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THE QUANTIFICATION OF THE DIVERSIFICATION'S IMPACT OF COMMERCE WITH AGRI-FOOD PRODUCTS ON THE EFFICIENCY OF EXTERNAL TRADE

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Abstract

In the context of foreign economical relations, the main aim for the Republic of Moldova is the agri-food trade diversification without intermediaries that can transform it from a poor country in a prosperous one. The consumer's needs, preferences and their satisfaction require a higher effort that leads to strong competition on the agri-food markets. The above mentioned lead to positive changes on the agri-food market by being considerably diversified the assortment of products. As a result, Moldova's agri-food trade relations with the World requires the modernization of the given sector by increasing the amount of manufacturing products with high value-added, supply diversification of exported products and markets.

Key words: *agricultural products, import-export, rural area, the final product diversification of trade.*

INTRODUCTION

Agriculture traditionally remains the basic sector of the Moldavian economy. Some key objectives have been fulfilled during the past reforms, but despite these objectives, an obvious trend of decline has been noticed in the foreign trade balance of the Republic of Moldova over the last decade, which shows the unsatisfactory evolution of the economic sector as a whole.

The export of food products in Moldova is mainly oriented to the traditional markets of the Commonwealth of Independent States (CIS), these are emerging, currently unstable markets, which involves high risks for the export to these countries.

The reduction of food products export is influenced by several factors, and namely: low competitiveness of local agricultural products in both national and foreign markets due to poor quality and safety regarding the increasing requirements of these markets. [2, p. 131]

The objective of Moldova's integration in the world economic system as a competitive partner must change the situation. The globalization of the world economy and the scientific and technical progress offer new opportunities to our country to increase the agricultural output at the level of various industries. To implement this task in Moldova one should primarily concentrate on the production of high quality food and its export, taking into consideration the neighbourhood and demand of one of the most profitable markets of the modern European Community.

Keeping in mind the objectives of the Republic of Moldova to diversify markets, increase exports, attract investments and projects, increase GDP per capita in rural areas, protect environment and society, lower costs, increase customer confidence, food safety and traceability in agriculture.

The diversity of food products structure in Moldova aims at receiving highest revenues by food producers, the compliance with both national and foreign demand, minimizing the

unemployment rate in rural areas, reducing the export of agricultural raw materials, increasing the volume of final products, developing original and unique products in Moldova. The diversity of food products can be achieved only if foreign economic partners are diverse. The maintenance of export-import relations with neighbouring countries cannot be always effective. The expansion of economic relations with Arab countries could contribute to the development of new food products specific to the food consumption in these countries, for example grain legumes. Albumin deficiency in food during fasting periods is supplemented by the consumption of grain legumes. Being exported, these goods can be a payment form for oil resources import from these countries.

In our opinion, only the diversity of food products can lead to the increased trade efficiency by diversifying importers of oil products without intermediaries, the fact due to which Moldova, a poor country, can be transformed into a prosperous state.

Thus, there is a problem: the organization of large-scale production of grain legumes in the Republic of Moldova; the initiation of oil resources import from Arab countries. Export-import flows are usually more intensive between neigbouring trade partners. In our case the distance between the Republic of Moldova and Arab countries is quite big, and therefore it is necessary to minimize transportation costs. The problem is difficult because: economic relations are determined by the market, interests of economic subjects are diverse, there may appear some intermediaries in the schemes of "optimal flow" – export beans, import oil – which is usually not good for both producers and consumers, contributing to the unjustified price increase. The problem of "closeness" of oil-exporting countries to the Republic of Moldova can be solved with the help of economic and mathematical methods.

To solve the problem of food products diversification means to increase energy consumption by agricultural producers and the one that process agricultural raw materials. Agriculture, cultivating grain legumes, can diversify its activities, increase soil efficiency and fertility, create new raw materials, increase the volume of end products. And not the least important, agriculture can provide energy resources (oil) in exchange for grain legumes.

