

FOOD SECURITY IN THE BALTIC STATES

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Abstract

The article analyses food security in the Baltic States and identifies the main factors that determine it. The aim is to assess the level and differences in food security in the Baltic States. In order to assess the impact of food security factors in the Baltic States, a research methodology has been developed that includes a system of indicators at both national and regional levels. Food prices and income have been found to have the greatest impact on food security, especially for the poor. The results of the research can be used in investigating the problem of ensuring food security in the countries of the European Union and in preparing scientific studies on issues of ensuring food security.

Keywords: *food security, producer price equivalent, poverty rate, citizens' income.*

JEL Codes: *E22, F21.*

Introduction

Relevance of the topic. Food security has been and remains one of the world's greatest challenges. According to Domingo et al. (2021), millions of people die each year as a result of hunger, poverty and deprivation. Food security is defined as a situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food choices for an active and healthy life. According to Ranganathan et al. (2018), research statistics show that overall food production is declining, which is putting pressure on the current agricultural system in terms of food security. Food security is a growing challenge as the world's population is on the rise. In the Food and Agriculture Organization of the United Nations report 'Feeding the World 2050', FAO (2021) studies showed that food production will need to increase by 75% by 2050 to meet the food needs of more than nine billion people worldwide. This would

require an additional 100-250 million hectares of arable land (FAO, 2021). The global food system is dependent on food supply and is highly vulnerable to crises such as climate change and global pandemics, leading to food shortages. The war in Ukraine and the COVID-19 pandemic are good examples of how disruptions to normal life patterns can interrupt the food supply chain and affect the food security of populations, especially the poorer ones (Altieri and Nicholls 2020).

One in five deaths worldwide can be attributed to poor or inadequate nutrition, obesity and other related conditions, which contribute significantly to the overall poor health of the world's population. The number of people suffering from hunger and food insecurity increased from 720 million to 811 million in 2019-2020 (FAO, 2021). The food security and nutritional status of the most vulnerable population groups is likely to deteriorate further

as a result of the health and socio-economic consequences caused by the military conflicts and the COVID-19 pandemic.

Research problem. How to assess the food security situation and the resulting threats in the Baltic States.

Research object. Ensuring food security in the Baltic States.

The aim is to assess the level and differences in food security in the Baltic States.

Food security is defined as the opportunity for “all people, at all times, to have access to enough food for a healthy and active life” (FAO, 2021). Food self-sufficiency is defined as the ability to meet consumption needs (especially for staple foods) through our own production, rather than buying or importing, meaning that we grow all the food we need ourselves. There is a long-standing debate about whether food self-sufficiency is a useful strategy for ensuring food security. As long as the national economy runs smoothly, we have food security. Just go to your local supermarket and take a look at the variety of food on offer, from fruit and cereals to tinned food. However, food self-sufficiency is a desirable hedge in case economic supply chains start to struggle, in which situation it is

preferable to obtain food at home (Sadowski and Baer-Nawrocka, 2019).

This paper analyses food security as an essential element of the economic security of a country, region or other strictly defined area. It is the result of a country’s ability to provide the population of a state (a limited area) with the necessary quantity of agricultural products for a rational life. The definition of food security has been influenced by fluctuations in food supply due to production constraints and the volatility of food grain prices (FAO, 2021). Over time, unequal access to food and distribution of food due to lack of economic resources and individual capabilities have been argued to be equally important aspects of food security. This has led to a gap between the ability of the state to ensure a steady supply of food at the national level and the ability of individuals or households to access the food that is affordable to them (Domingo et al., 2021).

The literature shows that the concept of food security is broad, encompassing food quality, social and economic aspects. It is very difficult to define food security precisely; there are more than 200 definitions. Some common definitions of food security are listed below (Table 1).

Table 1. Definitions of food security (compiled by authors, 2024)

Author	Definition
Jurabaevich, N. S. (2021)	These are strategic indicators that determine the food security position of countries in the global economy.
United Nations Food and Agriculture Organization (FAO) (2021)	Food security is the result of the availability, supply, stability and bioavailability of food. 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 an active and healthy life.
World Food Security Committee (CFS) (2021)	Food and nutrition security exist when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food of sufficient variety and quality to meet their dietary needs and food preferences for an active and healthy life, considering a hygienic environment, adequate health protection, education and care.
Bajagai, Y. S. (2016)	Food security is one of the key development and poverty reduction indicators that many international and national non-governmental organisations are working towards.
Patel, N. (2012)	Food security is a useful heuristic tool for understanding food-related health problems at overlapping scales.

