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Digitalization of Agribusiness in the Development of Foreign Economic Relations of the Region

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Abstract

The article is devoted to the research process of digitalization of vegetable development management as an important component of food security of the Black Sea region. Vegetables are necessary for the normal functioning of the human body, provide it with the necessary vitamins and trace elements. one of the conditions of good health. The annual volume of vegetables in food kits for the main social and demographic groups of the population of Ukraine is calculated. The dynamics of vegetable production of vegetable crops in the Black Sea region of Ukraine is studied. In addition, information and communication (digital) technologies in the agar sector are considered. It is proved that the digitization of agribusiness significantly saves the amount of materials and other resources, and execution time and production are optimized. Due to the systematization and grouping of data, the costs of document circulation are reduced, the process of accumulation and use of information is stimulated, the production and economic indicators of agricultural enterprises are improved, which will help increase their competitiveness in the long run.

Keywords: foreign economic activity of the region, export, import, digitalization, regional foreign economic relations.

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Introduction

Ensuring food security is an important condition for the functioning of an independent and economically developed state. However, the current functioning of the vegetable subcomplex of the Black Sea region is undergoing significant changes that could affect the food security of the state as a whole. Weather conditions associated with an increase in the number of dry days during the year and the increase of the average temperature of the region, political and economic factors that determine the principles of international trade vegetable products, define relevant issues vegetable food security in the Black Sea region (Balancing the food market in the context of food security, 2016).

At the same time, in modern conditions, new methods of using digital innovative technologies in the management of business processes of agricultural enterprises are deepening, attracting more and more attention of agricultural specialists. At the same time, compared to the existing knowledge and ability of agricultural entrepreneurs to implement these technologies in the activities of agricultural enterprises, recently the pace of technological progress in the field of digital technologies has made significant progress.

1.Analysis of recent research and publications

Peculiarities of food security are studied by Kordzaya & Egorov (2019)., Kurlyak (2018), revealing the theoretical principles, components of its formation and efficiency of functioning, mechanisms of strategic development of the food market and quality and safety of food products. Mechanisms in strategic board vegetable business activities, organizational and economic principles and aspects of vegetable growing different kinds of vegetables exploring are studied by Levkina (2013), Sych (2013), Skupsky (2013). However, the issue of paternity as a component of food security in the Black Sea region of Ukraine is still insufficiently studied.

Among Ukrainian researchers who paid attention to digitalization and changes in technological systems in their works, we can mark O. Vyshnevsky , V. Geyts, V. Lyashenko, S. Kolyadenko, V. Fishchuk and others. Foreign scholars, such as D. Tepscott, M. Castells, K. Schwab, and T. Mesenburg, have studied and laid the foundation for the theoretical and practical aspects of studying the phenomenon of the digital economy and studied the possibilities of deriving a positive effect from digitalization.

The purpose of the article is the research process of digitalization of vegetable development management as an important component of food security of the Black Sea region.

2. Presentation of the main research material.

The transformation of agricultural enterprises into e-agriculture can provide the use of modern digital technologies, such as computers, servers and websites, which allow the transmission and receipt of agricultural information, agricultural products and raw material markets; A variety of mobile devices that help you find information quickly include tooltips, access banks, sales information, etc.; satellites allow efficient meteorological data, global GPS positioning and remote sensing; telephones and communication are interactive voice response systems; telecommunications can be allowed the transfer of experience and communication, consulting services, communications, community building and cooperation; sensor networks

Vegetables are necessary for the normal functioning of the human body, provide it with the necessary vitamins and trace elements and are one of the conditions for good health. According to the resolution of the Cabinet of Ministers of Ukraine "Some issues of food security" of December 5, 2007 №1379 indicators characterizing the state of food security of the state (region) are calculated for the following main groups of food products: bread and bakery products; potato; vegetables, melons; fruits, berries and grapes; sugar; oil; meat and meat products; milk and milk products; fish and fish products; eggs (Some food security issues, 2007).