The diversity of food products is a complex problem and at the same time it is of the first importance for the Moldovan economy. The solution of diversification problems can contribute to the improvement of management methods, development of the economy at the territorial (district) level. The complexity and multitude of possible variations, uncertainty of economic processes both in the country and abroad can only be analyzed using a mathematical system of imitation, simulation of possible economic situations.

Diversification options must be characterized by a system of indicators: the ratio of population employed in agriculture, processing industries to the total number of population able to work, income per person, final income with specifications: income in agriculture - in processing industries - in trade. [3]

MATERIAL AND METHOD

Research aspirations quantifying the diversification impact of food products trade on the efficiency of foreign trade, there were used a number of methods and procedures such as: the method of analysis, induction, deduction and synthesis that allowed researching the essence of the topic and drawing some conclusions that we believed would be of interest for economics. The end result is to develop economic and mathematical methods to quantify the diversification impact of food products trade, which are scientifically based on the main aspects of perspective and efficiency of foreign trade in the Republic of Moldova.

RESULTS AND DISCUSSIONS

The consumption of agricultural production is determined by the structure of agricultural sector and vice versa. The modernization and improvement of production technologies, creation of new end products is one of the main actual directions, multiplication of both national and foreign demand. The economic development of the Republic of Moldova is conditioned by the current transformation of

economic structure to another structure, adequate to demand, potential possibilities of the country. The modernization and diversification of the agricultural products structure includes:

- Moldova's increased participation in the circuit of world economy;
- the increased share of original, principal and new developed products in GNP;
- the aspiration to develop some economy branches, stimulate ideas, technology, machinery in the food production *(x_{1});*
- the occupation and use of human and natural resources in the highly productive industry branches *(x_{2});*
- the harmonization of the socio-economic development of all districts, regions, of the country as a whole, improved working conditions *(x_{3});*
- the increased amount of technical equipment at every working place *(x_{4});*
- the stimulation and motivation of creative activities, design of new products, technologies *(x_{5});*
- the research of both national and foreign markets, demand for foodstuff *(x_{6});*
- the training of specialists in the analysis of the current processes structure used to produce food products *(x_{7});*
- the development of a standard structure *(x_{8});*
- the creation of some mechanisms to motivate convergence processes of two structures *(x_{9});*

The complexity of the listed problems makes us think about the idea of systematic treatment of diversification processes of food products.

Thus, the modernization and diversification of food products structure can be considered as F function which depends on variables $x_1, x_2, \dots x_9$. In their turn, each of the listed variables evolves over time. In formal language $F\big(x_1(t), x_2(t), \dots, x_9(t)\big)$ – the diversification function of agricultural products. The elements, variables $\big(x_1(t), x_2(t), \dots, x_9(t)\big)$

The change of a factor over time generates modification of other factors and therefore, of the structural diversification:

$$\Delta F\big(x_1(t), x_2(t), \dots x_9(t)\big) = \frac{\partial F}{\partial x_1} \times \frac{dx_1}{dt}\Delta t + \frac{\partial F}{\partial x_2} \times \frac{dx_2}{dt}\Delta t + \dots + \frac{\partial F}{\partial x_9} \times \frac{dx_9}{dt}\Delta t$$

The evolution of the current structure in relation to the standard structure may be divergent or convergent. The problem is formally reduced to the creation of the diversification function F^{*}, of the motivation systems in the processes to which asymptotically tends the current function $F\big(x_1(t), \dots, x_9(t)\big)$.

