Organic agriculture and structural investment: innovative proportions of the food sector

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Abstract. Organic agriculture, ensuring food quality, is under competitive pressure from both high-intensity technologies and environmental requirements. In the agricultural economy, there are significant risks of reducing the investment attractiveness of agriculture, which is slowly but surely being transformed into a certain biochemical corporation. Investments in high-intensity agriculture, a priori having a high return, form a different industry structure from the traditional one and, as a result, a biochemical model of nutrition. It is necessary to establish parameters of structural proportions in the agricultural economy, the achievement of which would ensure the implementation of the strategic goal of food security. In this case, the investment sphere should be supplemented with a structural investment mechanism that will provide monetary resources for the specified structural transformations based on the principles of science-based planning.

1. Introduction

The world population growth is impressive, surprising, and disturbing. In 2019, the world’s population was more than 7.7 billion people, which is three times higher than in 1950. By 2050, another 2 billion people will be added, which will undoubtedly require drastic changes in the food sector. [1] This is primarily due to the growing number of people suffering from chronic malnutrition. In 2018, their number exceeded 820 million people. [2] A steady increase in the number of people suffering from hunger is beginning to take shape. The Secretary-General’s annual report on “Progress in achieving the sustainable development goals” indicates that conflicts, droughts and climate change disasters are the main obstacles to success in the fight against hunger. [3] However, it is wrong not to take into account the exponential growth of population, which generates a continuous and steady increase in the total global demand for food.

The global food market is mutually compensated by two factors that keep it in balance: the growth of the number of consumers and technological innovations that increase the efficiency of food production. Global economic interaction has formed a steady trend of food quality decline, understood as further expansion of high-intensity, digital-based production of synthesized food. In this case, the intensification of agriculture will be a necessary means to cover the food needs of the world’s population. [4] Organic agriculture, from the point of view of investment attractiveness, does not have a competitive advantage to ensure the production of high-quality food in volumes corresponding to the rate of increase in the human population. The mechanism of the food market actually denies organic food products due to their low added value and marginality compared to “industrial” production. It is not possible to ensure the quality of food without a structural adjustment of the agricultural economy,
which provides for an increase in the share of organic food production. But any structural transformation is made possible by investment spending. Investment in agriculture is focused on structural transformations, which, in turn, provide the required level of return on these investments. [5] The optimality of the constructed proportions of the agricultural economy is verified by the profitability, which ensures attracting investment in the development of organic agriculture. If the level of return on investment reaches a threshold that allows positive investment decisions to be made, then the investment should be identified as structural.

2. Materials and methods
The influence of factors on the structural dynamics of the agricultural economy is considered through the prism of the classical model of market equilibrium. In the research, the determinants of global food demand, which form the fundamental market trends, are the size of the Earth’s population and high-intensity food production technologies. All other factors are accepted with the proviso “all other things being equal”.

The determinants of supply and demand, respectively, are quite strongly interrelated, and it is very difficult to establish a cause-and-effect relationship. It is reasonable to assume that innovations in agriculture allow the population to grow at a rate that has never been seen before in the history of civilization. The opposite assumption is also possible: the growth of the world population encourages the development and implementation of high-intensity food production technologies through increasing demand [1-5]. In addition, we should not exclude the cyclical nature of the relationship between the considered determinants of supply and demand.