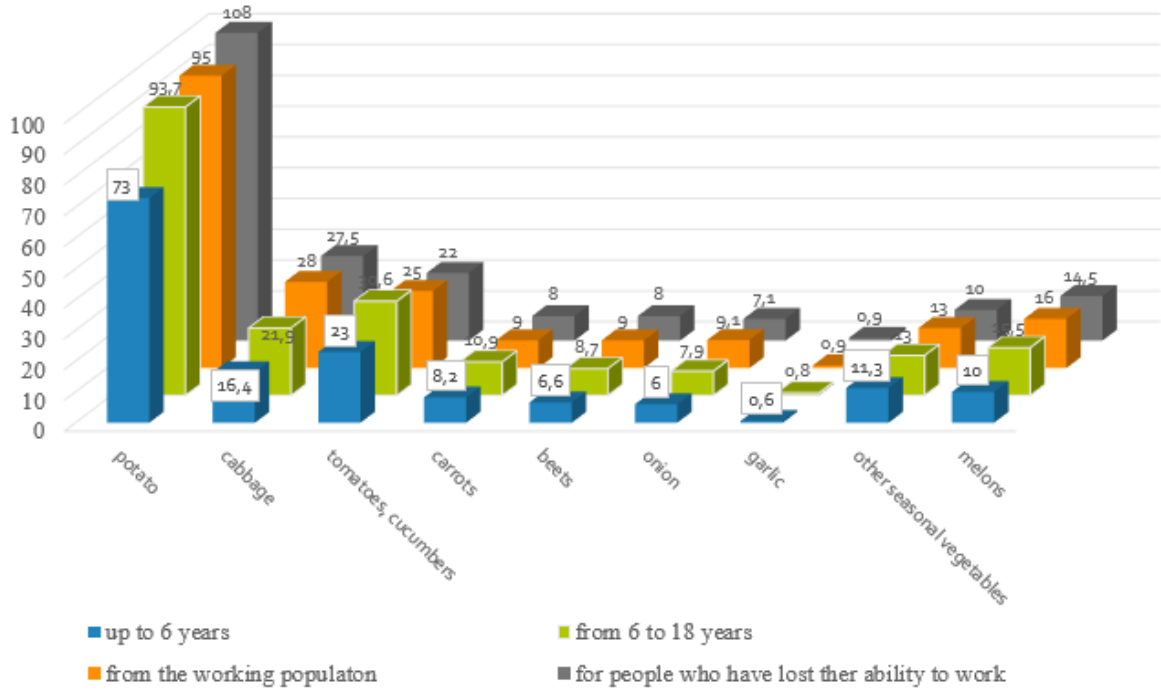

Figure 1. Annual amount of vegetables in sets of food for the main social and demographic groups of Ukraine (kg per person per year), according to the law

* Formed and calculated by the author according to (On approval of food kits, non-food kits and service kits for major social and demographic groups, 2016)

The Resolution of the Cabinet of Ministers of Ukraine "On approval of sets of food products, sets of non-food products and sets of services for major social and demographic groups" of October 11, 2016 № 780 determines the annual amount of vegetables in food packages for children under 18 years of age, the working population and persons who have lost the ability to work (Fig. 1).

Thus, vegetables are necessary in the diet of the population of all ages, so ensuring the financial possibility of consuming a sufficient number of safe domestic fresh vegetables, both in their season and in the off-season, is an integral part of food security in Ukraine.

In particular, in 2019 the leaders among the regions of Ukraine for the production of potatoes is Vinnitsya - 1826.7 thousands of tons, Zhytomyr - 1598.9 thousands of tons, and Lviv - 1 572.9 thousands of tons. In areas of the Black Sea region production reached: in the Odesa region - 381.0 thousands of tons, in Kherson - 258.8 thousands of tons, in the Mykolaiv region the smallestharvest of potato among all regions of Ukraine has grown - 176.8 thousands of tons (Regions of Ukraine for 2019). In general, the share of the Black Sea region in the total production of potatoes in Ukraine in 2019 was 4%.

Infrastructural and climatic conditions of the Black Sea region with a predominance of fertile soils and an existing network of irrigation canals provide significant potential for the development of vegetable and melon crops. Also a significant number of frost-free and sunny days during the year promote the cultivation of vegetables with a long growing season.

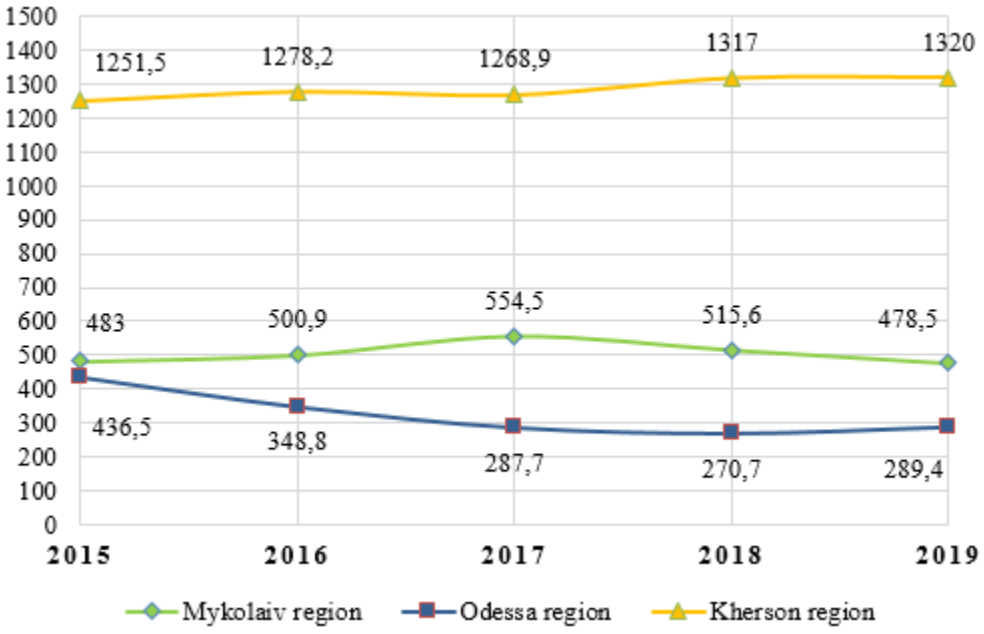

Figure 2. Dynamics of production of vegetable crops of the Black Sea region of Ukraine, thousands of tons

* Formed and calculated by the author according to (Regions of Ukraine for 2019).

The state of production of vegetable crops in the Black Sea region in 2019 demonstrates the leading position of the region in Ukraine. In particular, the Kherson region in 2019 has grown the biggest harvest of vegetables of all regions in Ukraine - 1320.0 thousands of tons. The Mykolaiv region also occupies high positions - 478.5 thousands of tons. The Odesa region has grown 289.4 thousands of tons of vegetables (Regions of Ukraine for 2019). The share of the Black Sea region in the total production of vegetable crops in 2019 in Ukraine is 21.6%.