The economic development of the Republic of Moldova actually means the diversification of the economic structure, the appearance and removal of certain branches, products and technologies. Structural changes in food products are determined by: the pace of economic growth, the development level of productive powers, the government's economic policies, labour productivity, natural and geographic conditions, the creative level of research and scientific analysis institutions, the degree of tech production, the improvement, possibilities, the adaptation of manufacturing technologies for food production, the efficient use of natural and human resources, the capital, the labour division, the increased volume and efficiency of foreign economic exchanges, the effects of natural economic circumstances, the level of national labour division, the quality level of labour, the organization of work. Each of the listed factors in its turn is subject to structural changes. Moldova's economy is characterized by a small number of branches, by the predominance of agriculture, weak connections between branches of production, it is an underdeveloped country. Labour productivity in Moldova's agriculture is lower than in EU countries. [4, p.56] The share of energy resources in the structure of productive expenditures is high, but that of labour resources is reduced. Consequently, the agricultural manufacturer can not usually make any profit. Moreover, there are monopolistic policies of foreign business partners: the agricultural producer in Moldova is "deceived" during both selling and purchasing. Thus, the Republic of Moldova is forced to restructure its end products, international economic relations,

to expand exports to Arab countries, to exchange goods for goods with Turkmenistan and other countries that export energy resources.

The reduction of energy procurement costs for farmers in Moldova may result in: the diversification of agricultural raw materials and end products, changes in wages, creation of conditions to store products, development of agricultural processing technologies, change of labour needs; request for skilled workers, improvement of unproductive consumption in rural areas and thus, the increased demand for food products, the creation of favourable conditions for agricultural and manufacturing sectors development. The current structure of the economy of the Republic of Moldova cannot be considered as modern, industry oriented with a high economic potential, strong technological capacity and active participation in the world economy, the current structure of the Republic of Moldova is an agrarian structure, disjointed, with a underutilized economic potential, with a low participation in the international economic cycle. In the last 20 years rural areas in Moldova increasingly have been deteriorating from the economic, social and cultural point of view. Therefore, the diversification of food products and economic partners-exporters of oil resources in exchange for grain legumes in constant ratio (for example) becomes a serious problem for the Republic of Moldova. The increased volume of end products changes the structure and vice versa. The diversification of food products becomes a demand multiplying mechanism, the one that is used to reduce Moldova's dependence on some energy exporting countries and importing agricultural products from Moldova.

The diversification of the Republic of Moldova is a process that has been taking place over time, but with a condition, it can be implemented only after a program-objective that is approved, coordinated, guided by the country authorities. Unadjusted market economy will for sure contribute to the further "depopulation" of rural areas, to the inefficient use of agriculture, the export of agricultural raw materials, increased unemployment, GNP reduction, increased imports, state debts. In other words, to the country's transformation into a poorer country.

In our opinion, only the diversification of food products and importers of oil products without intermediaries may transform the Republic of Moldova into a prosperous country. The system of agro-industrial production has a complex structure. This complexity requires the use of systemic methods in process analysis. The diversification of food products is identical to the substitution of one vector with another, beginning with the establishment of parties, structural units. A problem appears in the diversification process of agricultural products: diversification measuring (quantifying). There are various methods of analyzing the diversification process. Further we will use vector methods to analyze the structure of the final process. The diversification of food products is equivalent to the increase of the number of coordinates of the vector that consists of final products. Starting with the assumption of the final product in the agro-industrial complex, that is vector $Y = (Y_1, Y_2, \dots Y_9)$, then the module of this vector will $(Y)\sqrt{\sum_{i=1}^{n} Y_i^2}$. To interpret the contents of this economic indicator more persuasively one needs to analyze its variation range. Say the number of vector *Y* coordinates is *n*. Under these conditions, for example for *n = 2,* the length (module) of vector *Y* is equal to $|Y| = \sqrt{Y_1^2 + Y_2^2}$.

