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ASSESSING DYNAMIC STABILITY OF ECONOMIC DEVELOPMENT OF GLOBAL FOOD MARKETS IN THE CONTEXT OF GLOBALIZATION

Abstract
The global food market is in constant transformation. Cyclical fluctuations and force majeure (financial crises, epidemics, military actions) affect the volumes of production, consumption, exports and imports of food products. Therefore, the study of the dynamic stability of the growth of world food markets is especially relevant.

The purpose of the study is to assess the dynamic stability of economic growth in the world food markets: cheese, butter and sugar.

The study used general scientific and special methods: dialectical and logical to summarize the scientific foundations for ensuring the sustainable development of world food markets; regression analysis – to determine the direction of market development; variational analysis – to determine the sustainability of market development.

The advantage of the approach proposed in the paper is the assessment of the direction of development by the regression coefficients and the amplitude of fluctuations by the average percentage of deviations from the trend, which allows a more correct interpretation of the results than when using only the coefficient of variation, which takes into account changes around the average value.

It is established that the world markets for cheese, butter and sugar from 2011 to 2020 are characterized by dynamically stable growth in production, consumption, exports and imports. However, the markets of individual countries have developed unevenly: cheese production is most attractive and less risky in the EU, Brazil and South Korea; butter production in the EU and India; sugar production – in the USA, India, Algeria. Forecast calculations confirm the likelihood of growth in these markets.

Keywords dynamic stability, economic growth, food market, cheese market, butter market, sugar market

JEL Classification C22, C62, L66, Q11, Q18

INTRODUCTION
Finding solutions to the problems of measuring the sustainable development of food markets is especially relevant due to significant differences in the environment of socio-economic systems in different countries. Countries develop their own approaches to measuring sustainable development at the national level. However, to conduct such research at the international level, it is necessary to find ways to compare these problems and explore possible solutions to them.

According to FAO (2021b) Food Outlook Report, much attention is paid to the risks associated with the rising cost of food imports against the background of sharp price spikes. This is done to study the challenges of measuring the sustainable development of the global food system in the context of the COVID-19 pandemic. There are expectations that the global food trade in the near future should remain resilient, even despite the projected preservation of high international
exchange prices for food products in uncertain supply and demand. The actual trade volumes in the
global food markets during the pandemic, contrary to predictions, set new records – trade in agricultural
products, especially the less perishable ones, fared better than world trade in general.

It was forecasted that the global volume of food imports in 2021 should have reached $1.72 trillion – 12%
higher than the record level of 2020 ($1.53 trillion). However, rising prices raise concerns that increased
food costs could further deteriorate food nutrition in vulnerable countries. In addition, the increased
share of food imports in total imports can be a harbinger of crisis in some sectors. In low-income coun-
tries and countries with food deficits, food import costs are likely to rise by nearly 20% – five times faster
than in the least developed countries overall. Countries whose export revenues suffered greatly during
the pandemic may be particularly vulnerable (FAO, 2021a).

Sustainable development is considered a priority goal of Ukraine's national policy. However, the frame-
work of indicators for its measurement is still being approbated. Several methodical approaches to mea-
suring individual indicators already exist, but there are no solutions for measuring the sustainable de-
velopment of food markets among them (UNECE, 2013).

1. LITERATURE REVIEW

Sustainable development is defined as a type of “de-
velopment that meets the needs of the present with-
out compromising the ability of future generations
to meet their own needs” (United Nations, 1987, p.
37). In addition, it is viewed as a type of country and regional development when economic growth,
material production, and consumption, as well as other activities, occur within limits determined by
the ability of ecosystems to recover, absorb pollu-
tion and maintain livelihoods of present and future
generations (Marushevskyi & Nyzhnyk, 2017).

The formation of the essence of sustainable develop-
ment has an interdisciplinary basis. Thanks to
this, several concepts and stages of its evolution
are distinguished, forming a theoretical mod-
el based on the criteria of ethics, justice, natu-
ral capital, location, and global political order
(Drahomyretska, 2019; Bobrovsk, 2021). Based
on the basic concept of sustainable development
as an equilibrium and stable state of the habitat of humankind paired with economic growth, the
development of scientific thought has been re-
flected in experimental economics, individualistic
ethics, concept of social justice, and other theories
(Kasych & Yakovenko, 2019).

Scientific literature considers a multitude of fac-
tors influencing the behavior of consumers in dif-
ferent conditions of food systems. The problem
of ensuring the sustainability of food systems
has been discovered. It is associated with the in-
consistency between the sustainable development
goals (Naylor et al., 2007; Waldron et al., 2017) – as
increasing food production to end hunger is con-
trary to other objectives, in particular, to ensure
“clean water and sanitation” (Goal 6), “responsible
consumption and production” (Goal 12), and to
combat “climate change” (Goal 13). The main risks
and problems of sustainable food security are usu-
ally associated with food availability, price insta-
bility, purchasing power of the population, quality
and environmental friendliness of food products.
Studies of these relationships and the joint action
of various factors are set out (Nejati et al., 2011;
Ariffin et al., 2019).

The inconsistency between the sustainable de-
velopment goals and food security has generat-
ed a need to strengthen the effectiveness of food
policies in the EU. Particularly, it is vital to con-
sider the migration of the population caused by
problems of uneven access to food products, and
ensure the quality and safety of food in the EU
countries, limited by internal resources (including
land suitable for organic production in individual
countries). Moreover, increasing the efficiency of
state financing of R&D for the agri-food complex
and deregulation of technological development,
usually applied to reduce possible risks, is crucial
(Petrunenko et al., 2021).

In recent years, several major global driving forces
have disrupted the global sustainable development
efforts toward eradicating hunger and malnutrition by 2030. The problems have been exacerbated by the COVID-19 pandemic and related containment measures. As a result, millions of people worldwide suffer from food shortages and various forms of malnutrition because they cannot afford healthy eating. Such changes in food security and nutrition were caused by factors, the frequency and intensity of which are constantly increasing. These include conflicts, weather variability, and extreme climate events, slowing and declining economic growth exacerbated by the underlying causes of poverty and an overly high and persistent level of inequality (FAO, 2021b).

In the light of the aforementioned, the state of food security in the context of SDGs remains a noticeable concern. It has four aspects: availability, accessibility, use, and stability. Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for active and healthy life (FAO, 1996). Conversely, obstacles to providing any of these elements can threaten food security at all levels, from individual to global (Gunaratne et al., 2021).