However, as we can see in Fig. 2, the regions of the Black Sea region demonstrate the dynamics of changes in the production of vegetable crops. Growing up to be deprived of in the Kherson region, in which indicator for all the years, around 2017, is growing up for 2019, obviously from 2015 to become year 5.5%. In the Mykolaiv region growth of the indicator of volume of production of vegetable crops during 2015-2017 is observed, since 2017 there is a decline according to which the indicator for 2019 makes 86,3% from 2017 and is almost equal to the indicator for 2015 is 99%. Only in the Odesa region the rate of change in the volume of production of vegetable crops is characterized by a constant negative trend during 2015-2018, in particular the rate of decline during 2015-2016 is 20.1%, 2016-2017 is 17.5%, 2017-2018 is 5.9%, while in 2018-2019 there is an increase of 6.9% (Regions of Ukraine for

2019). Total production of vegetable crops Black Sea region by 2019, compared with 201 five year, reaching 96.2 %.

A similar unevenness in the field of vegetable growing in the Black Sea region is observed in the share of regions in the fund of consumption of vegetables and melons of the region since 2019 (Fig . 3) .

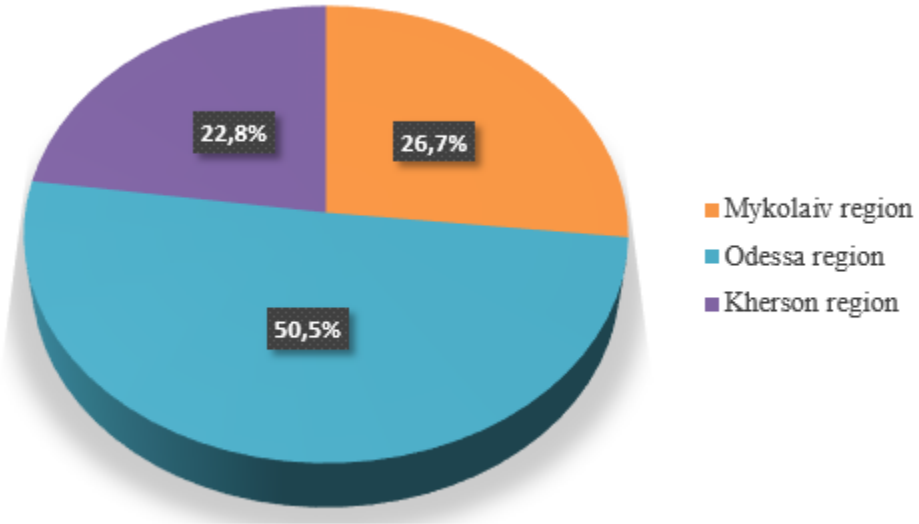

Figure 3. The share of oblasts in the fund and consumption of vegetables and melons of the Black Sea region in 2019, %

* Formed and calculated by the author according to (Regions of Ukraine for 2019)

According to Figure 3., the Odesa region has 50.5% of the total - 381.8 tons, the Mykolaiv region has 26.7 % (201.9 thousands of tons), the Kherson has 22.8% (172 thousands of tons). The assignment of the allocation of regions to the fund for the cultivation of vegetables and food crops is important for the outbound number of the population of the regions of the Black Sea region. In particular, as of January 1, 2020, the current population of Odesa region has 52.5% of the total regional number, Mykolaiv has 24.6% and Kherson has 22.7%. Consumption of vegetables and melons is also influenced by age, sex, income level, gastronomic preferences and the proportion of urban population. Thus, in the Kherson region it is 61.4%, in Odesa - 67.2%, in Mykolaiv - 68.6% (The population of Ukraine in 2019). This ratio indicates that in rural areas, vegetables are largely consumed directly by the producer - small farms, which affect the statistics.

Ensuring food security of the Black Sea region should be carried out by guaranteeing the quality and necessary range and volume of agricultural enterprises of all levels, due to the inherent seasonality of supply for fresh produce and dependence on climatic conditions and yields.

Table 1.The share of indicators in the balance of vegetables and melons of enterprises and farms of the population of the Black Sea region in 2019 (as a percentage)

Components of the balance sheet / Vegetable growers, regions		Enterprises				Households			
Part of the balance	Balance sheet indicator	Mykolayiv	Odesa	Kherson	The average value of the indicator	Mykolayiv	Odesa	Kherson	The average value of the indicator
Receipts	Stocks at the beginning of the year	8,9	30,8	8,2	16,0	16,4	11,8	29,6	19,3
	Produced	91,1	69,2	91,8	84,0	66,3	46,2	66,8	59,8
	Bought and other income	0	0	0	0,0	17,3	42	3,6	21,0
Using	For sowing	0	0	0	0,0	0,6	1,2	1,2	1,0
	On the stern	0	0,1	0	0,0	8	5,7	19,7	11,1
	Implemented in all areas	89,9	67	87	81,3	13,5	10,3	32,5	18,8
	Storage losses	6,9	0,5	4,5	4,0	2,3	1,9	6,2	3,5
	For consumption	-	-	-	0,0	59,7	67,9	13,2	46,9
	Stocks at the end of the year	3,2	32,4	8,5	14,7	15,9	13	27,2	18,7

* formed and calculated by the author according to (Statistical collection for 2019)

As we can see from table 1, in terms of regions of the Black Sea region, the indicator of production of vegetables and melons has a share of 69.2% (57.4 thousands of tons) of revenues of the Odesa region to 91.8% (634.2 thousands of tons) of revenues of the Kherson region. The stock index at the beginning of the year ranges from 8.2% (56.8 thousands of tons) in the receipts of vegetables and melons of the Kherson region to 30.8% (25.6 thousands of tons) of Odesa. The average share of inventories at the beginning of the year of enterprises in the Black Sea region is 16%, and production -is 91.8%.