The end product is $Y = Y_1 + Y_1$. Let us solve the task:

$$|Y| = \sqrt{Y_1^2 + Y_2^2} \Rightarrow \quad min$$

Under $Y_1+Y_2=Y$

We develop Lagrange function

$$L = \sqrt{Y_1^2 + Y_2^2} + \Lambda(Y - Y_1 - Y_2)$$

$$\begin{cases} \frac{\partial L}{\partial Y_1} = \frac{1}{2\sqrt{Y_1^2 + Y_2^2}} \times 2Y_1 - \Lambda = 0 \\ \frac{\partial L}{\partial Y_2} = \frac{1}{2\sqrt{Y_1^2 + Y_2^2}} \times 2Y_2 - \Lambda = 0 \end{cases}$$

where we get $Y_1=Y_2$

The module of the vector *Y* is minimal when $Y_1 = Y_2 = \frac{Y}{2}$. The diversification of the end product is maximum; the length of the vector *Y* is maximum when Y_1 or Y_2 is zero, when the whole mass of the end product is concentrated in a single coordinate $Y_2=Y$ or $Y_1=Y$, the end product diversification is minimum. So, one of the possible indicators that could measure the diversity of food products is the module (length) of the end product vector $Y = Y_1 + Y_2 + \cdots + Y_n$. In reality the number of vector *Y* components is very large (there can be hundreds of thousands of end products). Therefore, there appears a necessity of aggregation-disaggregation of the end product vector structure. Aggregation-disaggregation operations logically change the vector. The statement can be exemplified. If the end product is aggregated into one group $(Y_1 + Y_2 + \cdots + Y_n)$, then the module of the vector *Y* will be $|Y| = \sqrt{(Y_1 + Y_2 + \cdots + Y_n)^2} = Y_1 + Y_2 + \cdots + Y_n$; if each component of the end product will be a coordinate of the vector *Y* of equal size $Y_i = Y_{i+1} = \frac{Y}{n}, i = 1,2, \ldots, (n-1)$, then the length of the vector will be:

$$|Y| = \sqrt{\left(\frac{Y}{n}\right)^2 + \left(\frac{Y}{n}\right)^2 + \cdots + \left(\frac{Y}{n}\right)^2} = \frac{Y}{\sqrt{n}} = \frac{Y_1+Y_2+\cdots+Y_n}{\sqrt{n}}$$

The end product structure is more diverse, with no concentration, i.e. the volume for each product will be $\frac{Y}{\sqrt{n}} = \frac{Y_1+Y_2+\cdots+Y_n}{\sqrt{n}}$ (the average number).

The diversification of food products will be at the limit when $\frac{Y}{n} = 1$,of the module $|Y| = \sqrt{1^2 + 1^2 + \cdots + 1^2} = \sqrt{n}$. So, one of the possible criteria that would allow evaluating the diversification level is the module of the vector of food products. The aggregation of the end product vector *Y* can be made through the aggregation matrix.

$$A = \begin{array}{c} \\ n_1 \\ \\ n_2 \\ \\ \cdots \\ \\ n_k \\ \end{array} \overset{\longleftarrow k \longrightarrow}{\begin{pmatrix} 1 & 0 & \ldots & 0 \\ 1 & 0 & \ldots & 0 \\ \vdots & \vdots & \cdots & . \\ 1 & 0 & \cdots & 0 \\ 0 & 1 & \ldots & 0 \\ 0 & 1 & \ldots & 0 \\ \vdots & \vdots & \cdots & . \\ 0 & 1 & \ldots & 0 \\ \cdots & \cdots & \cdots & \cdots \\ 0 & 0 & \ldots & 1 \\ 0 & 0 & \ldots & 1 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & 1 \end{pmatrix}}$$

where:

n_1; n_2; …; n_k – the number of end products included in group 1; 2; … k; $n_1 + n_2 + \ldots + n_k = n$.

The end product *Y* with *n* components, having been aggregated will be expressed by the vector $Y_{agr}^{(k)}$ with k components $k < n; Y_{agr}^{(k)} = Y \times A$.

The aggregation level can be arbitrarily determined depending on the analysis, highlighting the main share of new food products in the end product structure.