In a variety of contexts, such as uncontrolled population growth, climate change, natural disasters, disease and economic crises, food security is a key strategic issue facing people around the world. Food security in the agriculture and food sector means that there is enough food, and people have the economic means to feed themselves (Krivko et al., 2019). Food security means having enough safe and uncontaminated food for a healthy life. It can be argued that sustainable local food production is a key factor in ensuring global food security.

The concept of food security emerged some 45 years ago during the global food crisis. The initial focus was on food security, considering the availability of staple foods as well as global and local price stability. This was the result of the huge volatility in agricultural commodity prices in the early 1970s, due to turbulence in currency and energy markets and a number of other adverse circumstances. The emphasis on supply-side issues reflects changes in the organisation of the global food economy that is responsible for these crises (Domingo et al.). Hunger and food crises have necessitated a redefinition of the concept of food security that recognises the critical needs and behaviours of potentially vulnerable and affected people (Clay, 2022). The World Bank released a landmark report on *Poverty and Hunger*. It established a timeframe for food security, distinguishing between chronic food insecurity associated with poverty problems and short-term food insecurity caused by natural or man-made disasters (Domingo et al., 2021). These concerns have led to an expansion of the concept of food security to include “the possibility for all people, at all times, to have access to enough food for an active and healthy life” (Clay, 2022).

FAO has been reporting and monitoring food insecurity issues almost since its establishment. From the 1950s to the 1970s, much work was done to assess the resources of different populations in different countries in relation to adequate dietary energy requirements.

The organisation has improved and implemented tools for the assessment of energy poverty at a country level. A more systematic and coherent framework was prompted by the World Food Summit, when the organisation was mandated by its members to monitor progress towards the goal of halving the number of undernourished and malnourished people (Domingo et al., 2021). Over time, as the term *food security* had been evolving, the terms *nutrition security* and *food and nutrition security* also emerged to combine these aspects (Committee on World Food Security, 2012). The definition of food security was further refined as *the state of food insecurity in the world*: “Food security is a situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (Committee on World Food Security, 2012). According to Shaw (2007), there are three dimensions to food security:

- globalisation;
- sustainable development;
- human rights.

It is no secret that in a globalised world, every country is taking steps to ensure its national food security. These measures depend on the level of protection, including economic development, and consider criteria such as political, social, legal and economic conditions. Countries are implementing strategies and programmes in the areas of agriculture and foreign trade to prevent the negative effects of externalities (Bulturbayevich and Jurayevich, 2020).

Other authors (Garrett et al., 2019) highlight that food security also depends on household disposable income to purchase food at current prices and note that most households cite increased income or improved economic access to food as prerequisites for food security. Nyariki et al. (2016) also highlight two levels of food security: the individual level and the micro level. At the individual level, food security is

considered to be achieved when a person has access to food on a regular basis in order to ensure a healthy life. At the micro level, food security is considered achieved when households have regular access to food. The authors note that poverty and low income are barriers to sustainable food provision. According to Staatz et al. (2009), even if a country is able to achieve food security, this does not mean that all households will be food secure. In addition to being able to import and produce enough food, it is also important for a country to ensure that households receive or access it.

Domingo et al (2021), who have a particular focus on individual food security, argue that food security is the process of ensuring that current nutritional needs are met. It can be thought of as making sure that the cells, tissues and organs have an adequate supply of nutrients. Food security is closely linked to the activity of the agricultural sector. The FAO report (2021) states that failure to conserve the natural resources on which food production depends will not only undermine the principle of a secure food system, but will also harm future generations.

Methodology

National food sovereignty has been and continues to be used to assess a country's food security potential, whether food is produced domestically or imported. At national level, food sufficiency can be assessed by comparing total supply and demand. Food availability per capita is a good indicator, but statistics on food stocks are often inaccurate. While local production is the main source of food supply in many countries, the level of imports is a key determinant of food sufficiency in many food-insecure states. The ability of these countries to achieve food security depends on their import capacity, or the amount of staple food a country can import without major economic disruption (Fanzo et. al, 2020).

When analysing food security at the national level, it can be measured in terms of gross domestic product (GDP) per capita, which

reflects a country's level of development, the ratio of total exports to food imports, and the possibility to import food (Wahbeh et al., 2022). A more appropriate indicator of food security than the food trade balance is the ratio of total food exports to food imports. Countries with a relatively higher share of total export earnings are less vulnerable to the volatility of global food prices (Wahbeh et al., 2022). These authors are echoed by Leventon and Laudan, (2017) who argue that the ratio of GDP to total exports and food imports can only give an indication of a country's overall situation and its level of development in terms of food security.