If $T=f(P)$, then population growth leads to higher food prices, and this growth is offset by investment in the development of high-intensity technologies. Current demand $D$ increases to the level $D'$. If $P=f(T)$, then the cheapening of food products stimulates the growth of the world’s population, and the current supply $S$ increases to the level of $S'$. As one of the possible options, the balance in the world food market stabilizes food prices $P^0$, despite the intensive increase in the population. In the long-term development of technologies and the material and technical base of food production, a stable price level will “find” a critical volume of production, which will be the result of applying only intensive technologies. The population size will be such that organic production will be “out of the game”, i.e. the solution to the problem of hunger and malnutrition will be possible only under the condition of chemical and genetic processes, abandoning the bio-organic methods of food production. Examples include urban vertical farms, poultry cage keeping, stall keeping of farm animals, and technologies for cloning and growing living tissue from stem cells. Scientific and technical progress in the agricultural economy is launched in this direction: the replacement of natural processes with processes that remove any biological restrictions. Does humanity have the right to do this? Will the growth of the human population in such conditions lead to its death? The questions are more philosophical and ideological than economic. However, it is resource constraints that will shape the paradigm of sustainable human development.
The formation of a given or desired ratio of organic and intensive agriculture will depend on the structure of investment flows directed to the agricultural economy. Structural investments allow achieving the specified production proportions; the trigger for their movement is an increased return on investment resources in those areas of the national economy that are subject to transformation. At the stage of market formation and stable demand, the state provides increased returns on investment activities, applies fiscal instruments, providing direct support to citizens, and sets the required technological standards.

3. Results
It is considered that the Russian agriculture is still largely relict, not subject to the degree of intensification that is characteristic of the developed economies of the world. This is a positive factor that affects the quality of food. However, recently, national agriculture has become more intensive, more industrial, and more digital. Agricultural enterprises inevitably lose the diversified nature of agricultural production. Industry specialization of livestock enterprises practically buries traditional agricultural enterprises that produce a wide range of agricultural products from grain to milk with processing elements. During 2000-2017, the amount of mineral fertilizers applied per 1 ha of acreage increased by 2.9 times, in contrast to organic fertilizers, which increased by only 66.7% to 1.5 tons per 1 ha of acreage, which is undoubtedly very insufficient [6].

The number of cattle and pigs is concentrated on large specialized livestock enterprises, which creates not only environmental, but also epidemiological problems. Interaction with other agricultural enterprises requires additional costs. Concentration of livestock leads to formalization of the livestock industry as a whole. Even in the personal subsidiary farms of citizens, industrial life-support products are used for livestock. Surprisingly, when the number of cattle and pigs decreased by 4.4% over 17 years, the application of organic fertilizers even increased by 0.6 million tons, which was only 0.9%. At the same time, the yield of grain and leguminous crops increased by 1.9 times. In general, there is unrestrained, unrestricted intensification of agricultural production to the detriment of food quality.

The spread of organic farming in the Russian Federation in modern conditions will slow down the pace of expanded reproduction, and the investment attractiveness of the industry as a whole may decrease, as a capacious and steadily growing organic food market in the country has not been observed yet. Federal Law No280-FZ “On organic farming and amendments to certain legislative acts of the Russian Federation”, which came into force in 2020, laid the institutional foundations of the organic food market and defined the contours of economic activity, but effective practices still need to be developed and replicated. In this context, state regulation of the organic food market will require significant financial resources, which could be attracted through the State program for the development of agriculture and regulation of markets for agricultural products, raw materials and
food. This State program has played a decisive role in the development of national agriculture, transferring it to an industrial basis using intensive technologies. Maintaining the current trends in the agricultural sector in the future to deepen the intensification of reproduction processes will obviously contradict the task of providing the population with high-quality food. In the last decade, systematic measures have been taken to develop the production of high-quality and balanced food products [7].

Within the framework of the State program for the development of agriculture, the project stage has begun to be implemented since 2018, which a priori assumes the achievement of a new quality of economic growth in the food sector. Obviously, the process of accumulating quantitative changes in the agricultural economy ended, and radical transformations of reproduction processes in the industry were required. Here, the project method of change management is suited best. State projects should be aimed at changing the structural proportions in agriculture, the parameters of which are set by the state itself, based on an understanding of the threats and limitations of socio-economic development of the country. It is necessary not only to get investment income, but also to create positive social changes, reduce the negative impact on the environment, and comply with ethical standards [8].