The development of global food markets during the first two decades of the 21st century has generally improved. However, the growth rate began to decline in the last few years. The main driver of this dangerous trend is the heavy burden of climate change and forcible conflict in areas already deprived of food security. In addition, the recent COVID-19 crisis has reinforced this trajectory (Queiroz et al., 2021). The complexity of ensuring food security to achieve global climate change goals and sustainable development goals calls for a radical modernization of the global food system (WFP, n.d.).

At the same time, along with the problem of ensuring sustainable development, the question of food sovereignty arises. Namely, the right of people to healthy and nationally acceptable food produced by environmentally safe and stable methods and their right to determine their own food systems is vital. Food sovereignty at the heart of food systems and policies sees the interests of food producers, distributors, and consumers, not the market interests of corporations. It protects people's interests, including those of the next generation. It also ensures that the rights to use and dispose of “land, territory, water, biodiversity will remain in the hands of those who produce food products” (Declaration of Nyeleni, 2007, p. 1). Food sovereignty is based on six approaches (pillars): activities in the natural environment; focus on providing food to the population; responsibility of food suppliers; localization of food systems; ensuring local control and the development of food sovereignty science and practice to ensure sustainable development (Declaration of Nyeleni, 2007; European Coordination Via Campesina, 2018).

Quantitative and qualitative assessment of the complex processes associated with the implementation of sustainable development requires a system of indicators that will adequately characterize the three main components of sustainable development. Numerous international and domestic scientists are working on this problem. However, an unambiguous position on forming an optimal measurement system has not yet been achieved.

Thus, the Institute for Applied Systems Analysis of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute” assesses the level of sustainable development using the Isd index. It is calculated as the sum of indices for three dimensions: economic (Iecd), environmental (Ied) and social (Isd) with appropriate weightings. Each of these indices is calculated using internationally used indices and indicators. All indicators are brought to a normalized form so that their changes, as well as changes in the indices themselves, are in the range from 0 to 1. In this case, the worst values of these indicators correspond to numerical values close to 0, and the best ones bring these values closer to 1. This rationing calculates each of the indices – Iecd, Ied, Isv, and Isd – in the form of an average amount of its components with the corresponding weightings (Zghurovskyi, 2006).

The complexity of sustainable development processes, their dependence on a multitude of factors, and the difficulties of objective assessment bring this issue to the level of a rather complex scientific and methodological problem, especially from the point of view of forming a holistic methodology (Kasych & Marek, 2018). In economic research, the choice of a methodological approach usually
depends on quantitative characteristics. In addition, it determines the algorithm for analyzing the sustainability of the development of economic systems and subjects. In particular, indicators of the stability of dynamic economic growth constitute the orienting economic indicators. This kind of measurement allows assuming in what direction or what dynamic trend in the development of the studied economic processes should be expected (Iudina, 2020).

Today, monitoring and evaluating dynamic stability of economic systems is a prerequisite for controlling the influence of objective economic factors operating at the global level that the population faces in everyday life. Moreover, while the need for transformational changes in the global food system is already universally recognized, how they will occur in vulnerable contexts has not been studied enough.

These problems are of particular relevance due to the importance of achieving global sustainable development goals, particularly regarding food security, which necessitates improving the existing methodology for assessing the dynamic stability of economic growth of food systems.

In theoretical and methodological terms, the issue of choosing correct models and methods for assessing the stability of socio-economic systems in the context of the dynamics of their development is especially relevant.

Any system influenced by externalities and internalities changes its state over time. A dynamic system can be defined as a set of interacting components. Here the processes that occur are determined by the initial states of these components, the relationships between them, and the influences added to the system.

Economy can be characterized by constant fluctuations in the volume of production, trade in goods, prices – all around the trends set by the progressive movement of the economy, the growth of real output, that is, economic growth, which can be considered as a long-term aspect of the dynamics of aggregate supply. Among the most commonly used and substantiated models for economic growth is the Solow model. It identifies and explores the reasons behind temporary, constant, and stable economic growth, and emphasizes that output can change over time only with changes in production factors.

Stability is the ability of the system to return to an equilibrium state if it is withdrawn from it. In this case, the state of equilibrium is stable. Another option corresponds to the instability of the state and system. The concept of “dynamic stability” determines the property to slightly deviate from the given trajectory of the system under minor perturbation influences of the external environment. Such a justification for the “dynamic stability of economic growth” does not contradict, but reveals an additional aspect of the “sustainable development” category, complements and specifies the system’s state.

2. AIM AND HYPOTHESES

The aim of the study is to assess the dynamic stability of the economic growth of world food markets using the example of cheese, butter, and sugar markets. Therefore, the following hypotheses were developed:

H1: It may not be effective to assess the dynamic stability of the economic growth of food markets using only the coefficient of variation since it does not consider the direction of market development and makes it impossible to formulate reliable conclusions.

H2: An improved methodological approach that accounts for trend changes (their presence or absence) to assess the dynamic stability of economic growth of food markets would improve the quality of economic development assessments, in particular, in determining their directions, as well as the amplitude of fluctuations in the main indicators relative to the trends.

3. METHODOLOGY

A widely accepted indicator that characterizes the stability of time series in economic analysis is considered the coefficient of variation, calculated
as the ratio of the standard deviation to the average value of the indicator as a percentage. With its help, it is possible to estimate the amplitude of fluctuations relative to the average value of the indicator, which characterizes the level of uncertainty and riskiness of the activity. It is generally believed that if the value of the coefficient of variation is less than 10%, the amplitude of oscillations is insignificant, which indicates a low level of uncertainty and riskiness of activities. Next, if the coefficient ranges from 10% to 20%, the amplitude of fluctuations is average (the average level of uncertainty and riskiness of activities). Finally, if its value exceeds 20%, the amplitude of fluctuations is significant (high level of uncertainty and riskiness of activity).

The main disadvantage of this indicator is the inability to consider the development trends (growth or decline, which is extremely important in the studies of the sustainable development of food systems), since the average value used in calculating the coefficient of variation is constant. Therefore, if there is a statistically significant trend in the study, it is possible to misinterpret the deviations of the amplitude of fluctuations in the indicators studied, and the formulation of incorrect conclusions, in particular regarding the risks of exporting certain types of food to individual countries or the investment attractiveness of the production of certain products, etc.

The importance of taking into account the direction of the indicator’s trend in assessing the dynamic stability of the growth of sectoral food markets is based on the structure of the time series. Each series consists of a trend, a cyclical (per year), a seasonal (per month or quarter), and a random component. Cyclical and random components exhibit fluctuations relative to the trend or average and complement each other in the research framework.

