

## HIGHLY MARGINAL GOODS AS SOURCE OF EXPORT EFFICIENCY RISE IN AGRARIAN SECTOR

William H. Meyers<sup>3</sup>, \*Natalia Karasova<sup>2</sup>, Olga Yatsenko<sup>3</sup>

<sup>1</sup> *PhD. Emeritus Prof. University of Missouri; Iowa State University; School of Economics, Management and Statistics; University of Bologna. USA, Columbia, Tel. +1573356024. E-mail meyersw@missouri.edu*

<sup>2</sup> *Prof. Dr. Kyiv National University of Culture and Arts. Yevhena Konovaltsa str. 36. 03680, Kyiv, Ukraine, Tel. +380674091203. E-mail karasyova.natasha@gmail.com*

<sup>3</sup> *Prof. Dr. Kyiv National Economic University Named After Vadym Hetman. Peremogy avn. 54/1. 03680, Kyiv, Ukraine. Tel. +380679529916. E-mail yacenkoolgakneu@gmail.com*

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Having high export potential, Ukrainian agrarian sector continues to be in the agricultural commodity market periphery. One of the key problems is low export efficiency determined by raw materials domination in the structure. The study aim was to ascertain a reorientation possibility of export commodity structure in order to reduce the raw materials part and increase the highly marginal goods part. The methodology consisted in studying the character of reciprocal influence comparison of different commodity groups volumes of agricultural produce using Verhulst's function. As a result, parameters of optimal goods correlation were designed, and a number of highly marginal goods and conceptual basis able to improve export efficiency were established.

*Key words: export, agrarian sector, highly marginal goods, raw materials, export commodity structure.*

*JEL Codes: C23, F15, Q17.*

### 1. Introduction

Over the past ten years agrarian sector of Ukraine has been showing stable increase of production volume and positive foreign-trade amount of trade which lets us talk about its high export potential. However, despite positive dynamics agricultural food export is still concentrated on a narrow product segment and the branch specializing in raw materials doesn't use dynamic factors of competitive fight for trade areas. Today's major problem is that 75% of currency proceeds falls on only seven items out of 170 items of export goods. Thus, nonoptimal commodity structure determines low export efficiency of agrarian sector.

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*\* Corresponding Author*

Commodity structure is the main indicator of specialization on international markets and predominance of high-technology goods with considerable extra cost provides high efficiency of both export and the branch itself. While revealing development reserves of the branch export potential, the following question becomes urgent: how quality is the agrarian sector export structure and how should it be changed to reach highest possible effect from using existing comparative advantages in international trade of agrarian items?

High technology export influence on economic indicators of developing countries using non-parametric models was studied by Basu and Das (2011). Athanassoglou, Backinezos и Georgiou (2010) worked on the export efficiency problem interconnected with commodity composition and competition of Greece on world's markets. Suresh and Mathur (2016) studied the perspectives of Indian agricultural export development at the expense of its structure differentiation. The problem of competition increase of Mexican agricultural produce on international markets was studied by Málaga and Williams (2006). Funke and Ruhwedel (2001) examined ten countries of Eastern Asia concerning increase of commodity export structure influence on economic indicators of foreign trade. Export volumes increase possibilities and its structure change concerning goods safety in the world were studied by Paice and Greenwood (2012), Hanrahan (2013) and others.

Development factors of agrarian sector export potential in Ukraine as well as the ones of foreign trade with agrarian production goods were examined by such scientists as Bestuzheva (2015), Mohylnyi (2015), Demchak (2016) and others. Competition advantages of Ukrainian agricultural goods were studied, volumes and export structure were analyzed, perspective markets and potential possibilities of their gain were studied within this context. However, reserves of export efficiency increase, particularly at the expense of its structure quality improvement are still not fully disclosed. Thus, **the aim** of the article is to ascertain diversification extent and reorientation possibility of export commodity structure in order to reduce raw materials part and increase the highly marginal commodity part on the basis of reciprocal influence comparison of commodity groups volumes of agricultural produce using Verhulst's function.