In households, the share of purchase and other receipts of vegetables and melons are equal to 3.6% (48.9 thousands of tons) of the share of revenues of the Kherson region, 17.3% (54.17 thousands of tons) of the Mykolayiv and 42% (225.17 thousands of tons) of the Odesa region. Stocks at the beginning of the year are equal to 11.8% (66.5 thousands of tons) of the share of revenues of Odesa region, 16.4% (55.6 thousands of tons) of the Mykolaiv region and 29.6% (385.5 thousands of tons) revenues of the Kherson region. At the level of 46.2% (259 thousands of tons) of the share of revenues of the Odesa region is production, and 66.3% (224.1 thousands of tons) and 66.8% (869.6 thousands of tons) of the Mykolayiv and the Kherson regions in accordance. The average stock at the beginning of the year in the farms of the Black

Sea region is 19.3%, purchases and other income - 21%, the largest average is the share of production of vegetables and melons of households - 59.8%. This indicator of the use of vegetables and melons as a loss during storage in enterprises in 2019 has 6.9% (21.6 thousands of tons) of total use of the Mykolayiv region, 4.5% (31 thousands of tons) of Kherson and 0.5% (0.4 thousands of tons) of the Odesa region. The average volume of losses at storage in the enterprises of the Black Sea region makes 4%, in turn, the corresponding average indicator on volumes of stocks at the end of years reaches 14,7% (the Mykolayiv region is 3,2%, Kherson is 8,5%, Odesa is 32,4%). Losses during storage have an average second level proportion of households 3.5%, including 1.9% of Odesa, Mykolayiv has 2.3% and 6.2% of Kherson. The largest share in the regional use of vegetables and melons belongs to the sales indicator in all areas, reaching 89.9% (280.8 thousands of tons) of Mykolaiv, 87% (601.2 thousands of tons) of Kherson and 67% (55.6 thousands of tons) of Odesa regions. The average share of sales in all areas of vegetables and melons in enterprises in the regional context is 81.3%, which significantly exceeds the average value of this indicator in the households of the Black Sea region, which is equal to 18.8% (from 10,3% (57.8 thousands of tons) of Odesa to 32.5% (423.3 thousands of tons) of Kherson region). The share of vegetables and melons in the Black Sea region for consumption, the average value of which is 46.9%, in particular - 13.2% of Kherson, 59.7% of Mykolaiv and 67.9% of Odesa region, predominates in the share of households in the Black Sea region. Based on the study of receipts and use of vegetables and melons, further development of vegetable growing in households is slowed down due to low marketability, due to the predominant focus of the harvest on own consumption and lack of widespread marketing principles in sales activities. The dynamics of growth are negatively affected by market factors and aspects of public policy, which are manifested in the low level of development of the regional vegetable market and the functioning of comprehensive state support to ensure food security. At the level of vegetable processing enterprises in the Black Sea region, cooperation is defined as the main areas of development. In particular, this is due to the creation of value chain as a regional and state so and global level. An example of an enterprise in the Black Sea region is the Sandora plant, which is located in the Mykolayiv region. It is owned by PepsiCo and sells its products under the brands Sandora, Sadochok, Sandorik, manufactures Lay’s chips and is constantly expanding its range. Integration into the transnational campaign promotes the development of vegetable growing in the region and its food security, as it increases financial security through access to the parent company's budget, guarantees a high level of marketing and product quality, in particular, through the introduction of quality management system DSTU ISO 9001, food safety management system DSTU ISO 22000 (PepsiCo company). Enterprise Black Sea region, namely JSC "Chumak", was the first in Ukraine supplier of cucumbers, ketchup and mayonnaise of McDonald's. The company's products meet the requirements for quality management system and food safety, according to the annual SQMS audit (PJSC "Chumak"). Joining international chains also contributes to the development not only of the enterprise itself, but also of the region as a whole by making investments, providing employment

and filling regional budgets through tax revenues.

Cooperation at the regional level provides for the establishment of closed-cycle enterprises, which makes it possible to increase profits by reducing the cost of products for processing. An example of such an enterprise in the Black Sea region and Ukraine is a vertically integrated group of companies "Agrofusion", which produces and processes tomatoes and consists of 3 plants - southern (Gola Prystan, the Kherson region), northern (Shevchenkove, the Mykolaiv region), with the current plant (Snihurivka, the Mykolaiv region); 10 branches and 2 greenhouses (Agrofusion Group of Companies). The group of companies covers all cycles of production activity of processing tomatoes into tomato paste. Such cooperation allows for effective financial management and strengthening food security in the region by providing the opportunity to purchase quality processed products and vegetables, and by increasing the wages of the region's population by creating jobs with sufficient wages. Also in the Black Sea region there is an agricultural complex of Vladam-Yug LLC, which provides import of seeds from France, grows vegetables in its own fields and provides the storage and sale of fresh vegetables during the year and production and sale of canned natural juices (Vladam company). The company offers a wide range of products and provides high volumes of export-import operations with countries. Satisfying the demand of the population of the Black Sea region of Ukraine with the products of the vegetable subcomplex provides an opportunity to purchase a sufficient volume, range and quality of fresh vegetables and products of their processing. Regional producers have a fairly high rate, but not fully able to ensure the saturation of the domestic market, which necessitates the export and import of products (Fig. 4).