Another very important aspect is the Laspeyres price index, which calculates a consumer price index that measures the change in the price of a basket of goods and services and compares it with a given base period weight. The Laspeyres price index, developed by the German economist Etienne Laspeyres, is also known as the base year quantity weighting method. This is a price index that is used to measure the general level of prices and the cost of living in an economy and to calculate the inflation rate. The index normally uses a base year of 100, with periods of higher price levels shown in indices above 100 and periods of lower price levels shown in indices below 100. The Laspeyres price index formula is:

$$\text{Laspeyres price index} = \frac{\sum(P_{i,t})x(Q_{i,0})}{\sum(P_{i,0})x(Q_{i,0})} \times 100 \quad (1)$$

Where $P_{i, 0}$ is the price of an individual commodity in the base period and $P_{i, t}$ is the price of an individual commodity in the period considered. $Q_{i, 0}$ is the quantity of a single commodity in the base period. The numerator is simply the total expenditure on all items during the observation period using base quantities, and the denominator is the total expenditure on all items during the base period using base quantities. The main difference with the Laspeyres price index is that it uses weights that are taken from the base period.

Food security is an essential element of the economic security of a country, a region or any other strictly defined area. It is the result of a

country's ability to provide its people with the agricultural products they need in sufficient quantities to live a reasonable life. In order to ensure an optimal standard of living for the population of the region, the State must provide a set of foodstuffs that is, on the one hand, sufficient in terms of composition and quantity and, on the other hand, adequate. Considering the national composition of the population, the natural and climatic characteristics of the territory are considered, i.e. the adaptability to these parameters. The area food security function combines the actual (physical and economic) provision of agricultural products and their security (Wahbeh et al., 2022). Through the establishment of quantitative values or standards, these parameters should be fully guaranteed at all levels of governance in the region. The list of these indicators should include optimal food consumption, minimum subsistence levels, quality of life indicators, guaranteed prices, etc. At the same time, it must be considered that the level of food security and its quantification are influenced by a number of interrelated factors, the relative importance of which varies from one area to another:

- factual income and quality of life of area residents;
- nutritional inequalities in the population of a region due to country, climate and other factors (Ripoll-Bosch et al., 2021);
- insufficient or poor implementation of quality control mechanisms in the agricultural sector (Michalk et al., 2019);
- risky natural conditions in the area, which lead to large fluctuations in the domestic agricultural production (Fanzo et. al., 2020);
- a significant proportion of agricultural imports (Michalk et al., 2019);
- the foreign policy situation and its impact on the ability to purchase food outside the territory (sanctions and counter-sanctions) (Michalk et al., 2019).

In planning for food security, it is proposed to pay attention to a number of indicators that determine the agricultural supply of the region:

- population dynamics and demographic characteristics of the region;
- the structure and the volume of the food resources in the region; the size of the local agricultural production;
- environmental factors in the production of agricultural products;
- federal and regional policies for exporting and importing food.

In addition, the level of food security in a region can be measured by the ratio of regional agricultural production to consumption. It shows how much of a particular type of agricultural product is produced per capita (Fanzo et. al., 2020).

$$l = \frac{(P+Z_1-Z_2-V)}{Ch \cdot Norm} \quad (2)$$

Where l is the regional coefficient of production-consumption of agricultural products; P is the quantity of food i produced in the region in period t ; Z_1 and Z_2 are the residual quantities of food i in the territory of the region at the beginning and at the end of period t ; V is the export of food i from the region in the period t ; Ch is the actual number of inhabitants in the territory under consideration in the period t ; $Norm$ is the norm of rational consumption of food, established by the legislation, taking into account the climatic, national and other peculiarities of the regional population. (Fanzo et. al., 2020).

The values of this indicator can be explained as follows: $1 < 1.1$ - this type of food is available to the population of the region, but its consumption is higher than rational (due to its relatively low price, the population's consumption habits, etc.) and the optimal consumption structure is therefore compromised; $1.1 > 1 > 1.0$ - the product is affordable for the population and the consumption structure is optimal; $1.0 > 1 > 0.8$ - the product is practically available to the inhabitants of the region, but for

some reason consumption is slightly below rational levels; $0.8 > 1 < 0.5$ - the food is of limited availability in the region and there are problems with its consumption; $1 > 0.5$ - serious problems with the availability of the product, disruption of the optimal structure of consumption in the region, search for substitute products.

Research results

The proportion of the population unable to afford a healthy diet is 2.1% in Lithuania, 2.3% in Latvia, 1.08% in Estonia and around 2.23% in the EU. It can be said that the majority of the population has access to healthy food or food staples. According to FAO (2021), nearly 43% of the world's population cannot afford a healthy diet based on nutritional standards.