The choice of an indicator for assessing the amplitude of fluctuations relative to the trend is also a problem. Since the average value of deviations from the trend is close to zero, the use of coefficient of variation would be incorrect. The results of experimental calculations proved the possibility of using the trend’s value of “average percentage of deviations”, which is calculated by:

\[
BB_{TP} = \frac{100}{n} \sum_{i=1}^{n} \frac{|X_i - X_{TP}|}{X_{TP}},
\]

where \(X_i\) – the actual value of the indicator, \(X_{TP}\) – the relevant trend value, \(n\) – the amount of time periods, years.

In economic and statistical analysis, the main indicators for assessing the dynamic stability of the growth of sectoral food markets are the volumes of production, consumption of food products, exports, and imports that characterize market demand and supply. The amplitude of fluctuations and the direction of growth of these indicators determine the stability of the system development.

Thus, for an objective assessment of the dynamic stability of growth and transformation of sectoral food markets in the global market, the study proposed an approach based on the direction of development and the amplitude of fluctuations. The direction of development is determined using regression coefficients by constructing a trend equation. And the amplitude of fluctuations is based on the average percentage of deviation from the trend and, in the absence of a trend, a coefficient of variation. At the same time, trend equations make it possible to build forecasts for the indicators studied.

If the regression coefficient obtained is positive and statistically significant (\(p < 0.05\)), the trend direction will increase. Next, if the regression coefficient is negative and statistically significant (\(p < 0.05\)), the trend direction will fall. And if the regression coefficient is statistically insignificant (\(p > 0.05\)), the trend direction is considered unchanged. Deviations in the amplitude of fluctuations are segregated into three levels: insignificant (less than 10%), medium (from 10% to 20%), and significant (more than 20%). The level of dynamic growth stability is determined based on the level of deviation of the fluctuations’ amplitude: a low amplitude corresponds to a high level of dynamic stability, a medium – to, obviously, medium, significant – to a low one.

The calculations result in 9 variants of indicators’ combinations, characterizing the dynamic stability of the food market: by the trend direction –
The algorithm for assessing the dynamic stability of sectoral food markets’ growth is shown in Figure 1. This approach can be applied to a similar assessment of economic, social, demographic, and other processes.

4. RESULTS AND DISCUSSION

The most dynamic sectors of the global food market with ever-increasing volumes of production and trade are now the market of dairy products (including hard cheese and butter) and sugar. For this study, these sectoral markets are taken as representative. The analysis is carried out based on the example of five regions of the world, the share of which in global production of the selected products constituted more than 50% (TOP-5).

Per the algorithm, at first, the paper applied the generally accepted approach based on the calculation of variation coefficients. The results of the calculations are presented in Tables A1-A3 (Appendix A).

Based on the values of the coefficients of variation for the dynamic set of indicators of the global cheese market (Table A1), it was found that the indicators of production and consumption volumes were relatively stable during 2011–2020. Significant fluctuations in production can be observed in Russia, and average – in Argentina. Average fluctuations in consumption show trends in Russia and Mexico. Fluctuations in global exports and imports have an average level of stability. Therefore, international trade operations in the cheese market are riskier than within individual countries.

According to the calculations presented in Table A2, it is possible to conclude the relative stability of global production growth and consumption of butter over the past 10 years. Average fluctuations in indicators can only be observed in India. Fluctuations in global exports of butter are relatively stable, while in the TOP-5 countries, the amplitude of fluctuations is too volatile (the coefficient of variation in the EU is 26.4%, in Argentina
Unstable dynamics of fluctuations is also characteristic for global imports of butter (coefficient of variation – 20.8%). That is, international trade operations in this market are distinguished by uncertainty and riskiness of activity.

The structure of the global sugar market is based on two types of raw materials – sugarcane and sugar beet. The main producers of sugarcane are Brazil, India, and China. The leading regions in sugar beet production are the EU and USA. The global sugar market is characterized by generally good sustainability of growth in production, consumption, exports, and imports (Table A3). At the same time, the TOP-5 countries demonstrate average deviations of the amplitude of fluctuations in production, exports, and imports. Significant deviations in the amplitude of fluctuations are inherent to India’s export and Indonesia’s import.

The next step is to compare the traditional and proposed approaches to assessing the dynamic stability of food markets’ growth: 1) by the coefficient of variation; 2) by the average percentage of deviations from the trend (if a trend is present), and by the coefficient of variation (in the absence of a trend). The results of calculations are provided in Tables 1-3.

Table 1. Comparison of the traditional and improved approaches to assessing dynamic stability of the growth of the global cheese market in 2011–2020

| Top-5 | Characteristics of market development | Traditional approach | Improved approach |
|-------|---------------------------------------|----------------------|-------------------|
|       |                                       |                      |                   |
|       | regression coefficient (level of significance p) | direction of market development | coefficient of variation, % | deviation of the fluctuation's amplitude, % | average percentage of deviations from the trend*/coefficient of variation, % | deviation of the fluctuation's amplitude, % | Dynamic stability, level |
| EU    | 146.6 (0.00) | increase | 4.6 | insignificant | 1.1 | insignificant | high |
| USA   | 145.9 (0.00) | increase | 8.2 | insignificant | 1.2 | insignificant | high |
| Russia| 67.3 (0.00)  | increase | 27.1 | significant** | 17.9 | medium | medium |
| Brazil| 8.6 (0.00)   | increase | 4.1 | insignificant | 3.1 | insignificant | high |
| Argentina| 11.8 (0.23) | no changes | 17.7 | medium | 17.7 | medium | medium |
| Global| 489.3 (0.00) | increase | 7.7 | insignificant | 1.6 | insignificant | high |

| EU    | 122.7 (0.00) | increase | 4.2 | insignificant | 1.5 | insignificant | high |
| USA   | 133.4 (0.00) | increase | 7.8 | insignificant | 2.2 | insignificant | high |
| Russia| 52.5 (0.00)  | increase | 16.7 | medium | 11.3 | medium | medium |
| Brazil| 8.3 (0.00)   | increase | 3.8 | insignificant | 2.8 | insignificant | high |
| Mexico| 27.2 (0.00)  | increase | 19.9 | medium | 10.6 | medium | medium |
| Global| 458.9 (0.00) | increase | 7.5 | insignificant | 1.5 | insignificant | high |

