in production in 2012, 2015, 2020 and 2022 – years with difficult climate conditions (Figure 3). The strong dependence on weather conditions makes this agricultural sub-sector to be of an increased-risk activity. Taking into account the lack of an attractive insurance system for Moldovan farmers, as well as appropriate banking conditions for insuring the yield, the gaps registered in production during years with severe drought have a significant impact on the public support program, mainly through the need to distribute additional funds (or the

existing ones) for countering the effects of adverse climate conditions. At the same time, the lack of irrigation systems also represents a cause for the low production.

Therefore, the need of climate-change adaptation and mitigation measures is strongly correlated with the current state of the sector and more emphasize should be placed on the development of cereals and technical crop production in a sustainable practice, taking into account the climate factors.

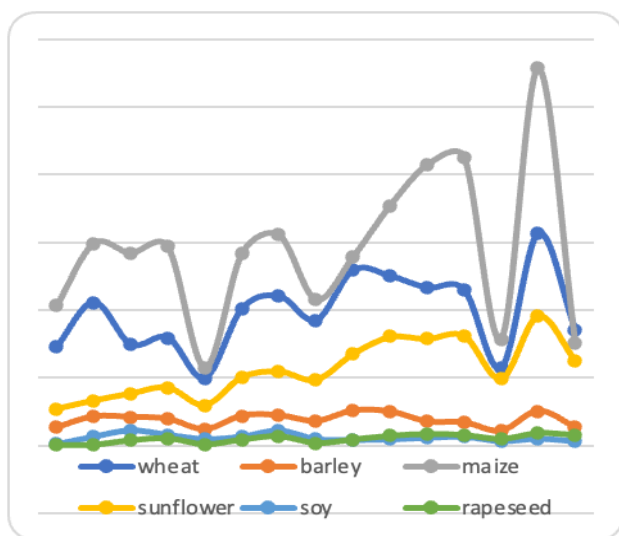


Fig. 3. Cereals and technical crops production, thous. tons
 Source: National Bureau of Statistics of the Republic of Moldova, 2023 [12].

The self-sufficiency level of wheat is mostly over 100%, as being an important product for ensuring food-security, there is also a state reserve of wheat intended for emergency purposes. The market regulation for wheat is a liberalized one, with very few and random cases of export prohibition. Maize is more affected by climate changes than other crops, and significant issues arise for agricultural producers engaged in cultivation of maize, especially from the South region of the country, where the volume of annual precipitations is decreasing. Thus, the shortage of maize, being one of the most important forage crops for the livestock, creates preconditions for hindering the development of the animal sector in the subsequent period, due to its insufficiency in production. With respect to sunflower, being one of the most attractive crops for Moldovan

farmers, the self-sufficiency level during 2012 – 2022 is always exceeding 100%. (Figure 4).

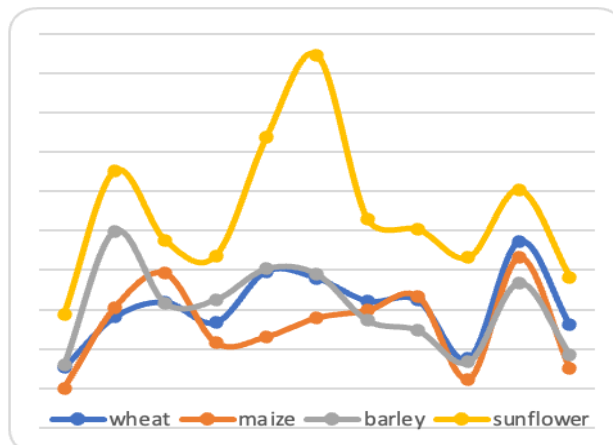


Fig. 4. Cereals and technical crops self-sufficiency level, %
 Source: National Bureau of Statistics of the Republic of Moldova, 2023[12].

With respect to cereals and technical crops, based on the analysis of the Trade Specialization Index (TSI), Republic of Moldova during 2015 – 2022 has been a net exporter of wheat, barley, maize, rape seed and sunflower. Fluctuating values have been noticed for rye and oats (Figure 5).