Table 2. Average values of food security indicators in the European Union and the Baltic States (compiled by authors from FAO, 2024)

Food security indicators	European Union	Lithuania	Latvia	Estonia
Number of people unable to eat a healthy diet (%)	2.23	2.1	2.33	1.08
Average food energy adequacy (%)	134.91	136.91	129.64	125
Population with access to adequate drinking water services (%)	93.08	91.07	95.02	95.90
Coefficient of dependency on imported cereals (%)	-23.23	-142.38	-154.70	-146.83
Value of food imported out of total goods exported (%)	7	10.6	15	8.9
Employment in agriculture, forestry and fishing as a share of total employment (%)	6	7.77	7.69	3.73
Share of agricultural land (%)	20.96	46.47	30.42	22.72
Proportion of arable land that is under irrigation (%)	9.48	0.2	0.1	0.23

The average food energy adequacy indicator shows how much a country's average calorie intake is normalised by the average energy requirement calculated for its population, to give an indication of the calorie adequacy of the food supply. This indicator helps to determine the prevalence of malnutrition and gives an idea of whether malnutrition is mainly due to inadequate food supply or to particularly poor distribution of it. However, in the Baltic States and in the EU, the average energy intake from food is well within the norm, ranging from 125 % to 135 %.

The Baltic States and the European Union were found to have safe access to drinking water, averaging between 91% and 96%. This indicator provides useful information for the assessment of the utilisation aspect of the results on food security.

The cereal import dependency ratio is a measure of how much of the available domestic cereal food is imports and how much is domestic production. It is calculated as $(\text{cereal imports} - \text{exports}) / (\text{cereal production}) + (\text{cereal imports} - \text{exports}) * 100$.

According to this formula, the indicator only has values close to 100. Negative values are an indication that the country is a net exporter of cereals. It can therefore be said that all of the Baltic States and the European Union are exporters. This indicator shows the extent to which a country or region is dependent on imports of cereals. The higher the indicator, the higher the level of dependency.

Food imports as a percentage of total merchandise exports are around 10.6% in Lithuania, 15% in Latvia, 8.9% in Estonia and 7% in the EU. This indicator shows the vulnerability and adequacy of foreign exchange reserves to pay for food imports, with implications for national food security in terms of production and trade patterns.

FAOSTAT updates the employment indicators annually using data from the International Labour Organisation (ILO) database, which contains a rich set of indicators on a wide range of labour statistics topics. The share of employment in agriculture, forestry and

fishing in total employment is about 7.77 % in Lithuania, 7.69 % in Latvia and 6 % in the EU. By comparison, the figure for Estonia is only 3.73%, an indication that agriculture is not popular in the country.

The proportion of agricultural land in Lithuania is as high as 47 %, compared with just under 30 % in Latvia, 23 % in Estonia and around 21 % in the EU as a whole. The area of irrigated land is defined as the area used to supply water to crops (by irrigation). It includes areas equipped for full and partial control irrigation. In Lithuania the area under irrigation is only 0.2%, in Latvia only 0.1%, in Estonia 0.23%, but in the European Union it is as high as 9.48%, as many EU countries are located in

areas with higher temperatures, where irrigation systems are more necessary. It can be said that this indicator shows the dependence of a country or region’s agriculture on irrigation. This shows that agriculture is vulnerable to water scarcity and climatic shocks (e.g. droughts), with implications for national food security in terms of production and trade patterns.

The Producer Price Index (PPI) is an economic measure of the average change in the price that domestic producers of goods and services receive for their output. The producer price index is based on the average for 2014-2016 = 100 and is calculated using FAOSTAT price and output data.