| EU    | 22.8 (0.00) | increase | 9.9 | insignificant | 7.5 | insignificant | high |
| USA   | 11.5 (0.01) | increase | 14.8 | medium | 14.5 | medium | medium |
| New Zealand| 8.0 (0.02) | increase | 10.6 | medium | 12.6 | medium | medium |
| Australia| -0.3 (0.71) | no changes | 4.5 | insignificant | 4.5 | insignificant | high |
| Argentina| 1.0 (0.30) | no changes | 14.9 | medium | 14.9 | medium | medium |
| Global| 65.5 (0.00) | increase | 11.0 | medium | 4.0 | insignificant | high |

| EU    | 22.8 (0.00) | increase | 9.9 | insignificant | 7.5 | insignificant | high |
| USA   | 11.5 (0.01) | increase | 14.8 | medium | 14.5 | medium | medium |
| New Zealand| 8.0 (0.02) | increase | 10.6 | medium | 12.6 | medium | medium |
| Australia| -0.3 (0.71) | no changes | 4.5 | insignificant | 4.5 | insignificant | high |
| Argentina| 1.0 (0.30) | no changes | 14.9 | medium | 14.9 | medium | medium |
| Global| 65.5 (0.00) | increase | 11.0 | medium | 4.0 | insignificant | high |

| Russia| -14.0 (0.10) | no changes | 25.7 | significant | 25.7 | significant | medium |
| Japan| 9.4 (0.00)   | increase | 11.4 | medium | 4.5 | insignificant | high |
| South Korea| 7.9 (0.00) | increase | 22.3 | significant | 7.0 | insignificant | high |
| USA   | 2.6 (0.20)   | no changes | 13.3 | medium | 13.3 | medium | medium |
| Mexico| 4.4 (0.00)   | increase | 14.6 | medium | 13.4 | medium | medium |
| Global| 38.9 (0.00) | increase | 10.6 | medium | 7.1 | insignificant | high |

Note: *Italics mark the value of the average percentage of deviations from the trend. **Bold denotes the difference between the amplitude of fluctuations calculated using the traditional and the improved approaches.
The assessment of the dynamic stability of the global cheese market growth carried out through the traditional approach (Table 1) indicates an overestimated amplitude of fluctuations in the development trend compared with the average percentage of deviations from the trend. Thus, it distorts the results of production, export, and import volumes in individual countries, as well as global indicators.

The use of an improved assessment approach for the global butter market made it possible to clarify the levels of deviations in the amplitude of fluctuations in the production and consumption of these products in India, as well as similar overestimated indicators of export and import volumes (Table 2).

With the help of the proposed methodical approach, the assessment of the fluctuations’ amplitude in sugar imports of Indonesia (reduced from significant to medium) and in Algeria (reduced from medium to insignificant) was clarified. Thus, under the growth trends and moderate fluctuations in import volumes, prospects for the sale of sugar in these countries increase.

Table 2. Comparison of the traditional and improved approaches to assessing dynamic stability of the growth of the global butter market in 2011−2020

| Characteristics of market development | Traditional approach | Improved approach |
|---------------------------------------|----------------------|-------------------|
| **regression coefficient**<br>**(level of significance p)** | direction of market development | coefficient of variation, % | deviation of the fluctuation’s amplitude, level | average percentage of deviations from the trend**/
| | | | | coefficient of variation, % |
| **Production volume** | | | | |
| India | 189.0 (0.00) | increase | 11.1 | medium** | 1.4 | insignificant | high |
| EU | 40.2 (0.00) | increase | 5.8 | insignificant | 3.7 | insignificant | high |
| USA | 12.3 (0.00) | increase | 5.4 | insignificant | 4.7 | insignificant | high |
| New Zealand | −0.04 (0.99) | no changes | 6.9 | insignificant | 6.9 | insignificant | high |
| Russia | 6.9 (0.00) | increase | 9.3 | insignificant | 6.6 | insignificant | high |
| Global | 276.3 (0.00) | increase | 8.5 | insignificant | 1.2 | insignificant | high |
| **Consumption volume** | | | | |
| India | 186.1 (0.00) | increase | 11.0 | medium | 1.2 | insignificant | high |
| EU | 22.6 (0.00) | increase | 3.9 | insignificant | 3.8 | insignificant | high |
| USA | 23.0 (0.00) | increase | 8.5 | insignificant | 3.7 | insignificant | high |
| Russia | 4.6 (0.03) | increase | 5.6 | insignificant | 6.6 | insignificant | high |
| Mexico | 5.9 (0.00) | increase | 8.4 | insignificant | 6.8 | insignificant | high |
| Global | 284.0 (0.00) | increase | 9.2 | insignificant | 0.8 | insignificant | high |
| **Exports volume** | | | | |
| New Zealand | −0.4 (0.93) | no changes | 7.4 | insignificant | 7.4 | insignificant | high |
| EU | 12.7 (0.00) | increase | 26.4 | significant | 20.9 | significant | low |
| USA | −5.1 (0.05) | decrease | 53.1 | significant | 63.3 | significant | low |
| Argentina | −1.0 (0.22) | no changes | 50.0 | significant | 50.0 | significant | low |
| India | 2.9 (0.03) | increase | 75.3 | significant | 95.2 | significant | low |
| Global | 16.3 (0.04) | increase | 8.7 | insignificant | 11.4 | medium | medium |
| **Imports volume** | | | | |
| Russia | −1.9 (0.40) | no changes | 16.7 | medium | 16.7 | medium | medium |
| USA | 7.1 (0.00) | increase | 57.4 | significant | 42.9 | significant | low |
| Australia | 3.0 (0.00) | increase | 32.1 | significant | 15.9 | medium | medium |
| Canada | 2.1 (0.00) | increase | 43.4 | significant | 39.3 | significant | low |
| Mexico | 1.1 (0.38) | no changes | 23.4 | significant | 23.4 | significant | low |
| Global | 23.3 (0.00) | increase | 20.8 | significant | 11.8 | medium | medium |

Note: *Italics mark the value of the average percentage of deviations from the trend. **Bold denotes the difference between the amplitude of fluctuations calculated using the traditional and the improved approaches.
A comparison between the traditional and improved approaches to assessing the dynamic stability of the global sugar market growth has confirmed earlier assumptions. Thus, the application of the variation factor is practical when the market direction remains unchanged, that is when there is no trend (growth or decline). However, when the direction of market development demonstrates growth, the amplitude of fluctuations may be overestimated, as happened in the dynamics of imports of Indonesia and Algeria (Table 3).