## **2. Methodology of the study**

In order to disclose the problem in the piece of work, a method of mathematical modeling and an economic-mathematical model of growth dynamics of agrarian commodity export volumes were used. Indicators of export volumes of agrarian goods from Ukraine in the way of commodity items over the past ten years became the empiric base of the study. International bases of statistics data *Food and Agriculture Organization of The United Nations FAOSTAT* (2018), *United Nations Conference on Trade and Development UNCTADSTAT* (2018) as well as official data of the State fiscal service of Ukraine (2018) served as informational sources. Theoretic-methodological approach is based on models which describe "natural growth" pro-

cesses taking into consideration satiation mechanism. Mathematical model is presented as second-order quadric nonlinear differential equation from which Verhulst's logistic equation derives (Verhulst, 1845; Weisstein, 2018). The object of modeling is agrarian commodity export volumes in groups of goods and the process of their change in time ( $t$ ) depending on proportional correlation in its raw materials and highly marginal produce volume structure. In this model highly marginal goods refer to meat, dairy, eggs, honey, vegetables, fruit, nuts, plants, fats and oils. Raw materials group consists of crops and flour, oil-bearing crop seeds and others. Let's designate the export volume growth tempo as differentials of respective functions:

$$\frac{dx(t)}{dt}; \quad \frac{dy(t)}{dt}; \quad \frac{dz(t)}{dt}$$

where  $x(t)$  – raw materials export volume;  $y(t)$  – highly marginal goods export volume;  $z(t)$  – general export volume of agrarian goods.

So the general model of economic dynamics of the object can be presented as a system of differential equations:

$$\frac{dx(t)}{dt} = \alpha x(t) \left( 1 - \frac{x(t)}{x_{\max}} \right) \pm \gamma y(t) x(t) \quad (1)$$

$$\frac{dy(t)}{dt} = \beta y(t) \left( 1 - \frac{y(t)}{y_{\max}} \right) \pm \delta x(t) y(t) \quad (2)$$

$$\frac{dz(t)}{dt} = c_1 x(t) + c_2 y(t) \quad (3)$$

where (1) and (2) are first-order non-linear differential equations with a glance of processes of satiation and reciprocal influence and as a result export growth speed of raw materials and highly marginal goods reaches its maximum value and stabilizes; (3) is a first-order lineal differential equation which describes growth dynamics of general agrarian goods export volumes;  $C_1$  и  $C_2$  are weighed coefficients which express correlation between volumes of raw materials and highly marginal commodity groups; model parameters  $\alpha, \beta, \delta, \gamma$  are standardized quantities in range values  $[0,1]$  which were obtained by experimental way as a result of mathematical-statistics analysis of the informational empirical base. The calculations were done with the help of tools of modern application package Mathcad, Excel, Statistica.

### 3. Results

Importance of agriculture to Ukrainian economy becomes more visible in the context of foreign trade. Over 2010–2017, share of agricultural products in total export increased – from 21% in 2010 to 44% in 2017, while share of agricultural products in total imports fluctuated around 10%. Agricultural exports have been the largest export category since 2013. In 2017, its share was almost 2x larger than that of the 2nd largest export category (ferrous and nonferrous metals) (Agricultural..., 2018) However, its structure where raw materials dominate, determines dependence of foreign trade potential from domestic market condition of importing countries. Particularly, Herfindahl index calculated on the basis of statistics data from 2016 is equal to 0.98 which indicates a high level of concentration and accordingly a low degree of goods diversification of export flows in agrarian sector. The export nucleus among agrarian goods is sunflower oil, corn, wheat, press cakes, barley and soy beans (with 3-digit and 4-digit codes from group 1–24 (Harmonized Commodity Description and Coding Systems (HS))). The fraction of vegetables, meat and meat products, eggs, fruit, beans and others appears insignificant in export commodity structure of agrarian sector (Fig. 1).