To increase the acreage certified for organic production, financial resources will be required that can implement the structural transformation of both the national agriculture and the national food market. Stimulating the production of agricultural products requires additional support measures, including at the level of investment and capital expenditures [9]. Within the framework of state projects, two sources of financing for the proposed activities are determined: budget allocations and extra-budgetary funds, which are understood as credit resources of commercial banks. In both cases, we cannot talk about investment, especially about structural investments. Any investment must be returned or repaid, which is not a characteristic feature of budget financing, where the only significant is the targeted use of funds allocated from the budget [10]. Bank loans, provided on the condition that they are repayable, are focused on generating income in the form of interest, rather than profit, as in the case of classic investment. For structural investments, relevant structural ratios in the reproduction process must be specified, which is clearly absent in government projects. However, due to the lack of development of financial markets, funds raised within the project from any sources are considered investments a priori, which is not entirely legitimate. Taking into account that projects by default should structurally transform the agricultural economy, such quasi-investments can be taken as structural.

In the investment sphere, the formation of financial flows that can transform reproduction ratios in a given direction is the essence of the mechanism of structural investment. In the economic system, this mechanism is a necessary component that functions in various forms and manifestations. The formation of a new economic structure always requires direct allocation of investment, and this new structure is considered correct by society and the state [11]. Obviously, this is how new markets are formed, which subsequently function using traditional investment technologies and interaction mechanisms.

The author’s calculations suggest that to ensure parity of consumption of organic food by residents of the United States and Russia in Russian agriculture, it is necessary to certify the additional 0.8 million hectares for organic production, bringing the total area of certified land to 1.05 million hectares. The market capacity of organic food is 160 million dollars, of which the share of domestic producers is only 10%. The growth potential of domestic organic food production allows increasing sales over 4 billion rubles. However, the expansion of the market will be limited by insufficient solvent demand of the population, and competition for consumers by domestic producers is likely to be lost due to the fact that the competitive advantages of Russian enterprises have not been fully obvious yet. Therefore, it is necessary to create conditions that allow replacing foreign products with domestic ones on the organic food market. In other words, the market share of national producers can reach 42%. This requires structural investments that allow for changes in market proportions and ratios. By influencing the cost of organic food production and stimulating consumer behavior in a given direction, it is possible to ensure the development of the organic food market in Russia on an innovative basis that guarantees the safety, environmental friendliness and naturalness of food.
State support for organic food producers should start with funding for organic certification of agricultural land. To achieve the target number of organic producers, the annual cost of land certification will be at least 300 million rubles [12]. If certification for 2000 enterprises is made free of charge, budget allocations will be invested in creating a federal network of institutions that certify land for organic food production. After 8-10 years, certification should be declared fee-paying and costs should be included in the price of organic food, shifting the burden of these costs to consumers of this product. In addition, public and private partnerships can attract private investment in the creation of organic food market infrastructure - a certification network. Consequently, the budget funds invested in the creation of this mandatory element of the organic food market will be returned. Taking into account that the cost of certification is determined by the state, it is quite possible to ensure a ten percent return on this activity in full accordance with the target indicators of profitability established by the State program for the development of agriculture.

Unrelated per-hectare support for organic food producers by definition increases their investment attractiveness, which is associated with cost compensation that equalizes the conditions of management in comparison with the use of intensive technologies. However, in the context of low consumer demand associated with a low level of disposable income of potential consumers, investment risks are not covered by compensation payments.

To attract private investment, unrelated per-hectare support for organic producers is an effective tool that has been tested by most countries with developed agriculture. Budget financing, by reducing the cost of organic food production, helps to increase production and tax revenues. In this case, it is logical to consider budget expenditures as structural investments that change the share of national producers in the market of organic products. If we determine per-hectare financing in the amount of 400 million rubles annually, then the cost of organic food production will decrease by 10%, which will reduce market risks, increase investment attractiveness, and also contribute to improving the competitiveness of national organic producers. The transmission mechanism of the organic food market returns the injection of per-hectare support to the budget with tax revenues in a certain ratio, the definition of which is a promising direction for studying the investment support of the food sector of the national economy. Budget funds that are subsidized in reproduction processes in order to change the proportions and structure of economic interaction are returned by tax revenues, and due to this circumstance, they perform the functions of structural investments, forming innovative proportions of the food sector.