**Table 3. Comparison of the traditional and improved approaches to assessing dynamic sustainability of the growth of the global sugar market in 2011−2020**

| Top-5 | Characteristics of market development | Traditional approach | Improved approach |
|-------|---------------------------------------|----------------------|------------------|
|       |                                       |                      | Dynamic          |
|       |                                       |                      | stability, level |
|       | regression coefficient (level of      | deviation of the     | deviation of the |
|       | significance p)                        | fluctuation’s        | fluctuation’s    |
|       | direction of market development        | amplitude, level     | amplitude, level |
|       |                                       |                      | level            |
|       | coefficient of variation, %            | average percentage   | deviation of the |
|       |                                       | of deviations from   | fluctuation’s    |
|       |                                       | the trend**          | amplitude, level |
|       |                                       | coefficient of       | level            |
|       |                                       | variation, %          |                  |

| Production volume |
|-------------------|
| Brazil | –201.5 (0.67) | no changes   | 10.9 | medium | 10.9 | medium | medium |
| India  | 616.5 (0.16)  | no changes   | 13.2 | medium | 13.2 | medium | medium |
| EU     | –150.2 (0.46) | no changes   | 10.3 | medium | 10.3 | medium | medium |
| China  | –366.8 (0.07) | no changes   | 16.9 | medium | 16.9 | medium | medium |
| USA    | 33.6 (0.40)   | no changes   | 4.2  | insignificant | 4.2 | insignificant | high |
| Global | –485.4 (0.29) | no changes   | 2.3  | insignificant | 2.3 | insignificant | high |

| Consumption volume |
|-------------------|
| Brazil | –133.6 (0.00) | increase | 4.1  | insignificant | 2.5 | insignificant | high |
| India  | 305.1 (0.00)  | increase | 4.2  | insignificant | 3.9 | insignificant | high |
| EU     | –254.0 (0.03) | decrease | 6.5  | insignificant | 6.1 | insignificant | high |
| China  | 18.8 (0.88)   | no changes | 6.5  | insignificant | 6.5 | insignificant | high |
| USA    | 91.7 (0.00)   | increase | 2.9  | insignificant | 2.2 | insignificant | high |
| Brazil | –133.6 (0.00) | decrease | 4.1  | insignificant | 2.5 | insignificant | high |
| Global | 1090.4 (0.01) | increase | 2.5  | insignificant | 2.3 | insignificant | high |

| Exports volume |
|----------------|
| Brazil | –43.6 (0.93) | no changes | 15.7 | medium | 15.7 | medium | medium |
| Thailand | 1073.0 (0.56) | no changes | 18.9 | medium | 18.9 | medium | medium |
| India  | 361.0 (0.03)  | increase | 47.0 | significant | 63.7 | significant | low |
| Australia | 68.2 (0.07)  | no changes | 10.0 | medium | 10.0 | medium | medium |
| Guatemala | –5.5 (0.84)  | no changes | 11.5 | medium | 11.5 | medium | medium |
| Global  | 622.3 (0.20)  | no changes | 7.3  | insignificant | 7.3 | insignificant | high |

| Imports volume |
|----------------|
| Indonesia | 255.6 (0.00) | increase | 21.9 | significant** | 17.6 | medium | medium |
| China    | 20.0 (0.84)   | no changes | 17.2 | medium | 17.2 | medium | medium |
| USA      | –7.7 (0.84)   | no changes | 10.4 | medium | 10.4 | medium | medium |
| Bangladesh | 98.3 (0.00)  | increase | 16.3 | medium | 13.8 | medium | medium |
| Algeria  | 87.2 (0.00)   | increase | 13.9 | medium | 8.8  | insignificant | high |
| Global   | 539.6 (0.02)  | increase | 4.2  | insignificant | 5.0 | insignificant | high |

**Note:** *Italics mark the value of the average percentage of deviations from the trend. **Bold denotes the difference between the amplitude of fluctuations calculated using the traditional and the improved approaches.*
In particular, production and export indicators determine the competitive positions of countries and the prospects for investing in the relevant industries. Moreover, indicators of consumption and import characterize the prospects for the development of domestic production in order to maximize self-sufficiency. For example, the growth of imports indicates an increase in unmet demand for a particular food product and the prospects for investing in the development of their own production. Dynamic growth of these indicators usually leads to a high level of investment attractiveness. When the dynamics of these indicators remains unchanged for a long time, investment attractiveness corresponds to the average level, and with a dynamic decrease in the values of indicators – the level of investment attractiveness is low.

The level of dynamic stability of the indicators studied characterizes the level of riskiness of investment: a high level of dynamic stability corresponds to a low level; the average level of dynamic stability is an average level; the low level of dynamic stability is a high level of riskiness.

The assessment of investment attractiveness and riskiness of attracting investments in the world’s sectoral markets of cheese, butter, and sugar over the past 10 years in the TOP-5 countries in terms of production, consumption, export, and import are presented in Tables 4-6.

Based on Table 4, it is possible to draw general conclusions about the sufficiently high investment attractiveness of the global cheese market (in terms of production and consumption) and the low risks of investing in this industry. Only five countries on the list have an average or high level of investment attractiveness and riskiness in investing in foreign economic transactions (Russia, Argentina, Mexico, and the USA).

Table 4. Investment attractiveness and risks of investing in the global cheese market

| Top-5 | Characteristics of investment attractiveness | Characteristics of investment risks |
|-------|---------------------------------------------|-----------------------------------|
|       | direction of market development | investment attractiveness, level | dynamic stability, level | investment risk, level |
|       | Production                          |                                   |                       |                      |
| EU    | increase                           | high                             | high                  | low                  |
| USA   | increase                           | high                             | high                  | low                  |
| Russia| increase                           | high                             | medium                | medium               |
| Brazil| increase                           | high                             | high                  | low                  |
| Argentina| no changes | medium                       | medium                | medium               |
| Global| increase                           | high                             | high                  | low                  |
|       | Consumption                        |                                   |                       |                      |
| EU    | increase                           | high                             | high                  | low                  |
| USA   | increase                           | high                             | high                  | low                  |
| Russia| increase                           | high                             | medium                | medium               |
| Brazil| increase                           | high                             | high                  | low                  |
| Mexico| increase                           | high                             | medium                | medium               |
| Global| increase                           | high                             | high                  | low                  |
|       | Exports                            |                                   |                       |                      |
| EU    | increase                           | high                             | high                  | low                  |
| USA   | increase                           | high                             | medium                | medium               |
| New Zealand| increase | high                     | medium                | medium               |
| Australia| no changes | medium                    | high                  | low                  |
| Argentina| no changes | medium                    | medium                | medium               |
| Global| increase                           | high                             | high                  | low                  |
|       | Imports                            |                                   |                       |                      |
| Russia| no changes                         | medium                           | significant           | high                 |
| Japan | increase                           | high                             | high                  | low                  |
| South Korea| increase | high                    | high                  | low                  |
| USA   | no changes                         | medium                           | medium                | medium               |
| Mexico| increase                           | high                             | medium                | medium               |
| Global| increase                           | high                             | high                  | low                  |