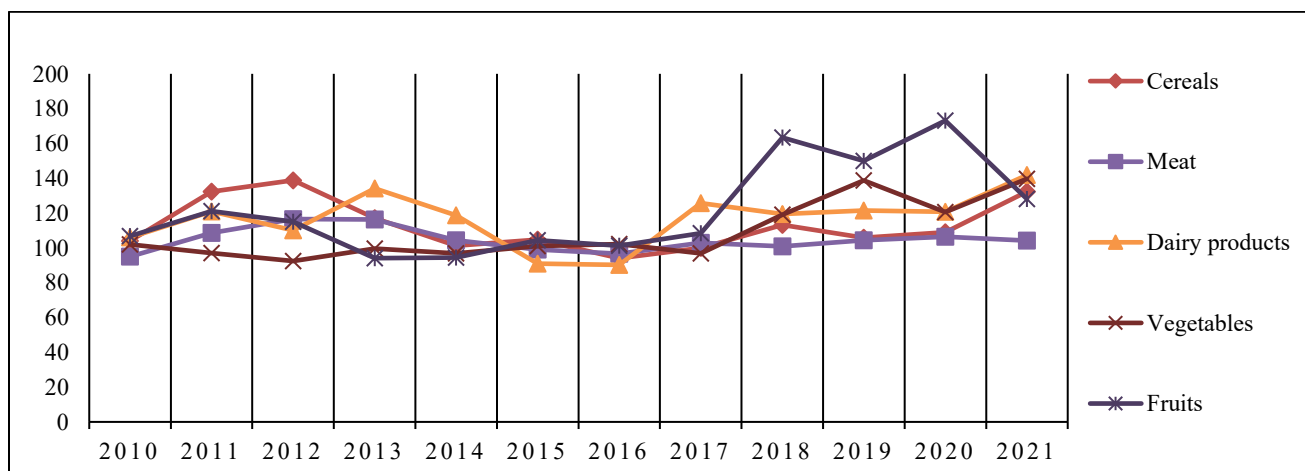


Figure 1. Changes in producer price indices for food products in Lithuania (compiled by the authors based on FAO, 2024)

An analysis of the producer price index for Lithuania (Figure 1) shows that the most significant increase over the period was in 2020: fruit prices rose by around 65%, dairy products by 34% and vegetables by 37%. The price increase was also driven by the Covid-19 pandemic, which restricted logistics. However,

since 2012, cereal prices fell by 5% and meat prices by 12% in 2013.

Figure 2 shows the changes in the Latvian producer price indices. The highest price increases are observed for: vegetables in 2019 (75%), fruit in 2020 (70%) and dairy products in 2021 (8%). However, cereal prices fell by 7% and meat prices by less (1%), as in Lithuania.

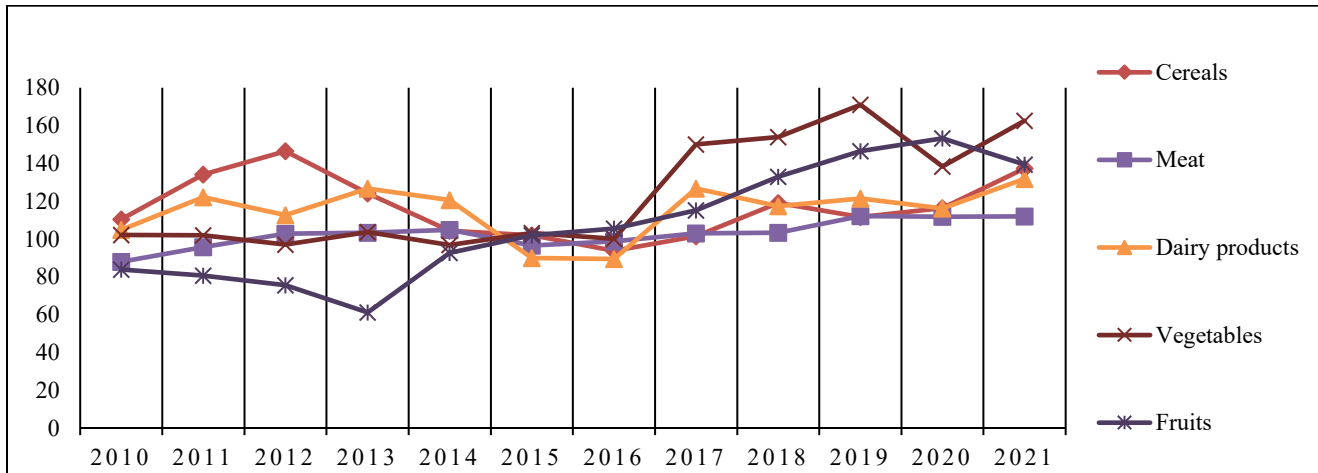


Figure 2. Changes in producer price indices for food products in Latvia (compiled by the authors based on FAO, 2024)

Figure 3 shows that fruit prices in Estonia increased significantly by as much as 103%, while vegetable prices increased by 17% in 2020, but returned to 2010 prices in 2021. Compared to other Baltic States, grain prices in

Estonia remain the highest, although they have fallen by 8% since 2012. Meat prices have fallen by 6% since 2014, while dairy prices have remained fairly stable with a 1% decrease.