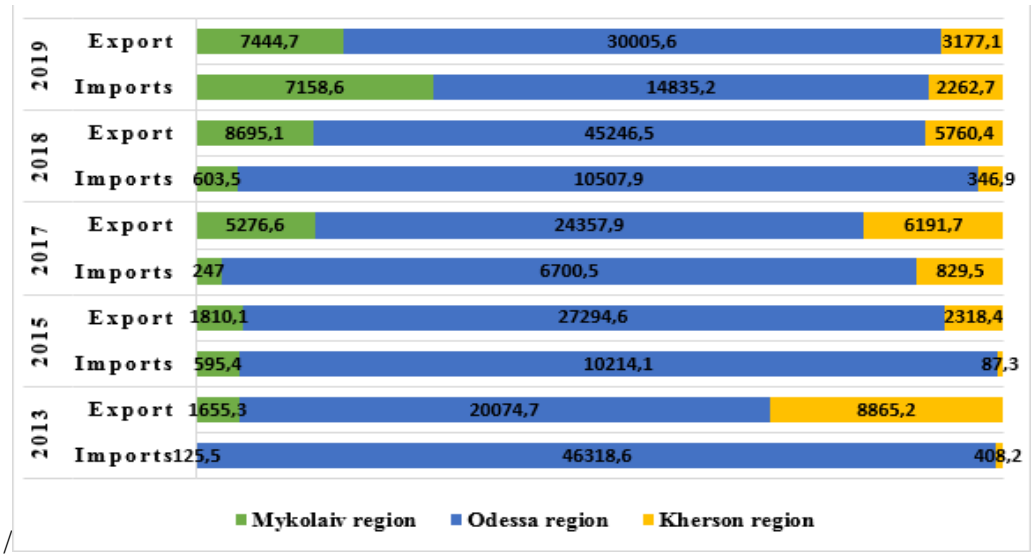

Figure 4. Dynamics of import and export of vegetables of the Black Sea region, thousands of dollars USA * Formed and calculated by the author according to (Regions of Ukraine for 2019)

Thus, it can be noted that the largest share in the volume of imports of the Black Sea region has the Odesa region, however, if in 2013 it accounted for 98.9% of the volume (46318.6 thousand dollars), and the Mykolaiv and the Kherson regions had 0.3% (125.5 thousand dollars) and 0.9% (408.2 thousand dollars), respectively, then in 2019 the share of the Odesa region decreased to 61.2% (1483 5.2 thousand dollars), the indicator of the Kherson region became equal to 9.3% (2262.7 thousand dollars), and the Mykolaiv has 29.5% (7158.6 thousand dollars). The volume of import of vegetables of the Mykolaiv region shows mainly positive dynamics, in particular, having carried out in 2019, in comparison with 2013, growth by 5604 v.p. or 7033.1 thousand dollars. Also, the volume of vegetable imports in the Kherson region is growing, in particular, by 454 percentage points, or 1853 thousand dollars, and export indicators are characterized by the opposite trend - a decrease of 64 percentage points, or 5688 , 1 thousand dollars. Export of vegetables in Odesa and the Mykolaiv regions rises on 49% (9930 thousand dollars) and 350 v.p. (5789.4 thousand dollars), respectively. The largest share of weight in the export of vegetables on the Black Sea region also the Odesa region has, which in 2019 is 73.9% (30,005.6 thousand dollars), compared with 2013 in which is la 65.6%. The Nikolaev area also increased specific weight, in particular, if in 2013 it was equal to 5,4% (1655,3 thousand dollars), in 2019 with the size of export in 7444,7 thousand dollars already reaches 18.3% of the regional volume. Only the Kherson region reduced its share from 29% (8865.2 thousand dollars) in 2013 to 7.8% (3177.1 thousand dollars) in 2019.

Thus, the dynamics of foreign trade of the Black Sea region indicates significant volumes of imports. This trend complicates the process of stable supply of vegetables to the population of the region, as their purchase depends on external factors, which are regulated by international law and determined by the world market situation (Latosha, 2020; Manita, 2020).

In general, it is possible to note the presence of certain problems in the vegetable growing of the Black Sea region, which negatively affect the state of its food security. In particular, the lack of well-established mutually beneficial cooperation between producers, processing enterprises, wholesale and retail buyers. Due to the lack of a clear understanding of the market structure and marketing support, private farms are prone to overproduction of vegetables, which, due to the characteristic storage properties, in the absence of proper demand causes their spoilage and further destruction and leads to losses (Vukolov, 2020; Sklyar, 2020).

The lack of well-established sales channels for vegetable products leads to the deterioration of the market and reduces its quality, which prevents further sale and forces producers to give it to livestock feed. The lack of a sufficient number of equipped warehouses with the required capacity indicates the problems of infrastructural support of the process of storage, processing and processing of vegetable products, which hinders its stable supply and price level and increases import dependence in this area to ensure food security (Podashevskaya, 2020).

It is advisable to build the latest facilities for freezing and drying vegetables, which will extend their shelf life. This is an important factor because fresh vegetables tend to spoil quickly and require special conditions of transportation and storage. In contrast, processed vegetables have a longer shelf life, and packaging can reduce the requirements for transportation and storage, as well as they can get additional consumer characteristics, such as slicing factors, taste, and so on. By selling not only fresh but also processed vegetables, the company gets the opportunity to increase profitability and enter international markets (Serebryakova, 2020).

However, further increase in exports to European countries is hampered by the legislative aspects of product certification, in line with EU requirements. Therefore, to increase the amount of foreign currency, it is advisable to increase exports of vegetables and vegetable processing products to countries on other continents (Sklyar & Boltyanska, 2012; Boltyanska, 2017).

An important aspect to guarantee product safety and economic development is the safety of vegetables, which should be by introduction of NASSR, which provides for contracts to supply products to large auction at structing networks. It is important to clearly ensure and control the content of chemicals in vegetable products within the recommended norms. Following the principles of the food safety management system and confirming this also helps to increase the business reputation of the farmer (Boltyanska, 2016).