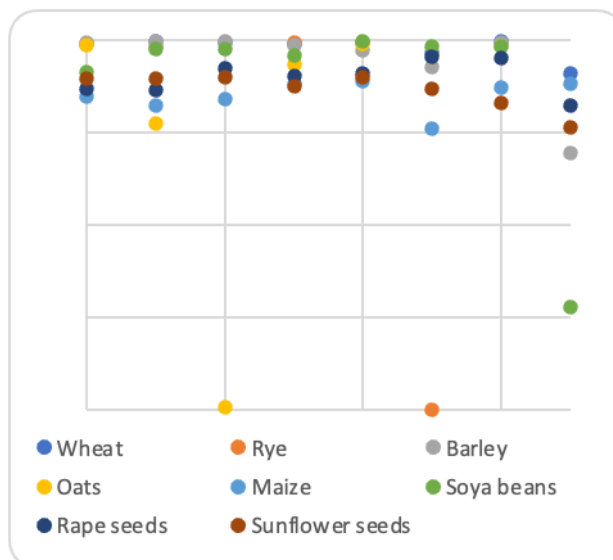


Fig. 5. Trade Specialisation Index, TSI, for cereals and technical crops
 Source: authors' calculations.

The Grubel–Lloyd index which is entitled to measure the intra-industry trade provides for the figures below (Table 1). Based on it and taking into account that for most of the values are quite closed to zero for all the analysed

products, it can be concluded that there is little intra-industry trade. This would mean that the country either only exports or only imports the above-mentioned goods.

Table 1. Grubel–Lloyd index for cereals and technical crops

	2015	2016	2017	2018	2019	2020	2021	2022
Wheat	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2
Rye		0.0		0.0		0.0		
Barley	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.6
Oats	0.0	0.4	0.0	0.1	0.0		0.0	
Maize	0.3	0.4	0.3	0.2	0.2	0.5	0.3	0.2
Soya beans	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.6
Rape seeds	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.4
Sunflower seeds	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.5

Source: authors' calculations.

Having a net export status for the most important cereals and technical crops like wheat, maize and sunflower, the RCA indicator confirms the competitiveness with respect to the world market for these products. Thus, RCA values are extremely high for sunflower seed reaching 265 in 2022,

followed by maize – 29, rape seeds – 14, etc. All the cereals and technical crops analysed except oats, rye and soya beans in some years have RCA values higher than 1, meaning a comparative advantage on the world market of these products (Table 2).

Table 2. RCA index for cereals and technical crops with respect to world market

	2015	2016	2017	2018	2019	2020	2021	2022
Wheat	11	20	19	16	16	4	26	5
Rye		0		1		0		6
Barley	18	19	24	15	8	3	21	4
Oats	0	0	0	2	0		0	0
Maize	12	12	13	23	23	15	17	29
Soya beans	4	1	1	1	1	1	0	0
Rape seeds	7	10	21	22	25	14	25	14
Sunflower seeds	378	397	381	335	319	281	289	265

Source: authors' calculations.

The RSCA indicator gives a more comparable approach with respect to competitiveness of products. The data can be visualized in the figure below and indicates on strong competitive advantage of sunflower, wheat, maize and rape seeds and negative values for oats, rye and soya bean (Figure 6).

The vegetable sector has also a significant role in the agriculture of the Republic of Moldova, especially due to its impact on the food security and the population's diet. Vegetable production is characterized by a strong seasonality and it largely depends on natural conditions and market availability (Ignat., A., Tirigan, S., Lucasenco, E., 2018) [9].

The Moldovan farmers also face a great competition on the internal market as a result of massive imports of vegetables from other countries. Greenhouses are still under

development, as most of the vegetable products are grown in open fields. There is also more room for the development of organic vegetable production, which is also supported by state through the existing subsidy program.

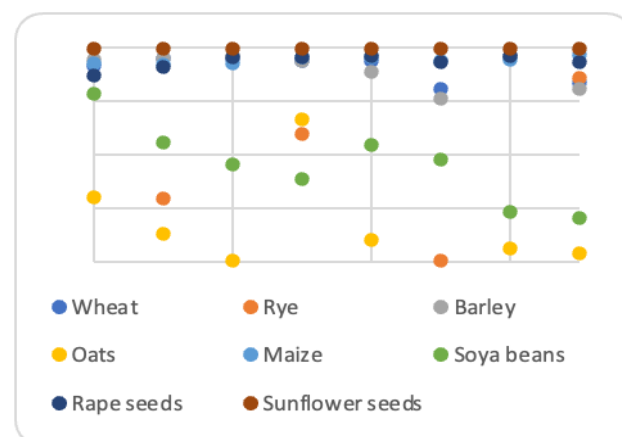


Fig. 6. RSCA for cereals and technical crops
 Source: authors' calculations.