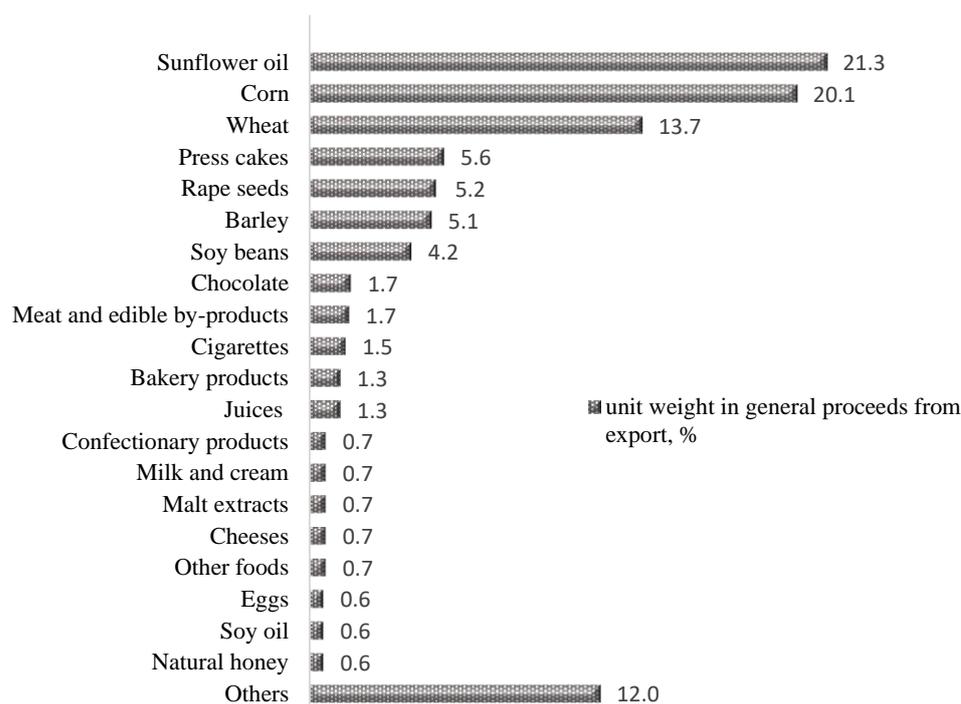


Fig. 1. Export structure of agrarian goods according to money proceeds volumes, 2016

Source: State fiscal service of Ukraine (2018)

At the same time leading countries in production and export of agrarian produce which include all countries of Western Europe, Canada, the USA, Israel, New

Zealand, Australia, Japan, Taiwan, South Korea and many others show the highest indices of production efficiency in the sector. Agricultural produce export makes from \$1,000 to \$5,000 per head. Export structure of agrarian produce is differential enough and majority of countries have stable advantage due to their commodity groups in international trade. Such goods include meat and dairy products, eggs, honey, vegetables, fruit, nuts, plants, fats and oils.

In Ukraine agricultural goods export makes about \$345,000 per head and all competitive advantages are determined by natural factors (climate conditions, using cheap work force, etc.). Because of not being able to compete on international markets at the expense of dynamic components, there is a lost benefit from potential trade of highly marginal goods with considerable extra cost and general export efficiency in the agrarian sector decreases. Thus, it is possible to reach more effective indices in foreign trade by modeling and improving the structure of export flows. The results of modeling of export volume dynamics of agrarian goods, taking into consideration interaction of raw materials and highly marginal groups for basic types of interaction which are typical for economic systems elements such as grab, competition and symbiosis are shown below (Fig. 2–4). The model parameters are chosen to increase export volume growth tempo of highly marginal groups of goods ( $\beta > \alpha$ ,  $\gamma \approx \delta$ ).