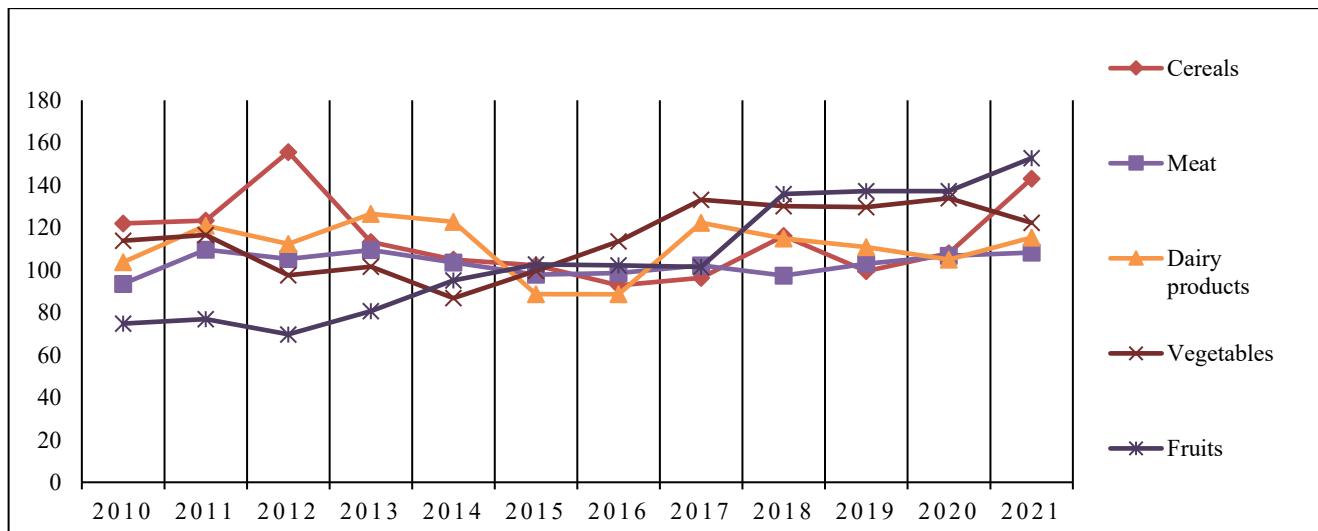


Figure 3. Changes in producer price indices for food products in Estonia (compiled by the authors based on FAO, 2024)

When summarizing the development of the producer price indices for food in the Baltic States, it can be stated that an increasing or decreasing value of the index indicates an increase or decrease in commodity prices. An increase in the PPI means that there has been a very large increase in producer prices in the year

under review, which has had an impact on the Consumer Price Index (CPI), which shows the average change in the price level of consumer goods. This indicator measures the change in the average price of a basket of goods and services purchased by the population between the current and the reference period.

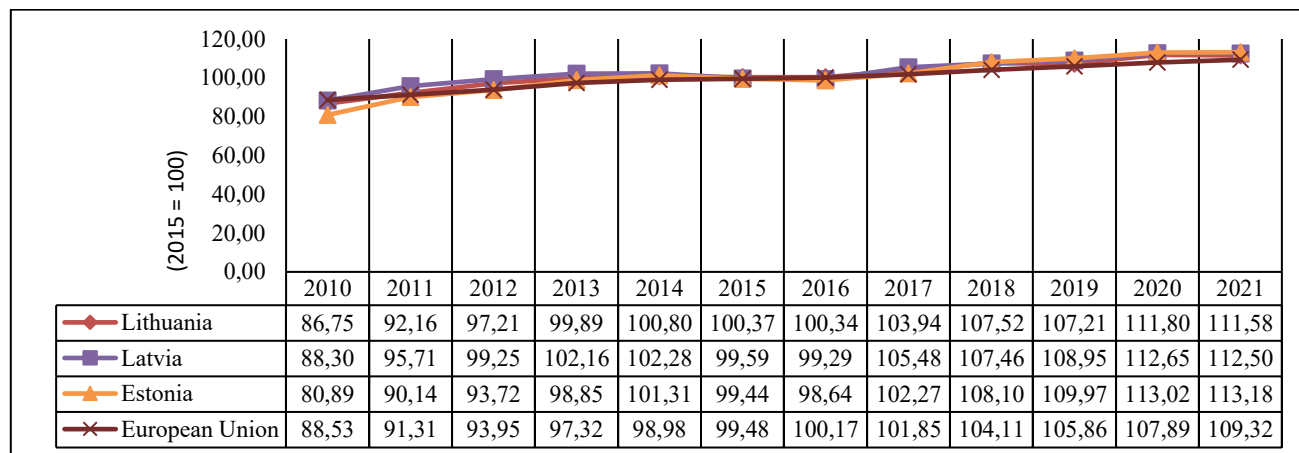


Figure 4. Changes in consumer price indices for food in the Baltic States (compiled by the authors based on FAO, 2024)

Figure 4 analyses the consumer price indices for food, which measure the change in the average price of a basket of goods and services purchased by the population between the current and the reference period. Inflation, as measured by the CPI for food, is defined as the change in the price of a basket of goods and services commonly purchased by specific groups of the population. The largest changes in consumer prices were 24% in Lithuania and 27% in Latvia in 2020 and as much as 40% in Estonia in 2021, suggesting that food security in the Baltic States decreased in these years due to rising food prices. When producers face rising costs, they are passed on to retailers and consumers, meaning that the poorest are hit the hardest. Therefore, in order to understand the situation during the study period, it is necessary

to analyse the level of poverty risk and the prevalence of food insecurity in the Baltic States.