Source: Authors’ elaboration.
### Table 5. Investment attractiveness and risks of investing in the global butter market

Source: Authors’ elaboration.

| Top-5 | Characteristics of investment attractiveness | Characteristics of investment risks |
|-------|---------------------------------------------|----------------------------------|
|       | direction of market development | investment attractiveness, level | dynamic stability, level | investment risk, level |
| Production | | | | |
| India | increase | high | high | low |
| EU | increase | high | high | low |
| USA | increase | high | high | low |
| New Zealand | no changes | medium | high | low |
| Russia | increase | high | high | low |
| Global | increase | high | high | low |
| Consumption | | | | |
| India | increase | high | high | low |
| EU | increase | high | high | low |
| USA | increase | high | high | low |
| Russia | increase | high | high | low |
| Mexico | increase | high | high | low |
| Global | increase | high | high | low |
| Exports | | | | |
| New Zealand | no changes | medium | high | low |
| EU | increase | high | low | high |
| USA | decrease | low | low | high |
| Argentina | no changes | medium | low | high |
| India | increase | high | low | high |
| Global | increase | high | medium | medium |
| Imports | | | | |
| Russia | no changes | medium | medium | medium |
| USA | increase | high | low | high |
| Australia | increase | high | medium | medium |
| Canada | increase | high | low | high |
| Mexico | no changes | medium | low | high |
| Global | increase | high | medium | medium |

### Table 6. Investment attractiveness and risks of investing in the global sugar market

Source: Authors’ elaboration.

| Top-5 | Characteristics of investment attractiveness | Characteristics of investment risks |
|-------|---------------------------------------------|----------------------------------|
|       | direction of market development | investment attractiveness, level | dynamic stability, level | investment risk, level |
| Production | | | | |
| Brazil | no changes | medium | medium | medium |
| India | no changes | medium | medium | medium |
| EU | no changes | medium | medium | medium |
| China | no changes | medium | medium | medium |
| USA | no changes | medium | high | low |
| Global | no changes | medium | high | low |
| Consumption | | | | |
| India | increase | high | high | low |
| EU | decrease | low | high | low |
| China | no changes | medium | high | low |
| USA | increase | high | high | low |
| Brazil | decrease | low | high | low |
| Global | increase | high | high | low |
A study of the global butter market found that this market is generally investment attractive, while foreign economic transactions (exports, imports) have an average level of riskiness of investing. The following regions of the world have high risks of investing in the export-import segment of the market: EU, USA, Argentina, India, Canada, and Mexico.

In terms of investment attractiveness and riskiness of investing, the most heterogeneous was the global sugar market. It has an average investment attractiveness in terms of production and exports and a high level in consumption and imports. The consumption segment has a risk level. At the same time, the level of investment attractiveness in this indicator in the EU and Brazil is low, as sugar consumption in these countries has decreased over the past 10 years.

**CONCLUSION**

The study, using experimental calculations, substantiated the possibility of improving the methodology for assessing the dynamic stability of the development of food markets in the trajectory of achieving global sustainable development goals. The application of the proposed approach makes it possible to correctly determine the directions of development and the level of deviation of the amplitude of fluctuations in the main market indicators, as well as to substantiate conclusions about the investment attractiveness and riskiness of investing in specific segments of the food market.

The calculations improve the prospects for foreign trade in cheese, butter, and sugar. At the same time, export and import operations with these products in foreign markets are more risky and unpredictable than trade in the domestic markets of countries. Global cheese and butter markets are much more investment-attractive than the sugar market. In particular, cheese production is particularly investment attractive and the least risky in the EU countries (by production, consumption, export), Brazil (by production and consumption), South Korea (by import volumes); butter production – in the EU countries and India (by production and consumption); sugar production – in the USA and India (by consumption), and Algeria (by import volumes). In Algeria, there is a high demand for sugar that has been unsatisfied for quite a long time. It requires further development of the domestic production base, which may be facilitated by introducing government incentive measures, including increasing the industry’s investment attractiveness for domestic and external investors.
The forecasts also confirm the probability of growth of these markets. Consumption and production of cheese and butter in the EU in 2025 against 2020 may increase by 8 and 14%, respectively (while maintaining previous trends), cheese exports by 7%. Next, in Brazil, there is a possibility of an increase in the consumption and production of cheese (approximately by 9%). Furthermore, South Korea should expect increased cheese imports (approximately by 24%). In India, there is a possible increase in the consumption and production of butter (approximately by 9 and 8%, respectively), as well as sugar consumption (by 5%). Finally, in the USA, there is a possibility to increase sugar consumption by 6%, and in Algeria – an increase in sugar imports (approximately by 21%).

Based on the assessment of dynamic stability and forecast calculations, for Ukrainian market operators, the prospects for exporting cheese to South Korea, butter to India, and sugar to Algeria are growing.

**AUTHOR CONTRIBUTIONS**

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## APPENDIX A

### Table A1. Coefficient of variation for the dynamic set of indicators of the global cheese market

Source: U. S. Department of Agriculture [2021].