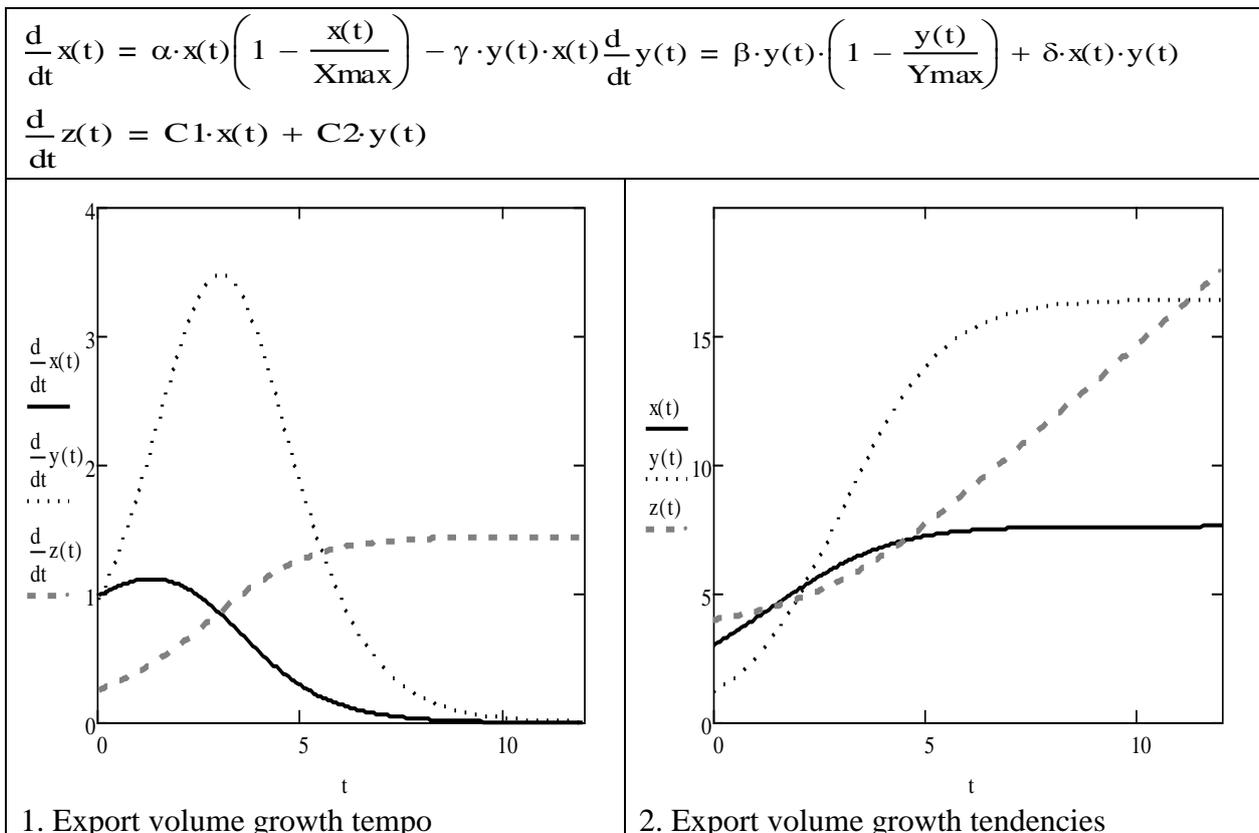


Fig. 2. Interaction model “predator-victim”

Let’s concede that in model "predator-victim" (Fig. 2) a group of highly marginal goods (“predator”) suppresses raw materials export fraction (“victim”). As a

result, raw materials export volume  $x(t)$  firstly grows (due to previous years tendencies) only on the initial stage and later it plummets and growth stops as a result of growth tempo  $\frac{dx(t)}{dt}$ . A tendency of volume increase is typical for produce with high extra cost. General export growth dynamics  $z(t)$  are determined by behavior of respective model components: raw materials export  $x(t)$  and goods with high extra cost  $y(t)$ .

In the model “competition” (Fig. 3) one group of export interferes with the other one. Export volume of highly marginal produce  $y(t)$  continues to grow as in the previous model “predator-victim”, however, the decrease of growth tempo  $\frac{dy(t)}{dt}$  slows down this process and the function  $y(t)$  gets to the specified satiation level  $Y_{max}$ . Raw materials growth dynamics  $x(t)$  are of negative type which negatively influences general agrarian goods export.