In these circumstances, direct support from consumers may be more appropriate. For example, in the United States, the implementation of food security measures through the supplementary nutrition assistance program amounts to $ 73.2 billion [13]. Using digital technologies, it is possible to achieve targeted use of budget subsidies provided to the population for the purchase of organic food produced by national enterprises. In addition, various educational and health organizations could also receive targeted subsidies (school meals, hospitals, etc.), ensuring national demand and strengthening the state’s status as a social state. At the same time, the price of organic food will be higher than the price of other products, and how much - this difference will be regulated by market mechanisms. And the higher the difference, the more investment in organic agriculture can be expected to increase. Increasing the capacity of the organic food market will increase tax revenues of the budget, in some part compensating for food subsidies to the population. In any case, food subsidies and direct per-hectare support can be used interchangeably as non-price determinants of supply and demand to ensure an intermediate balance in the organic food market and its regulation and expansion.

For the empirical analysis of the effects of non-price determinants on the organic food market, it seems appropriate to achieve parity in the amount of products that will result from changes in supply and demand. In this case, the subsidized supply of organic food will be completely bought out of the market by stimulated demand. And if the share of national producers increases by more than the amount of subsidized production, then it is legitimate to conclude that private sources have been added to structural investment.
One of the already discussed tools for stimulating demand in the Russian food market is food cards issued to certain categories of citizens and periodically replenished from budget sources. This is a direct form of social support for the population, related to the range of products purchased and the country of origin.

By issuing food cards with a total transfer of funds in the amount of 200 million rubles and setting a 50% discount on the purchase of organic food produced by national enterprises, the state is able to stimulate demand in the amount of 400 million rubles, which corresponds to the volume of subsidized supply. Thus, it is almost guaranteed that the organic food market is growing by more than 40% relative to the share of national producers: if about 960 million of the production of organic food by national enterprises is estimated, the growth of this indicator will be more than 40%.

In general, about 900 million rubles, of which 300 million rubles (more than 33%) certification costs, 400 million rubles (more than 44%) unrelated per-project support and 200 million rubles (more than 22%) subsidies to consumers will allow introducing an additional 0.8 million hectares into organic turnover and increasing the share of national enterprises in the Russian market of organic food over 42% [2].

The question of the duration of the period of achievement of the set proportions of the food sphere remains open. Here it is necessary to make a methodological digression. The development and use of econometric models for the formation and further development of the organic products market is counterproductive because it is impossible to take into account the factors and restrictions that will affect the formation of its structural proportions. The unknown in economic interaction usually manifests itself in the image of a “black swan” and destroys the econometric construction of the organic food market model. It is advisable to determine the structure of investment expenditures and empirically identify the dependence of the transformation of the proportions of the organic food market on structural investment. At the same time, the concept of the future is constructed based on the laws and imperatives of the neoclassical model. Based on Popper’s understanding of determinism, the laws – trends of market interaction allow projecting adequately the investment structure to the future proportions and ratios of economic interaction in the organic food market.

Thus, it is reasonable to determine the scale and direction of structural investments in the organic food market and empirically determine quantitative changes over a set period. For agricultural production, the period that allows getting reliable information about the ongoing transformations is undoubtedly the agricultural year, during which the reproduction cycle is completely completed. By financing the one-time creation of the certification infrastructure of the organic food market, subsidizing its producers and consumers, placing markers of structural changes, they can track the increase in the share of land certified for organic production, as well as the increase in the market share of national organic producers [1].