| Top-5  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | Coefficient of variation, % |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------|
| **Production volume, thousand metric tons** |       |       |       |       |       |       |       |       |       |       |                             |
| EU     | 8981  | 9287  | 9368  | 9560  | 9740  | 9810  | 10050 | 10160 | 10210 | 10340 | 4.6                                        |
| USA    | 4806  | 4938  | 5036  | 5222  | 5367  | 5514  | 5733  | 5914  | 5959  | 6012  | 8.2                                        |
| Russia | 425   | 446   | 713   | 760   | 861   | 865   | 951   | 970   | 983   | 1035  | 27.1                                       |
| Brazil | 679   | 700   | 722   | 736   | 754   | 745   | 771   | 760   | 770   | 750   | 4.1                                        |
| Argentina | 339 | 330   | 556   | 564   | 548   | 515   | 514   | 444   | 523   | 488   | 17.7                                       |
| Share of the Top-5 in the global volume, % | 89.6  | 89.9  | 90.2  | 90.3  | 90.2  | 90.0  | 88.2  | 88.0  | 87.9  | 87.8  | –                                          |
| Global | 17007 | 17460 | 18186 | 18659 | 19150 | 19391 | 20428 | 20740 | 20981 | 21203 | 7.7                                        |
| **Consumption volume, thousand metric tons** |       |       |       |       |       |       |       |       |       |       |                             |
| EU     | 8374  | 8597  | 8656  | 8883  | 9087  | 9093  | 9297  | 9386  | 9394  | 9460  | 4.2                                        |
| USA    | 4716  | 4786  | 4839  | 4977  | 5149  | 5369  | 5494  | 5675  | 5751  | 5750  | 7.8                                        |
| Russia | 759   | 789   | 1140  | 1072  | 1052  | 1076  | 1141  | 1200  | 1231  | 1319  | 16.7                                       |
| Brazil | 715   | 724   | 750   | 754   | 773   | 785   | 799   | 785   | 795   | 777   | 3.8                                        |
| Mexico | 344   | 349   | 368   | 370   | 391   | 403   | 511   | 526   | 551   | 549   | 19.9                                       |
| Share of the Top-5 in the global volume, % | 89.7  | 89.9  | 89.4  | 89.4  | 89.5  | 89.6  | 87.4  | 87.7  | 87.2  | 87.3  | –                                          |
| Global | 16621 | 16959 | 17618 | 17958 | 18389 | 18669 | 19734 | 20030 | 20317 | 20459 | 7.5                                        |
| **Exports volume, thousand metric tons** |       |       |       |       |       |       |       |       |       |       |                             |
| EU     | 682   | 768   | 787   | 721   | 719   | 800   | 828   | 833   | 879   | 943   | 9.9                                        |
| USA    | 225   | 260   | 316   | 368   | 317   | 287   | 340   | 348   | 357   | 355   | 14.8                                       |
| New Zealand | 253 | 306   | 277   | 278   | 327   | 355   | 343   | 322   | 335   | 327   | 10.6                                       |
| Australia | 168 | 163   | 163   | 151   | 171   | 167   | 171   | 172   | 160   | 153   | 4.5                                        |
| Argentina | 60  | 54    | 51    | 56    | 43    | 53    | 44    | 61    | 61    | 70    | 14.9                                       |
| Share of the Top-5 in the global volume, % | 93.0  | 94.2  | 86.6  | 87.0  | 86.8  | 86.5  | 87.4  | 86.4  | 85.7  | 84.5  | –                                          |
| Global | 1492  | 1647  | 1841  | 1809  | 1816  | 1921  | 1974  | 2010  | 2092  | 2187  | 11.0                                       |
| **Imports volume, thousand tonnes** |       |       |       |       |       |       |       |       |       |       |                             |
| Russia | 344   | 356   | 463   | 349   | 220   | 230   | 226   | 250   | 273   | 311   | 25.7                                       |
| Japan  | 215   | 235   | 236   | 232   | 249   | 258   | 273   | 286   | 303   | 292   | 11.4                                       |
| South Korea | 76 | 78    | 85    | 97    | 112   | 110   | 125   | 124   | 131   | 148   | 22.3                                       |
| USA    | 110   | 122   | 113   | 127   | 157   | 165   | 138   | 138   | 139   | 126   | 13.3                                       |
| Mexico | 78    | 89    | 103   | 99    | 116   | 123   | 122   | 123   | 121   | 114   | 14.6                                       |
| Share of the Top–5 in the global volume, % | 75.4  | 76.4  | 78.5  | 76.3  | 76.0  | 73.5  | 66.5  | 68.1  | 68.0  | 66.3  | –                                          |
| Global | 1091  | 1152  | 1274  | 1185  | 1124  | 1206  | 1329  | 1353  | 1422  | 1494  | 10.6                                       |
### Table A2. Coefficient of variation for the dynamic set of indicators of the global butter market

Source: U. S. Department of Agriculture (2021).

| Top-5         | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | Coefficient of variation, % |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------------|
| **Production volume, thousand metric tons** |
| India        | 4330   | 4525   | 4745   | 4887   | 5035   | 5200   | 5400   | 5600   | 5850   | 6100   | 11.1                         |
| EU           | 2055   | 2100   | 2100   | 2250   | 2335   | 2345   | 2340   | 2345   | 2375   | 2410   | 5.8                          |
| USA          | 821    | 843    | 845    | 842    | 839    | 834    | 838    | 893    | 905    | 973    | 5.4                          |
| New Zealand  | 487    | 527    | 535    | 580    | 604    | 584    | 525    | 550    | 525    | 500    | 6.9                          |
| Russia       | 217    | 216    | 219    | 252    | 260    | 246    | 270    | 256    | 268    | 278    | 9.3                          |
| Share of the Top-5 in the global volume, % | 92.1   | 92.1   | 91.3   | 91.4   | 91.7   | 91.9   | 90.9   | 91.1   | 91.7   | 91.8   | –                            |
| Global       | 8584   | 8914   | 9249   | 9636   | 9893   | 10020  | 10309  | 10588  | 10825  | 11180  | 8.5                          |
| **Consumption volume, thousand metric tons** |
| India        | 4320   | 4525   | 4735   | 4876   | 5032   | 5196   | 5387   | 5577   | 5803   | 6081   | 11.0                         |
| EU           | 1982   | 2027   | 2031   | 2162   | 2150   | 2176   | 2207   | 2207   | 2174   | 2167   | 3.9                          |
| USA          | 757    | 792    | 782    | 794    | 831    | 853    | 849    | 898    | 940    | 979    | 8.5                          |
| Russia       | 334    | 340    | 357    | 376    | 350    | 347    | 357    | 346    | 384    | 396    | 5.6                          |
| Mexico       | 223    | 226    | 234    | 221    | 228    | 255    | 264    | 250    | 277    | 266    | 8.4                          |
| Share of the Top-5 in the global volume, % | 94.0   | 93.8   | 93.4   | 93.4   | 93.6   | 93.5   | 91.9   | 91.9   | 92.2   | 92.3   | –                            |
| Global       | 8105   | 8431   | 8716   | 9023   | 9183   | 9443   | 9864   | 10100  | 10388  | 10711  | 9.2                          |
| **Exports volume, thousand metric tons** |
| New Zealand  | 449    | 506    | 508    | 560    | 552    | 554    | 476    | 501    | 509    | 471    | 7.4                          |
| EU           | 124    | 121    | 122    | 142    | 183    | 218    | 174    | 160    | 217    | 247    | 26.4                         |
| USA          | 65     | 47     | 93     | 74     | 23     | 26     | 29     | 49     | 26     | 77     | 53.1                         |
| Argentina    | 27     | 21     | 19     | 14     | 9      | 6      | 4      | 11     | 15     | 21     | 50.0                         |
| India        | 11     | 8      | 10     | 10     | 9      | 9      | 15     | 33     | 47     | 20     | 75.3                         |
| Share of the Top-5 in the global volume, % | 93.4   | 92.3   | 86.6   | 86.6   | 85.6   | 85.8   | 84.2   | 87.0   | 87.4   | –                               |
| Global       | 724    | 762    | 868    | 924    | 907    | 948    | 829    | 896    | 936    | 899    | 8.7                          |
| **Imports volume, thousand metric tons** |
| Russia       | 120    | 124    | 140    | 137    | 90     | 100    | 99     | 88     | 117    | 131    | 16.7                         |
| USA          | 12     | 17     | 12     | 22     | 38     | 50     | 41     | 59     | 66     | 70     | 57.4                         |
| Australia    | 19     | 21     | 21     | 23     | 23     | 30     | 35     | 42     | 40     | 43     | 32.1                         |
| Canada       | 11     | 8      | 7      | 11     | 17     | 27     | 22     | 22     | 25     | 24     | 43.4                         |
| Mexico       | 36     | 37     | 50     | 37     | 43     | 65     | 49     | 33     | 59     | 42     | 23.4                         |
| Share of the Top-5 in the global volume, % | 70.0   | 66.1   | 72.1   | 69.7   | 73.0   | 78.2   | 61.2   | 56.2   | 64.9   | 63.0   | –                             |
| Global       | 283    | 313    | 319    | 330    | 289    | 348    | 402    | 434    | 473    | 492    | 20.8                         |
Table A3. Coefficient of variation for the dynamic set of indicators of the global sugar market