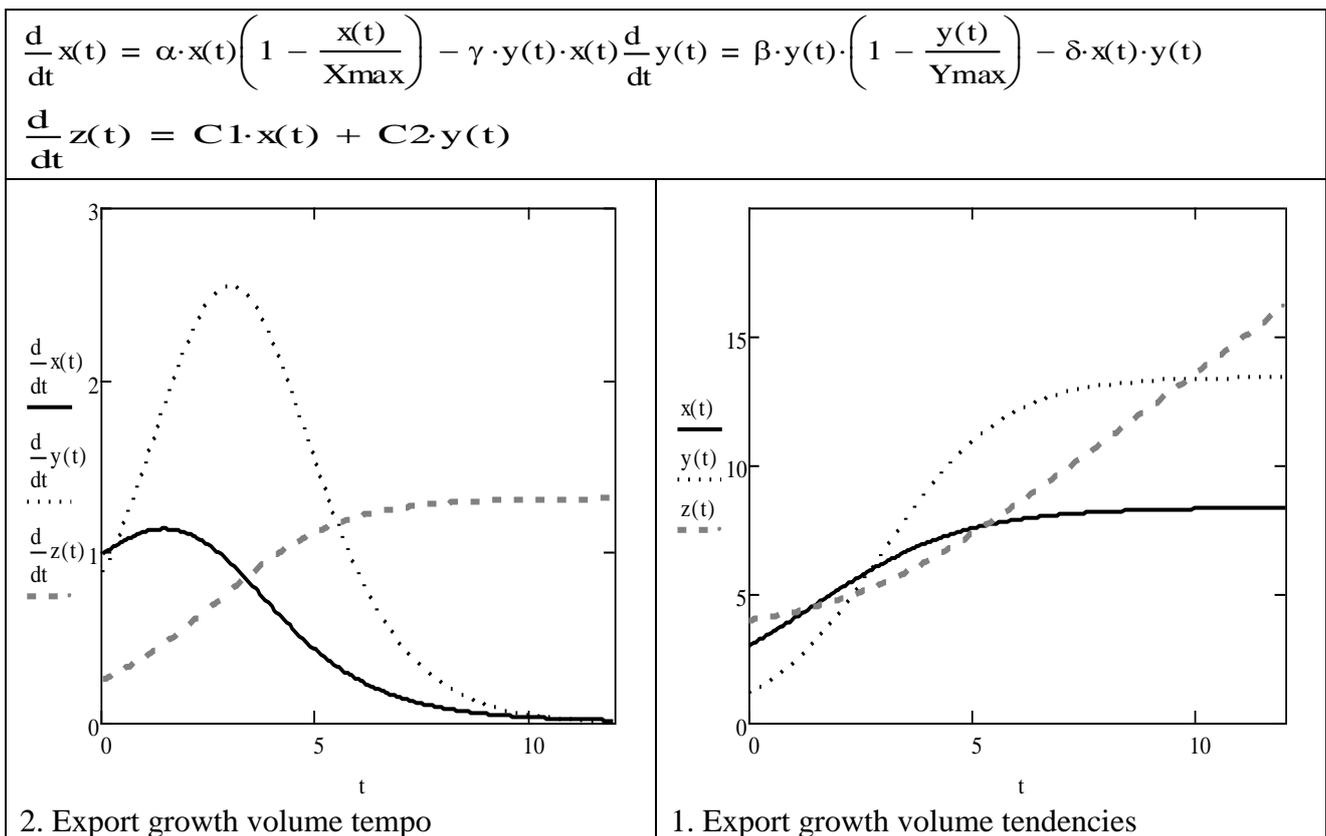


Fig. 3. Interaction model “Competition”

The model “symbiosis” (Fig. 4) where the development of raw materials export accelerates the dynamics of highly marginal goods export, and the export growth speed of goods with high extra cost does not interfere with the raw materials ones, has the best results. This variant is featured with maximum speed which leads to fast

growth of export volumes of both groups, and consequently to considerable growth of general export  $z(t)$ .