In order to begin the examination of poverty rates in the Baltic States, it is necessary to have a clear understanding of the basic definitions of poverty. According to the FAO (2021), poverty is an economic condition applied to those whose income falls below the poverty line, i.e. the income required to meet basic needs such as food, water, shelter and clothing. Other factors such as economic stability, income security and the predictability of a person’s regular means of meeting basic needs may be considered. When a large percentage of a country’s population lives below the poverty line, it can be incredibly difficult to reduce it (Lipton and Saghai, 2017).

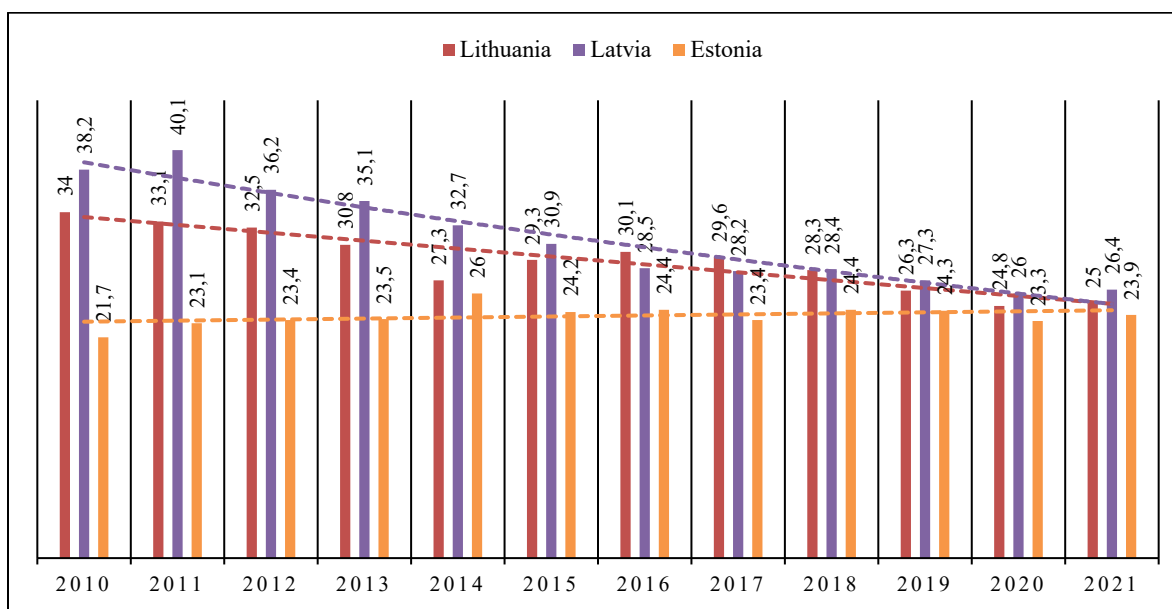


Figure 5. Population at risk of poverty in the Baltic States (% of total population) (compiled by the authors from World Bank, World Development Indicators database 2024)

Over the period considered (Figure 5), the largest proportions of the population experiencing poverty was 34% in Lithuania and 40.1% in Latvia in 2010-2011, and 26% in Estonia in 2014. It can be seen that poverty rates in the Baltic countries have been steadily declining, but are still quite high. According to the World Bank (2023), in 2022, Lithuania was ranked 81st, Latvia 75th and Estonia 87th in the world in terms of poverty. Political instability, corruption, war and global pandemics are major contributors to poverty levels. Reducing poverty requires improving education, promoting economic growth to raise income and expand employment opportunities for the poor, economic and institutional reforms to increase efficiency and improve the use of resources, and giving priority to meeting the basic needs of the poor.

According to FAO (2022), moderate to severe food insecurity in the world has been slowly increasing over the past six years and currently affects more than 30% of the world's population. In addition, the COVID-19 pandemic and military conflicts have caused severe hardship through massive job losses and disruptions that have driven up the cost of food, energy and fertilisers, putting adequate nutrition out of reach for the majority of people. Moderate to severe food insecurity is usually associated with an inability to eat healthy, balanced meals on a regular basis. In fact, the high prevalence of food insecurity can be seen as a cause of a wide range of diet-related health problems in the population, related to micronutrient deficiencies and unbalanced diets. This indicator aims to assess the different aspects and manifestations of food insecurity and policy options for more effective interventions and responses.