Source: U. S. Department of Agriculture (2021).

| Top-5  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | Coefficient of variation, % |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------------------------|
| **Production volume, thousand metric tons** |
| Brazil | 36150 | 38600 | 37800 | 35950 | 34650 | 39150 | 38870 | 29500 | 30300 | 42050 | 10.9 |
| India  | 28620 | 27337 | 26605 | 30460 | 27700 | 22200 | 34309 | 34300 | 28900 | 33760 | 13.2 |
| EU     | 18320 | 16655 | 16020 | 18449 | 14000 | 15505 | 19508 | 16750 | 16556 | 14717 | 10.3 |
| China  | 12341 | 14001 | 14263 | 11000 | 8430  | 9300  | 10300 | 10760 | 10400 | 10500 | 16.9 |
| USA    | 7700  | 8148  | 7676  | 7853  | 8104  | 8137  | 8430  | 8164  | 7392  | 8436  | 4.2 |
| Share of the Top-5 in the global volume, % |
| Brazil | 10.9  |
| India  | 13.2  |
| EU     | 10.3  |
| China  | 16.9  |
| USA    | 4.2   |
| Global | –     |

| Consumption volume, thousand metric tons |
|------------------------------------------|
| India | 24180 | 25588 | 26023 | 26500 | 26800 | 25500 | 26500 | 27500 | 27000 | 28000 | 4.2 |
| EU    | 18200 | 18250 | 18500 | 18700 | 18800 | 15441 | 17000 | 17000 | 16600 | 16600 | 6.5 |
| China | 14200 | 15100 | 16445 | 17558 | 17500 | 15600 | 15700 | 15800 | 15400 | 15500 | 6.5 |
| USA   | 10106 | 10421 | 10722 | 10785 | 10887 | 10979 | 10993 | 10982 | 11173 | 11000 | 2.9 |
| Brazil| 11500 | 11200 | 11260 | 11400 | 10900 | 10550 | 10600 | 10600 | 10650 | 10150 | 4.1 |
| Share of the Top-5 in the global volume, % |
| Brazil | 4.2 |
| India  | 6.5 |
| EU     | 6.5 |
| China  | 2.9 |
| USA    | 4.1 |
| Global | –   |

| Exports volume, thousand metric tons |
|--------------------------------------|
| Brazil | 24650 | 27650 | 26200 | 23950 | 24350 | 28500 | 28200 | 19600 | 19280 | 32150 | 15.7 |
| Thailand | 7898 | 6693 | 7200 | 8252 | 8800 | 7016 | 10907 | 10612 | 6672 | 7300 | 18.9 |
| India | 3764 | 1261 | 2806 | 2580 | 2900 | 2125 | 2236 | 4700 | 5800 | 6000 | 47.0 |
| Australia | 2800 | 3100 | 3242 | 3561 | 3650 | 4000 | 3600 | 3735 | 3600 | 3335 | 10.0 |
| Guatemala | 1619 | 1911 | 2100 | 2340 | 2255 | 1978 | 1881 | 2125 | 1858 | 1729 | 11.5 |
| Share of the Top-5 in the global volume, % |
| Brazil | 74.1 |
| India  | 72.9 |
| EU     | 71.8 |
| China  | 73.9 |
| Australia | 76.5 |
| Guatemala | 72.6 |
| Bangladesh | 71.2 |
| Global | –   |

| Imports volume, thousand metric tons |
|-------------------------------------|
| Indonesia | 3027 | 3570 | 3570 | 3050 | 3270 | 4781 | 4325 | 5362 | 4758 | 5200 | 21.9 |
| China    | 4430 | 3802 | 4275 | 5058 | 6700 | 4600 | 4350 | 4086 | 4408 | 4900 | 17.2 |
| USA      | 3294 | 2925 | 3395 | 3223 | 2931 | 2943 | 2972 | 2785 | 3842 | 2860 | 10.4 |
| Bangladesh | 1700 | 1547 | 2080 | 1980 | 2350 | 2097 | 2654 | 2429 | 2397 | 2450 | 16.3 |
| Algeria  | 1594 | 2014 | 1854 | 1844 | 1850 | 2135 | 2261 | 2328 | 2469 | 2405 | 13.9 |
| Share of the Top-5 in the global volume, % |
| Brazil | 8.9 |
| USA    | 26.7 |
| Bangladesh | 29.5 |
| Algeria | 29.8 |
| Global | –   |