The diversification of food products can be quantified by the coefficient [4].

$$C_{|Y|} = \frac{modulul\ curent - modulul\ minim}{modulul\ maxim - modulul\ minim}$$

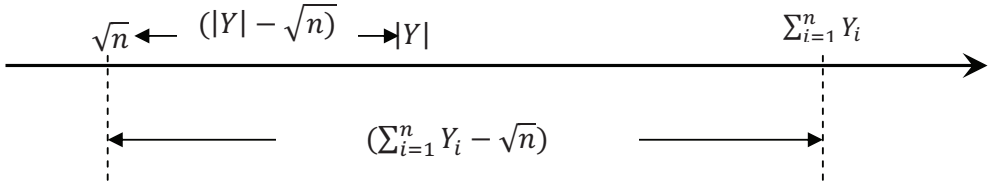

Fig. 1. Diversification degree of the end product
Source: Elaborated by authors

The potential level for diversification:

$$C_{|Y|}^{\wedge} = 1 - \frac{|Y| - \sqrt{n}}{\sum_{i=1}^{n} Y_i - \sqrt{n}} = \frac{\sum_{i=1}^{n} Y_i - |Y|}{\sum_{i=1}^{n} Y_i - \sqrt{n}}$$

The end product vector $Y = Y_1 + Y_2 + \cdots + Y_i + \cdots + Y_n$;

$$\frac{Y_1}{Y} + \frac{Y_2}{Y} + \cdots + \frac{Y_i}{Y} + \cdots + \frac{Y_n}{Y} = 1 \text{ or}$$

$$P_1 + P_2 + \cdots + P_i + \cdots + P_n = 1;$$

The module of the vector in the share of the end product:

$$|P| = \sqrt{P_1^2 + P_2^2 + \cdots + P_n^2}$$

The range of possible values of *p* shares can be deduced:

From fig. 1. we get $|Y| < \sum_{i=1}^{n} Y_i$,

$$\sqrt{Y_1^2 + Y_2^2 + \cdots + Y_i^2 + \cdots + Y_n^2} < \sum_{i=1}^{n} Y_i;\ \sqrt{\frac{Y_1^2}{Y^2} + \frac{Y_2^2}{Y^2} + \cdots + \frac{Y_i^2}{Y^2} + \frac{Y_n^2}{Y^2}} < \frac{\sum_{i=1}^{n} Y_i}{Y} = 1$$

The length of the vector *P* is minimal when its coordinates are equal $P_i = \frac{1}{n},\ i = 1, 2, \ldots, n$.

So,

$$\sqrt{\left(\frac{1}{n}\right)^2 + \left(\frac{1}{n}\right)^2 + \cdots + \left(\frac{1}{n}\right)^2} < |P| < 1$$

The diversification of food products can be achieved at the expense of the quantitative factor at the expense of a new product.

CONCLUSIONS

Taking into consideration the development of Moldova's agricultural sector and in order to increase the competitiveness of grain legumes, as well as to export them, one should:

1. promote the products from grain legumes for the export and cover existing market niches in specific areas by identifying new export markets as the Arab ones and to strengthen existing markets;
2. to implement the laws developed in the agricultural sector to strengthen the control system with the use of additional monitoring measures of inspection bodies by the competent authority to increase the quality of products designed for export;
3. to diversify and create a system to produce, process and sell organic products designed to meet the needs of both national and international markets;
4. to promote the export of grain legumes and cover existing market niches in Arab countries, especially unoccupied ones, by developing research studies of the traditionally consumed products;
5. to organize large-scale production of grain legumes in Moldova in exchange for the import of oil resources by the partners from Arab countries. Diversification problems can contribute to the improvement of management methods and economy at the level of a region, district or branch.
6. the diversification of the end product structure is one of the strategic issues of the country with commercial partnerships and different economic policies. Moldova can ensure financial stability only through diversification, thus, it will be able to withstand "attacks" from foreign economic partners, to value the potential of rural production.

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