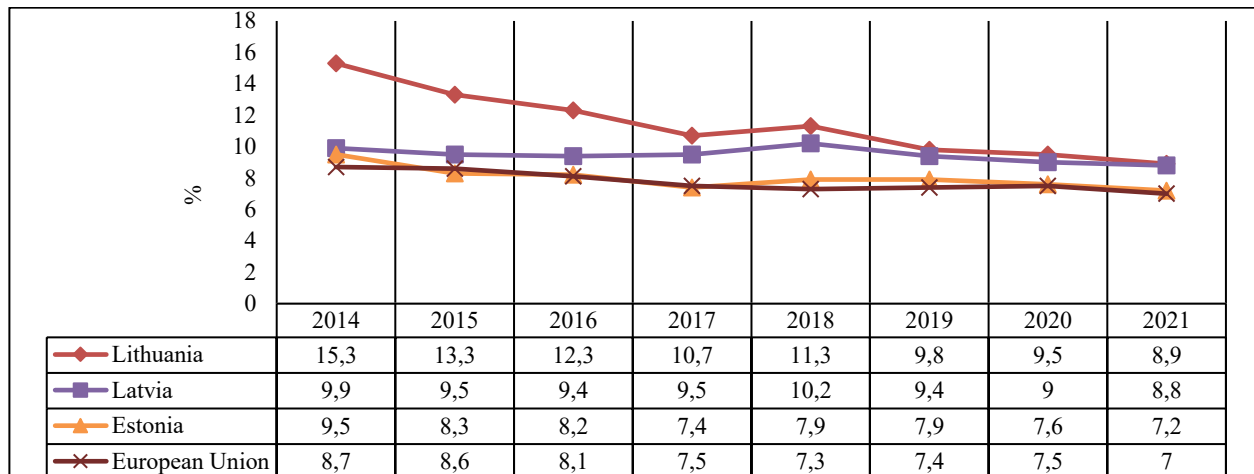


Figure 6. Prevalence of moderate to severe food insecurity among the total population (%) (compiled by the authors based on FAO, 2024)

When analysing the prevalence of moderate to severe food insecurity among the general population, 15.3% of the population in Lithuania, 9.9% in Latvia, 9.5% in Estonia and 8.7% in the European Union had the highest prevalence of problems with food adequacy in 2014. While the prevalence of moderate to severe food insecurity has declined since 2014, rates remain high and many people are food insecure.

In summary, the Baltic States are fully food secure, but they should take more responsibility for the food security of the poorer segments of the population and address their problems first. Decision plans should be developed, coordinated, managed and implemented at the national level, considering the food security situation. Ensuring food security for the poorer sections of the country's population should be a top priority and given due attention in national programmes.

Conclusions

Theoretical analysis of food security has established that food security is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs for a healthy and fulfilling life. Food security can be defined at a number of different levels: global, national, household and individual. The best way to assess countries' food security at the national level is to compare changes in trends and the factors that determine them. At the national level, food security is defined in terms of the three direct dimensions of food availability, food accessibility and food consumption. Direct factors have the greatest impact on food security, which is why they were chosen for the study.

The analysis of methods used to assess food security has shown that different methods and indicators are used depending on the chosen level of food security. The most common method used to determine the number of starving people in a country is the Food and Agriculture Organization of the United Nations (FAO) method of estimating the number of calories per capita per day. In order to assess the dimensions of food availability, accessibility and consumption, a series of steps were envisaged for the assessment of the Baltic States, and an indicator framework was developed in which the

dimension of food availability is examined in terms of crop and livestock production, food imports and exports, and the food production index. Changes in food prices, GDP per capita growth and minimum energy requirements are used to examine the food availability dimension. The food consumption dimension is analysed in terms of the use of basic agricultural products and the average daily per capita intake of protein, animal protein and fat.

The assessment of food security indicators in the Baltic States shows that the countries are fully food secure, but the analysis of the survey reveals problems that affect the poorer population. The analysis of food price developments shows that the energy price shock and the increase in agricultural prices in 2020 led to an average increase in food prices of around 8% in the Baltic States. The rapid rise in food prices is hitting poorer sections of the population who spend most of their income on food. The proportion of the population that is food insecure and at risk of poverty is also quite high in the Baltic countries. The conclusion is that poorer people cannot afford to buy good quality food and therefore choose poorer quality products, or do not have enough income even to buy the essentials.

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