In 2022, vegetables accounted for about 6.4% in the total agricultural output value. Between 2015 and 2022, decreases in agricultural production are observed in: potato (from 214.0 thousand tons to 171.8 thousand tons), cabbage (from 23.7 million tons to 15.7 thousand tons), tomato (from 54. 6 thousand tons to 47.1 thousand tons), cucumbers (from 17.3 thousand tons to 16.1 thousand tons) and garlic (from 10.2 thousand tons to 8.3 thousand tons). However, increases in

agricultural production were recorded for a number of vegetables like: carrots (from 16.1 thousand tons to 23.5 thousand tons), peppers (from 9.8 thousand tons to 13.8 thousand tons) and eggplant (from 4.2 thousand tons to 6.2 thousand tons).

The level of self-supply with all types of vegetables is insufficient. Decreases are noted for tomatoes, cabbage and cucumbers (Table 3).

Table 3. Self-sufficiency level with vegetables, %

	2016	2017	2018	2019	2020	2021	2022
Vegetables, total	99.8	96.9	86.3	85.5	78.2	79.0	81
Tomatoes	74.6	83.1	72.7	57.1	41.3	47.8	67.5
Cabbage	-	-	-	80	79.9	70.6	48.7
Cucumbers	-	-	-	96.8	84.0	99.5	59.6
Others	108.1	101.6	90.7	93.1	91.6	88.3	97.7

Source: National Bureau of Statistics of the Republic of Moldova, 2023 [12].

With respect to the weak points of the given sector, they are based on the lack of production diversification, insufficient irrigation systems, absence of high-quality inputs, and lack of producers' associations.

With respect to vegetables, based on the analysis of the Trade Specialization Index, Republic of Moldova during 2015 – 2022 has been a net importer of potatoes, tomatoes, onion and garlic, cabbages, carrots and cucumbers (Figure 7).

Based on the net importer status, it is expected for the Moldovan vegetables to be lacking in competitiveness on the foreign market.

Therefore, RCA values higher than 1 have been registered in random years for potatoes, tomatoes, onions, and carrots, but they are more an exception to the general rule of low competitiveness (Table 4).

The prospects of the development of the vegetable sector can be seen through the development of processing industry, mainly of frozen vegetables and organic agriculture. Moreover, new opportunities emerge for agricultural producers who may get specialized in cultivation of different salads like lettuce or rucola, parsley, broccoli or cauliflower. For all of this to take place, there is a need to develop specialized micro-zones and centres.

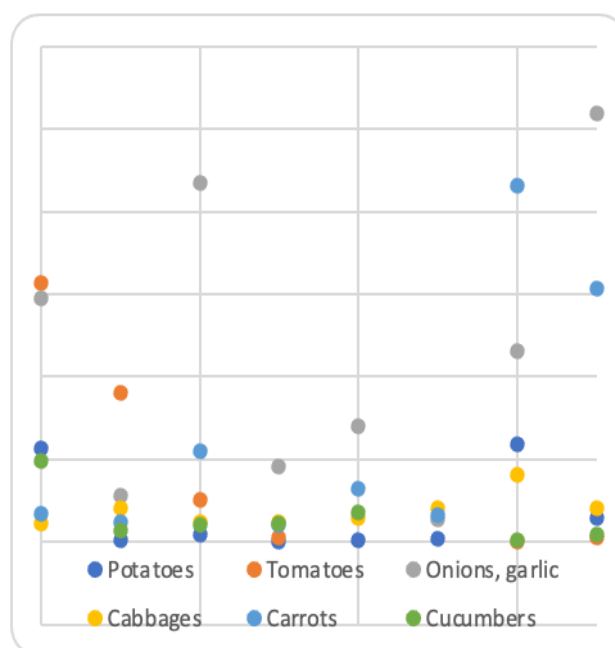


Fig. 7. TSI for vegetables

Source: authors' calculations.