Promising is the development of vegetable growing, protected soil and marketing principles, the development of logistics and market infrastructure. It is expedient to establish mutually beneficial relations between agricultural producers, processing enterprises and sellers, which will increase profitability and further expand production. In order to protect the population of the region from threats to food security in this area, it is necessary to organize the existence and maintenance of a consistently high level of own supply of vegetable products. This requires the coordination of both state and regional authorities and research institutions, which will create the necessary legislative, economic and intellectual resources to protect regional agricultural producers and increase their competitiveness, compared with imported products in the direction of creating and implementing innovative varieties vegetables and their hybrids to ensure high yields under conditions and adverse weather conditions to ensure food security. To improve the development of vegetable growing as an important component of food security in the Black Sea region, it is necessary to increase profitability by improving quality and reducing costs, taking into account market conditions and available natural, geographical and socio-economic resources through innovation.

Experience shows that consumers prefer traditional and familiar food, so farmers should focus on producing the necessary products. At the same time, most consumers do not want to buy a large number of products each week, and they are more interested in variety than quantity. Special requirements concern the safety, purity and quality of products. Since the most

common area of cooperation between producers and consumers is the cultivation of vegetables, most of the advice given to farmers relates to this area. It should be noted that the yield of each vegetable crop should be sufficient to meet all needs when filling the consumer basket (Ryzhov, 2020).

1. A balanced diet, nutritionally safe food has a significant impact on human health and is one of the key categories for their quality of life. At the same time, in the world, on the one hand, about 800 million people can't get enough food; on the other hand, obesity is an epidemic that is the cause of many dangerous diseases. In Ukraine, about two-thirds of all diseases are related to malnutrition (Pomazan, 2020).

2. The level and quality of human nutrition depends on the state of its food supply, material and economic affordability, and is very important on the safety, chemical and biological composition of food. The growing problems of health and nutrition of the Ukrainian population are associated with non-compliance with the norms of consumption of dairy products, fish and meat, reduced consumption of vegetables and fruits, children's diets do not contain micro- and macronutrients, vitamins A and D. there is an increase in the share of industrial production of agriculture made from low-quality raw materials (usually counterfeit products) (Zabolotko, 2017).

3. Due to the close link between safe and quality food and health, in countries around the world that have provided food aid to vulnerable groups (especially in the United States), funds for such aid are increasingly being used to purchase food and agriculture. "Healthy" food, especially eye and fruit, is usually grown by small farms on the principles of agroecology. Thus, health, the environment (in terms of quality of life) and the support of family farming are interrelated. Along with this, the direction of providing the population with "Healthy" food as an integrated agriculture is becoming more and more frequent (Boltyansky, 2016).

To improve the efficient functioning of agriculture, it is necessary to constantly improve the quality characteristics of agricultural products, introduce new management methods and modern technologies and form a complete infrastructure. Thus, we can determine that the effectiveness of agricultural innovation is influenced by certain factors: 1) External factors: market conditions; competition; strategic plans for agricultural development; STP; natural and climatic conditions; social policy, population conditions; price levels, inflation; levels of state support; political and economic conditions of the country; 2) Internal factors: production, product quality; labor productivity ; qualification of employees; the amount of costs; financial resources; application of new technologies; technical equipment (Boltyansky, 2011).

Therefore, the right strategy is the most important result and the most effective mechanism of strategic management, as it can mobilize technology, innovation, finance and economic, social and organizational potential of the enterprise in a particular industry. At the same time, for most

agricultural enterprises, the tasks of strategic planning of innovative development, including digitalization, digital technologies, drones, sensors, etc., are now becoming new and problematic problems that are not only possible but also necessary to meet. Thanks to the introduction of new technologies in the modern agricultural business environment, there are more and more opportunities to create the value of consumer production. It is established that the combination of technological development and changes in management systems and new business models can damage the traditional value chain in the process of organizing agricultural production (Boltyansky, 2015; Komar, 2019).

The transformation of agricultural enterprises into e-agriculture can provide the use of modern digital technologies, such as computers, servers and websites, which allow the transmission and receipt of agricultural information and agricultural products, raw material markets, etc.; a variety of help to quickly find information, include advice and visit banks; Sale of mobile equipment, such as information; satellites allow to receive effective meteorological data, global positioning of GPS, remote sensing; telephone and communication are interactive voice response systems; experience, consulting services, communications, community building and collaboration; sensor network (Fig. 5).