Table 1. The impact of structural investments in the proportions in the food sector [1].

| Markers of structural proportions                        | Transformation of structural proportions under the influence of investment expenditures |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------|
|                                                           | initial | expected |
| Share of national producers in the organic food market, % | 10.0    | 42.0     |
| The share of certified organic land in the total volume of agricultural land, % | 0.1    | 0.5     |
| The share of land certified for organic production per one resident of the Russian Federation, m²/person | 17.1    | 70.9 |

Structural investments in Russian agriculture will ensure that the country’s organic food consumption is comparable to the level of consumption already achieved in the United States. It is necessary to monitor the per capita supply of certified organic land, which is a necessary condition for increasing the share of the population for which quality food becomes available. Having reached 71 m² of certified land per capita, Russia will be able to become a leader in achieving the most important
global goal that modern humanity strives for – to provide access to high-quality and safe food while preserving the environment.

4. Summary
The development of organic agriculture at the present stage is difficult; it loses competition to high-intensity food production. The permanently increasing demand for food is a consequence of the accelerating growth of the world’s population, which encourages the widespread use of intensive technologies, but leads to the degradation of food quality.

The solution to the problem of food quality is associated with the transformation of the production structure of the agricultural economy. The volume of organic farming depends on the state’s efforts to create a market for organic food and ensure its sustainable functioning. Investment expenditures of all participants in the food market, directed to expand the production of quality food, are structural investments that change the reproduction proportions in the agricultural economy. Institutionally, the state must create the necessary conditions for the sustainability and further expansion of the organic food market, through which structural investment will ensure the required changes in reproduction proportions. The functioning of the organic food market will automatically adjust the proportions of the food sector to the dynamics of the population and changes in its consumer preferences. Thus, structural investment becomes a necessary condition for both technological and institutional renewal of the food sector of the national economy.

5. References
[1] UN Population [Electronic recourse]. URL: https://www.un.org/ru/sections/issues-depth/population/index.html (access date: 07.02.2020)
[2] UN Food [Electronic resource]. URL: https://www.un.org/ru/sections/issues-depth/food/index.html (access date: 07.02.2020)
[3] UN Goals of sustainable development OOH. [Electronic recourse]. URL: https://www.un.org/sustainabledevelopment/ru/progress-report/ (access date: 14.03.2020).
[4] Agriculture and global problems of humanity [Electronic resource]. URL: http://agropaktik.ru/blog/390.html (access date: 17.04.2020)
[5] Lipchenko E A 2019 Agricultural production structure and structural investment (Nikon readings) 24 133-135
[6] Statistical yearbook of Russia 2018 Moscow, Russia: Rosstat
[7] Viktorova N A, Tsareva G R, Ignatyeva T V 2019 Approaches of food industry enterprises to the development of lines of healthy food products (Russian Economic Bulletin) 2 (5) 178 – 183
[8] Dobrolyubskaya E L 2019 Circular investment as a condition for transition to a new model of the economy (Russian Economic Bulletin) 2 (6) 212 – 217
[9] Baleevskikh A S 2019 State support for investment infusions in the agro-industrial complex of the Russian Federation – the most important factor in the development of the industry (Modern Economy Success) 5 23 – 26
[10] Glazyev S Yu 2020 On the deep causes of increasing chaos and measures to overcome the economic crisis [Electronic resource]. URL: https://zen.yandex.ru/media/karaulovlife/zakliuchitelnaia-chast-doklada-akademika-siguazyeva-omerah-preodoleniia-krizisa-5e9dc242b6e0833eb9ee609a?&utm_campaign=dbr (access date: 10.04.2020)
[11] Ivanter V V 2017 Structural and investment policy (Economic strategists) 4 22-27
[12] Korshunov S A, Lyubovedskaya A A, Asaturova A M, Ismailov V Ya, Konovalenko L Yu 2019 Organic agriculture: innovative technologies, experience, prospects Moscow, Russia: Rosinformagrotech
[13] Pshikhachev S M 2019 Sustainable development in rural areas of the United States: the adequacy of the current challenges (Modern Economy Success) 4 128 – 133