Republic of Moldova is specialized in growing *fruits, nuts and grapes*. Moldovan fruits have remarkable organoleptic qualities that distinguish the products among others of different origin. The tradition of growing fruits and grapes is an old one, being based on the appreciation of taste and quality of fresh and processed products [2].

Table 4. RCA values for vegetables, %

	2015	2016	2017	2018	2019	2020	2021	2022
Potatoes	1.7	0.0	0.1	0.0	0.1	0.1	1.3	0.3
Tomatoes	3.0	1.4	0.3	0.1			0.0	0.0
Onions, garlic	0.8	0.1	0.8	0.6	1.0	0.1	0.8	2.4
Cabbages	0.1	0.3	0.1	0.2	0.2	0.2	0.6	0.3
Carrots	0.2	0.2	0.7	0.2	0.6	0.3	2.5	2.9
Cucumbers	0.6	0.1	0.1	0.2	0.3		0.0	0.1

Source: authors' calculations.

In the last 10 years, the sector has received a massive attention from the state through the subsidy program, where measures for deforestation, plantation, installation of anti-hail and anti-rain systems have been supported.

These all led to the beginning of deforestation of old, unproductive plantations and planting of new varieties required mainly on the international markets in super-intensive of intensive orchards.

Overall, the planted surface has undergone some changes for apples, with a decrease from 57.8 thous. ha in 2016 to 51.2 thous. ha in 2022, for peaches (from 7.9 thous. ha to 5.4 thous. ha) and vineyards (from 135.3 thous. ha to 116.5 thous. ha). Increases have been noticed for cherries, sour cherries, apricots

and nuts plantations (Table 5).

In 2022, fruits accounted for 11.9% in the total value of the agricultural output, while grapes – 9.2%. As for production, during 2016 – 2022, apples have increased from 411.8 thous. tons to 447.7 thous. tons, with a peak of 665.2 thous. tons in 2018, sour cherries from 4.1 thous. tons to 9.7 thous. tons and cherries from 7.6 thous. tons to 13.6 thous. tons.

Relatively stable values have been registered for apricots, peaches, plums and nuts and significant decreases for grapes (from 615.7 thous tons to 531.2 thous. tons) (Figure 8). Climatic conditions are one of the main factors in the decrease of the grape harvest in recent years, accompanied by plantations with varieties with low productivity.

Table 5. Area planted with fruit trees and vine, thous. ha

	2016	2017	2018	2019	2020	2021	2022
Apples	57.8	58.1	57.4	56.6	56.0	53.3	51.2
Sour cherries	3.8	4.0	4.1	4.2	4.4	4.5	4.8
Cherries	4.2	4.3	4.7	5.1	5.2	5.3	5.3
Apricots	4.0	4.2	4.3	4.5	4.4	4.4	4.5
Peaches	7.9	7.8	7.2	6.6	6.1	5.6	5.4
Plums	22.3	22.6	22.9	22.8	22.2	21.3	21.0
Nuts				26.7	33.2	35.0	35.5
Vineyards	135.3	129.7	133.0	126.0	121.2	117.5	116.5

Source: National Bureau of Statistics of the Republic of Moldova, 2023 [12].

The self-sufficiency rate for fruits is on the rise, increasing from 195.8% to 205.3% between 2006 and 2022.

The fruit sector represents an important component of the exported agri-food goods of Moldovan origin. Therefore, the export of "Edible fruits and nuts" has a share of around 18-20% in the total value of exports of agri-food products. The export value of this group of products exceeds the import values by about 2.7 times, the main exported subgroups being: "Other nuts, fresh or dried, whether or not peeled", "Apricots, cherries, sour cherries,

peaches (including nectarines), plums and plums, fresh", "Apples, pears and quinces, fresh" and "Grapes, fresh or dried" (Ceban, A., 2022) [2].

With respect to fruits, nuts and grapes, based on the analysis of the Trade Specialization Index, Republic of Moldova during 2015 – 2022 has been a net importer of quinces, pears and walnuts and a net exporter of plums, cherries, sour cherries, apricots, apples and grapes (Figure 9).