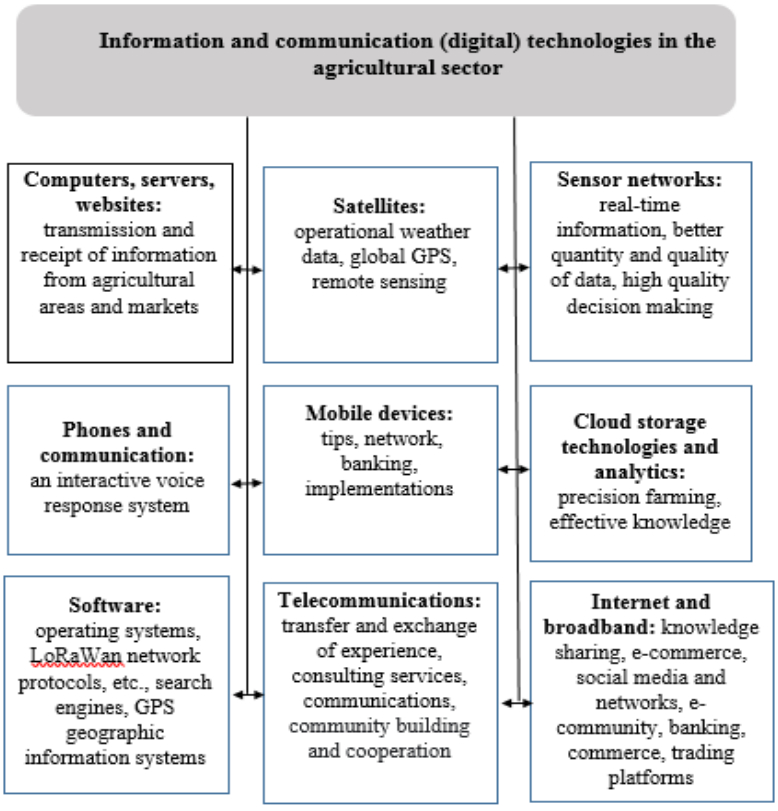

Figure 5. Information and communication (digital) technologies in the agar field (Komar, 2019; Boltyanska & Komar, 2018; Boltianska, N., Sklar & Podashevskaya, 2020; Boltyansky, 2015; Skliar & Skliar, 2013; Sklyar, 2018).

In turbulent environments, Ukrainian agricultural companies must actively implement digital technologies in business process management. In this regard, it is recommended to consider the classification of digital technologies that can be used in the agricultural food sector of the economy. Technologies that have been identified as having a significant impact on the configuration of the value chain of agricultural production include: Internet of Things (IoT) technology, which includes communication and understanding, or a network of physical objects that interact with them. internal state or -external environment; 2) Robotics - refers to the automation of systems or processes using robotic equipment; 3) Artificial intelligence (AI) is any device that can perceive the environment and take measures to maximize the chances of successfully achieving their goals; 4) Big data - big data improves the level of analysis and decision-making by increasing data exchange. This refers to a data set that is too large and complex for traditional processing (Skliar et al., 2019).

Thanks to the development of modern technologies and the Internet, the direction of smart agriculture is actively popularized. In the market of smart devices, competition among agricultural enterprises is becoming increasingly fierce. Smart agriculture is an agricultural concept that uses the latest information and communication technologies (Fig. 6). According to Swiss scientists, smart agriculture reduces the impact of agriculture on the environment. Minimized or accurate application of fertilizers and pesticides will reduce emissions of harmful substances into the environment and greenhouse gas emissions. With the help of modern information and communication technologies, it is almost possible to constantly monitor the farm using a sensor network. Similarly, even on a global scale, a theoretical and practical framework that combines information on the state of plants, animals and soil with resource needs (such as water and fertilizers) is quite achievable.

Smart agriculture improves farm profitability. Reducing resource costs will save farmers money and time, and increasing the reliability of spatial data will reduce risks. Location-specific targets, weather forecasts, plant protection measures, pest transmission probability maps and adverse natural events, as far as possible, will help to develop the best cultivation technologies based on a dense climate monitoring network. Space information creates new opportunities for insurance and commerce throughout the value chain, from technology and material suppliers to farmers, processors and traders in developed and developing countries. If all the data needed for agriculture are recorded by automatic sensors, the time of decision-making on the application and management of resources (fertilizers, etc.) can be reduced.

There is a high probability that smart agriculture will be recognized by consumers. Optimizing management will help improve product quality, promote the practice of planting products rich in antioxidants, and have a positive impact on the quality of consumer fruit, changing the density of planting and milk, adjusting the individual diet of dairy cows. These are not just health products - they can be sold at higher prices, which contributes to the efficient use of land. The ability to track - on which farm, which company produces the product, and under what conditions - increases the transparency of the production process and their subsequent passage in the chain "from field to table". This creates opportunities for new and more direct interactions between farmers and consumers.

At the same time, some scientists predict that 3D printing technology will have a significant impact on the value chain configuration, as this technology is very suitable for manufacturing individual objects (such as 3D printing tools for repair) according to the company's agricultural orders, equipment, 3D-spare parts, urban organic crop production, etc.) (25).