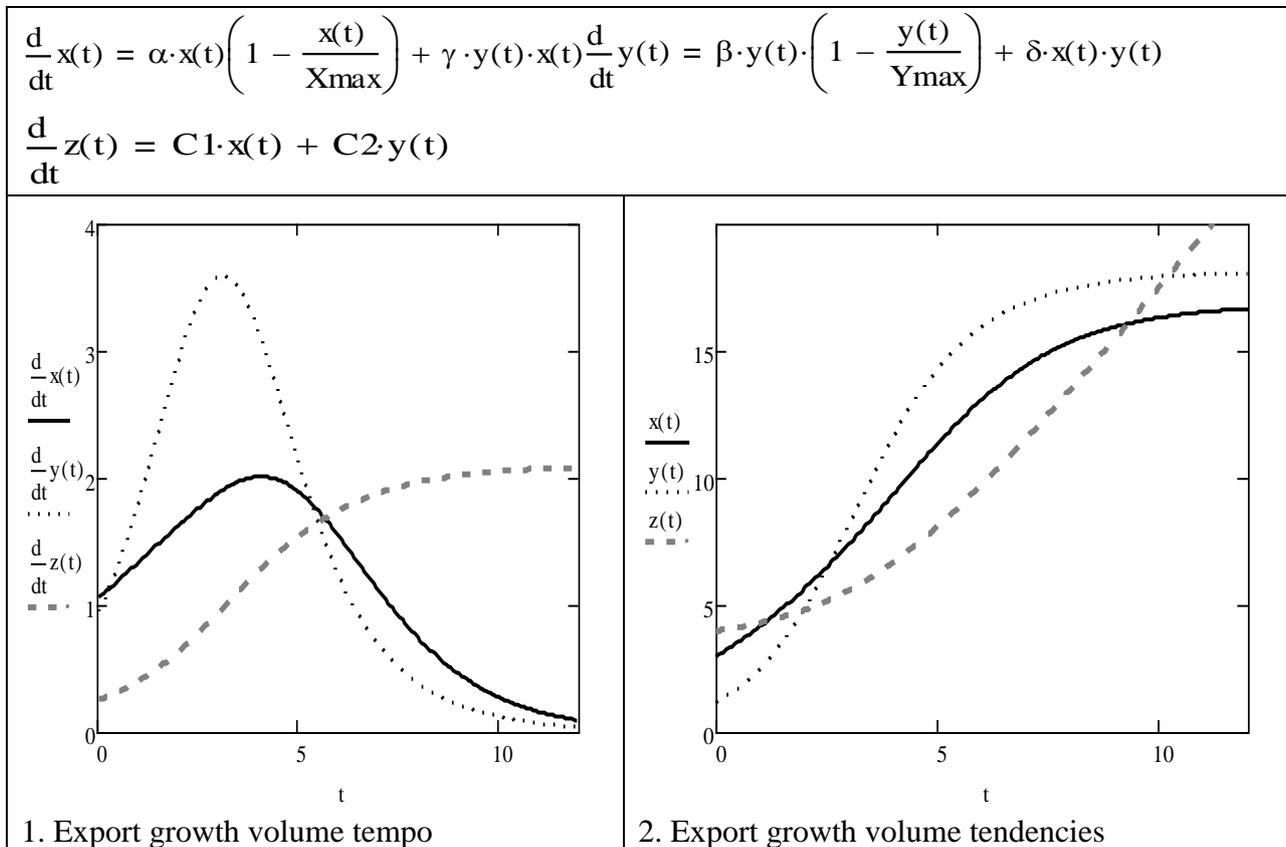


Fig. 4. Interaction model “Symbiosis”

It's important to mention that calculation of a universal correlation between raw materials and highly marginal goods which will secure maximum export efficiency and optimal economical effect for national economy is nearly impossible. In either case, one of the basic determinants of export-oriented production is factor conditions, and land resource takes the first place among them. Since different countries have different quantities of this resource, competitive advantages on international markets are formed differently. Thus, there's a common situation when small countries with limited land resource, such as Denmark, Estonia, France are specialized in export of agrarian goods which don't require a lot of land for being produced and produce such as meat, dairy, eggs and cheeses take about 50% in export structure. And vice versa, in Ukraine 32.5 ha of quality arable land is taken by almost 40% of grain crops in export structure, two of them – wheat and corn – are sensitive raw material goods on world's markets. Moreover, over the last few years there's a strong upward pressure for both production volumes and agrarian goods export in the country. On the other hand, export efficiency which can be measured through valuable

index per capita is \$3,584 in Denmark, \$1,017 in Estonia, \$930 in France and \$376 in Ukraine (Statistical, 2018; Trade Map, 2016).

Table 1 shows three different models of interaction dynamics of raw materials and highly marginal goods export as well as conceptual conditions of these models implementation.