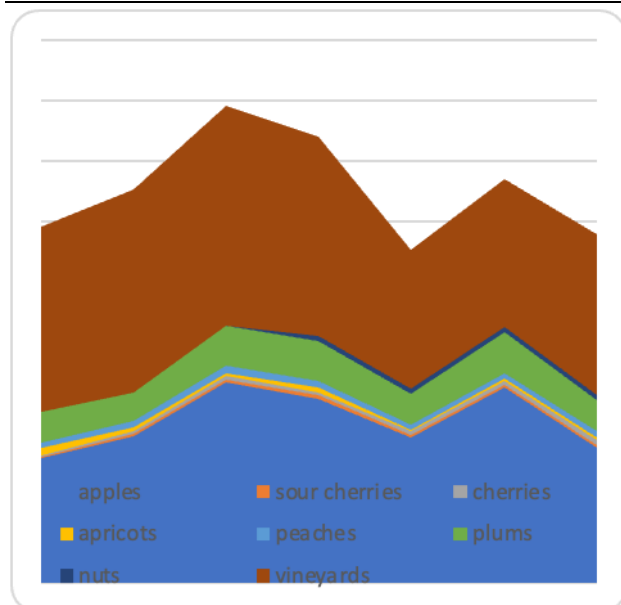


Fig. 8. Fruit and grapes production, thous. tons
 Source: National Bureau of Statistics of the Republic of Moldova, 2023[12].

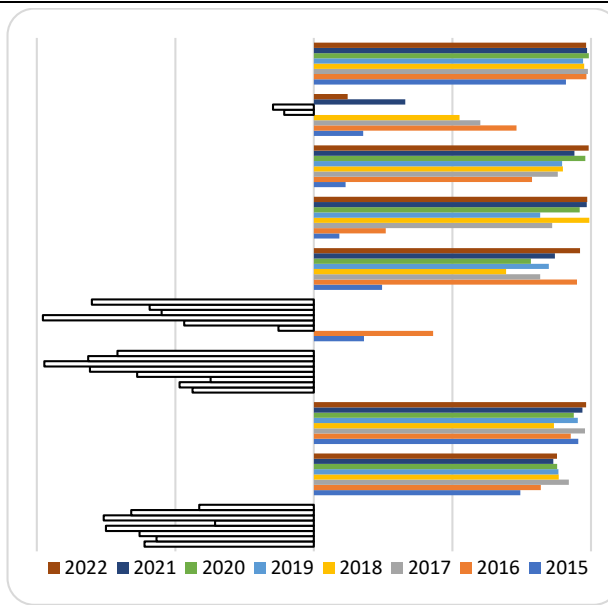


Fig. 9. TSI for fruits and grapes
 Source: authors' calculations.

Table 6. GLI values for fruits, nuts and grapes, %

	2015	2016	2017	2018	2019	2020	2021	2022
Walnuts	0.4	0.4	0.4	0.2	0.6	0.2	0.3	0.6
Grapes	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Apples	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0
Pears	0.6	0.5	0.6	0.4	0.2	0.0	0.2	0.3
Quinces	0.8	0.6	0.9	0.5	0.0	0.5	0.4	0.2
Apricots	0.8	0.1	0.2	0.3	0.2	0.2	0.1	0.0
Sourcherries	0.9	0.7	0.1	0.0	0.2	0.0	0.0	0.0
Cherries	0.9	0.2	0.1	0.1	0.1	0.0	0.1	0.0
Peaches	0.8	0.3	0.4	0.5	0.9	0.9	0.7	0.9
Plums	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: authors' calculations.

When analysing this sub-sector from the point of view of the Grubel–Lloyd index, we find out that with respect to apples, sour cherries, cherries, grapes, apricots and plums, GLI is quite close to zero, which means only a small amount of intra-industry trade. For walnuts, quinces, and peaches, the calculated values are near the figure of 1, pointing on the intra-industry trade (Table 6).

The RCA values for fruits, nuts and grapes are greater than 1 for all the analysed products except pears. High values are recorded especially for plums, sour cherries and apples, being followed by grapes, walnuts and cherries (Figure 10). Therefore, Moldova is highly competitive on external market with fruits, just like for cereals and technical crops.