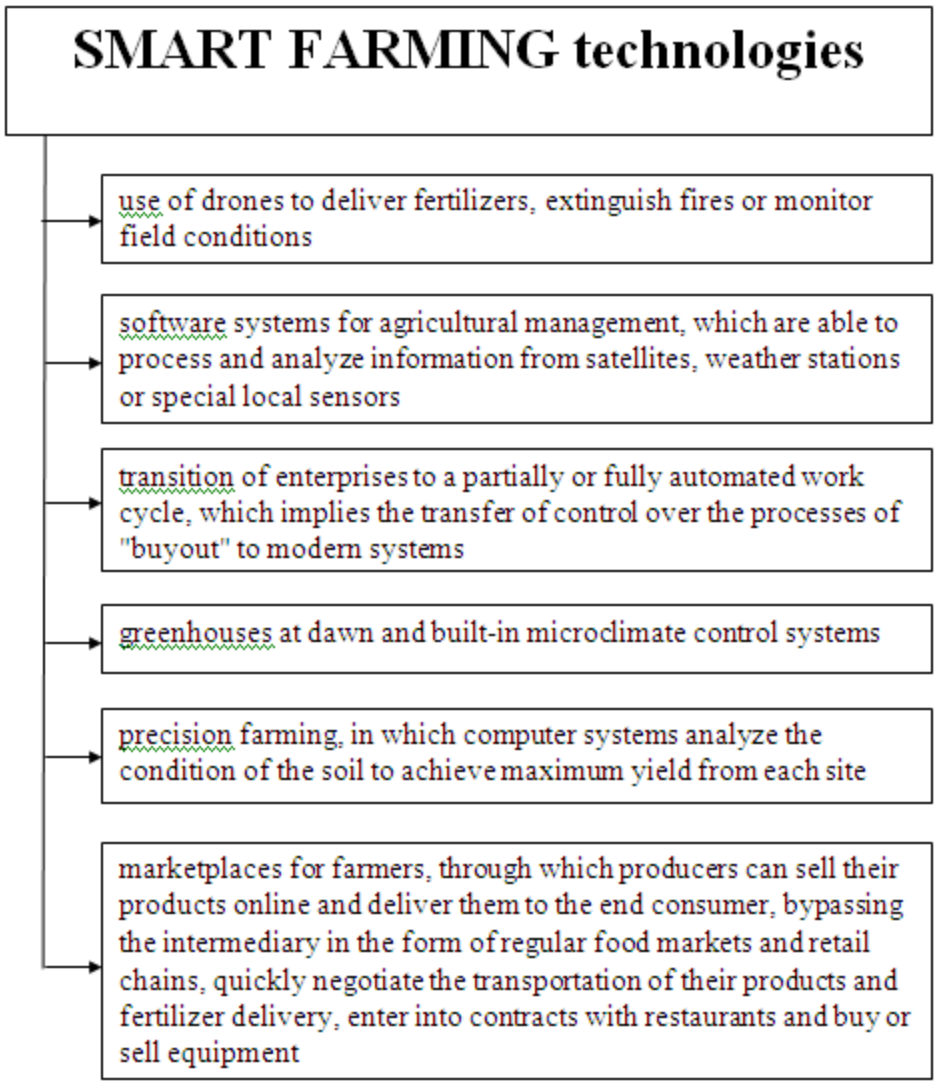

Figure 6. Smart farming technologies

With regard to digital technologies, which have the expected average impact on the value chain of agricultural production, scientists have a mile:

1. Blockchain is an ever-growing list of records, called blocks, interconnected by cryptography. The block in the blockchain contains the encrypted hash (memory) of the previous transaction and other important information, time characteristics, transaction data, etc;

2. Global Navigation Satellite System (GNSS), which is used in the program to determine the location of assets based on satellite data (for example, Global Positioning System (GPS), Global Navigation Satellite System (GLONASS), Galileo, Beidou, etc.). These systems can be easily extended to small and medium-sized agricultural enterprises;

3. Virtual reality (VR) is an interactive experience in a real environment. This is a very innovative way that will have a big impact on the performance of agricultural enterprises in the long run;

4. Unmanned aerial vehicle (UAV) or UAV - successfully used in the activities of agricultural

enterprises;
5. Geographic Information Service (GIS);
6. Intelligent biological sensors and high-tech sensors (built-in data modules) (Boltyanska & Komar, 2018; Komar, 2019). The practical application of these technologies will allow agricultural managers to make wise and successful management decisions based on the benefits of precision farming with the help of satellite navigation equipment, space imagery, special software and satellite monitoring of agricultural land.
Intermediate technologies that have less of an impact on the agri-food value chain can help to implement certain innovative solutions and are a necessary condition for the digitalization of agricultural production. Such experts include:
1. Broadband Internet is a broadband network used for data transmission that can transmit different signals and types of traffic (Romanenko, 2016).
2. E-commerce platform - software technology solutions based on other programs, processes or technologies (mainly digital commerce).
3. Information and communication technologies (ICT).
4. Agricultural mobile applications used for internal demand of enterprises and external communication.
5. Mobile messenger that improves communication and information component of agricultural production Consider the possibility of rapid exchange of information 24/7; 6) Agricultural forums and agricultural online programs (professional services) aim to improve the efficiency of information reception and professional awareness of farmers (Boltianska et al., 2020).
Given that the digital process of agricultural enterprises is implemented using cloud technologies; its management is based on a certain algorithm of remote work.

Usually the digitization of the enterprise begins with the spontaneous digitization of information data sets, which becomes a kind of large information. On the basis of grouping of big data in activity of the agricultural enterprises perspective branches of technics can be entered. Therefore, the complete digital transformation of agribusiness will allow you to perform any task without being in the corporate office, conduct business negotiations on the Internet and manage production and other business processes and more.

To effectively use the precision farming system, it is recommended to use the online service PreAgri (precision farming) for advanced planning, control and analysis of field work, which can effectively manage the application of fertilizers, pesticides and pesticides. Improve the process of managing the consumption of fuels and lubricants, labor, etc. The plan exchanges data with field equipment, controls the NDVI (vegetation) index, monitors mechanical movement and automatically generates reports on agricultural products for the entire land fund. The company will be able to apply fertilizers, plant growth regulators and pesticides in the required quantities locally and on time. It should be noted that the integration or integration of certain digital technologies has a synergistic effect, which is reflected in improving their efficiency. Especially

combined use of the Internet of Things, big data and artificial intelligence, as well as artificial intelligence and robotics.

Therefore, certain digital technologies are designed to reduce risks in agricultural production. For example, the use of drones can create detailed soil maps, control plant damage, determine the type and severity of crop disease, and set thresholds for codes. The use of micro aviation in agriculture can provide more accurate crop development and be ineffective at the initial stage to identify problem areas, the so-called "bottleneck", which will significantly improve agricultural management (Boltyansky & Boltyansky, 2016; Bondarenko et al, 2021). Global GPS positioning allows you to control the actual location, movement and use of agricultural machinery.

Conclusion

In general, as cooperation between agricultural production chains improves, the use of precision agriculture is beneficial to the entire value chain. Thanks to the introduction of digitalization in the activities of agricultural enterprises, the process of adaptation to new working conditions will be faster and better. Therefore, thanks to the digitization of agribusiness, the amount of materials and other resources was significantly saved, and execution time and production were optimized. Due to the systematization and grouping of data, the cost of document circulation is reduced, the process of accumulation and use of information is stimulated and production and economic indicators of agricultural enterprises are improved, which will help increase their competitiveness in the long run.

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