Table 1. Models of reciprocal influence of raw materials and highly marginal goods export

Essence of reciprocal influence	Implementation conditions
Model 1. Predator-victim	
The dynamics of raw materials export fraction (“predator”) suppresses development of highly marginal goods export (“victim”)	Overconcentration of production and accent on monocropping; lobbying of big capital interests only; public interests ignoring by a regulator
Model 2. Competition	
One of the export groups has negative influence on the other one’s dynamics even though there’s competitiveness relation between them	Lack of agreement of state policy with business groups’ interests; fragmentariness of state support; political and macroeconomical conditions instability
Model 3. Symbiosis	
Development of raw materials export accelerates dynamics of highly marginal goods export and vice versa	Well-grounded export-oriented strategy of the branch within conception of stable development; stimulation of small and middle agrarian business; improvement of market and transportation infrastructure; informational and consulting assistance; implementation of stable mechanisms of financial support

Thus, the best scenario of export-oriented activity is an increase of highly marginal goods part without a decrease of crops and other raw materials export volumes. Export diversification and number increase of types and descriptions of goods create conditions for a practical maneuver and widen opportunities for economy to overcome negative influence by unfavorable economic conjuncture. And vice versa, a high level of concentration determines dependence of foreign trade potential from domestic market condition of importing countries creating a threat for its efficient implementation.

#### 4. Conclusions

1. A high level of commodity concentration puts development efficiency of export-oriented activity of Ukrainian agrarian sector into a complete dependence from foreign market conditions. The export nucleus is only seven items which make 75% of foreign currency generation.

2. A promising model of increasing export efficiency of the agrarian sector is building-up a highly marginal goods part without cutting raw materials export vol-

ume which is possible at the expense of intensification and production growth and increase of milk and dairy, eggs, cattle beef, pork, vegetables, and fruit in the export structure. It can provide widening of market and create preconditions for efficiency increase of production systems on both micro- and macro-economical levels.

3. Conceptual conditions for implementation of the corresponding model are well-grounded export-oriented strategy of the branch within conception of stable development; stimulation of small and middle agrarian business; improvement of market and transportation infrastructure; informational and consulting assistance; implementation of stable mechanisms of financial support.

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## **AUKŠTOS MARŽOS PRODUKTAI KAIP EKSPORTO EFEKTYVUMO DIDINIMO ŠALTINIS AGRARINIAME SEKTORIJE**

**William H. Meyers<sup>1</sup>, Natalia Karasova<sup>2</sup>, Olga Yatsenko<sup>3</sup>**

<sup>1</sup> *PhD Prof. emeritas Missouri universitetas; Iowa valstijos universitetas; Ekonomikos, vadybos ir statistikos mokykla; Bologna universitetas. JAV, Kolumbia.*

*Tel. +1573356024. El. paštas meyersw@missouri.edu*

<sup>2</sup> *Prof. dr. Kyiv valstybinis meno ir kultūros universitetas. Yevhena Konovaltsa g. 36. 03680, Kyiv, Ukraina. Tel. +380674091203. El. paštas karasyova.natasha@gmail.com*

<sup>3</sup> *Prof. dr. Kyiv valstybinis Vadym Hetman vardo ekonomikos universitetas. Peremogy prs. 54/1. 03680, Kyiv, Ukraina. Tel. +380679529916. El. paštas yacenkoolgakneu@gmail.com*

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### **Santrauka**

Turėdamas didelį eksporto potencialą, agrarinis sektorius Ukrainoje ir toliau lieka pasaulio žemės ūkio maisto produktų rinkos periferijoje, todėl aktualu nustatyti šakos eksporto efektyvumo dydinimo šaltinius. Tyrimo tikslas – nustatyti prekių struktūros perorientavimo galimybę remiantis žemės ūkio produktų eksporto dinamikos analize. Tyrimo metodika rėmėsi Verhulsto diferenciacinės lygties taikymu, analizuojant abipusį poveikį žemės ūkio produkcijos prekių kiekio augimui. Gauti optimalūs prekių koreliacijos rodikliai, nustatyti ribiniai produktai ir eksporto augimą lemiantis conceptualusis veiksnys. Sumodeliuoti optimalaus produktų santykio eksporto struktūroje parametrai ir nustatyti aukštos maržos produktai, kurie galėtų pagerinti eksporto efektyvumą.

*Reikšminiai žodžiai: eksportas, žemės ūkio sektorius, aukštos maržos prekės, eksporto prekių struktūra.*

*JEL kodai: C23, F15, Q17.*