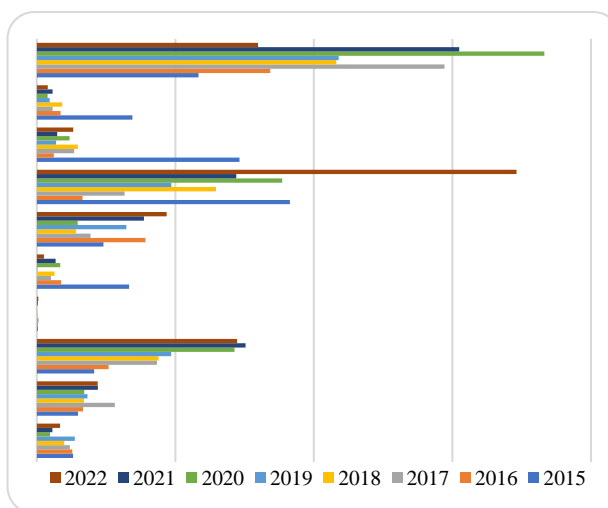


Fig. 10. RCA for fruits, nuts and grapes
 Source: authors' calculations.

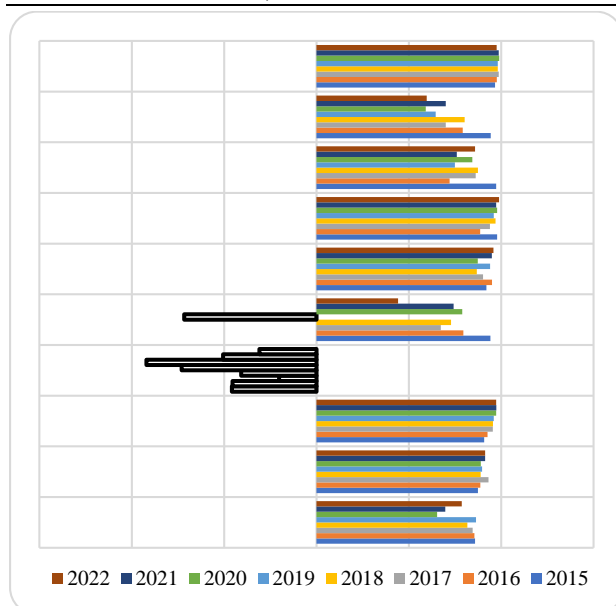


Fig. 11. RSCA for fruits, nuts and grapes
 Source: authors' calculations.

The RSCA indicator gives a more comparable approach with respect to competitiveness of fruits, nuts and grapes (Figure 11). The data can be visualized in the figure below and indicates on strong competitive advantage of all fruits, except pears and to a lesser extent – quinces.

CONCLUSIONS

The crop sector of the Republic of Moldova has an important impact on ensuring population's food security and dietary needs. It also represents a sector in a continuous development that needs additional incentives for its modernization and continuous growth. State support is significant and the first results are already noticeable, but additional recommendations are provided for its development.

For cereal and technical crops, which have an important share in the agricultural output, as well in the foreign trade, being some of the most competitive products externally according to the RCA indicator, the following recommendations are proposed:

- Improvement of crop cultivation technologies and precision agriculture. Large yields and increased productivity can be achieved through proper fertilizer management, optimizing crop rotation, controlling moisture levels through modern

irrigation practices, soil conditions and pest stress. By providing the sector with more precise planting and cultivation practices, farmers can benefit from increased efficiency and better cost management.

- Elaboration of antitrust rules for agricultural products that will help protect farmers from concerted commercial practices.

- Special incentives to diversify cultivated grains by increasing organic production and smaller-scale grains such as sorghum, oats or rye will help meet changing consumption patterns and international demands for high-value grains.

- Strengthening value chain infrastructure such as efficient storage facilities, transportation, export procedures and other means of facilitating exports and reducing costs. Farmers can be given more flexibility in adjusting production to a certain market category, as well as making the decision to store or sell production at a certain time of the year, thus increasing the chances of getting a higher price.

For fruits and vegetables, there is a need to support the development of processing sector, as it is one with the most perspectives and possesses high-quality raw material. RCA values are high for fruits and low for vegetables, which points on the need for additional developments in the vegetable sector. Development of agri-food clusters is another recommendation aimed at the establishment of modern infrastructure and common facilities for processing units. For the vegetable sector, it is becoming imperative to create profile associations able to represent the farmers and provide them with the necessary support. Moreover, it is necessary to support market research and business partnerships for the production of value-added processed fruits and vegetables. And one of the most important is the undertake of actions with respect to future farming, based on modern greenhouses and indoor vertical farming.

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