

Development of Small Farms in the Agro-Industrial Complex

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Summary

Modern small farms are important link components in the structure of the world agro-industrial complex. It ensures the food and nutritional sustainability of the country exclusively at the local regional level. The purpose of the research is to examine the role of farming in ensuring nutritional security and food stability based on the analysis of the Food Sustainability Index (FSI). Research methods: modeling, abstraction, analogy, analysis, synthesis, formalization, logical abstraction, theoretical cognition, systematization and classification, abstract-logical, etc. Results. Having analyzed the Food Sustainability Index for 2018, it has been established that there is a lack of a clear relationship between the pace of economic development and the level of food and nutritional sustainability. In addition, this study has identified the countries with the largest number of small farms, as well as the number of farms within the region. The correlation between the size of the farm and the area of agricultural land that it cultivates has been determined. The problems faced by small farms in the process of their activity have been analyzed. The programs implemented in the field of agro-industrial complex development by international profile institutions have been systematized. Particularly, the regional structure of agricultural development programs under the guidance of IFAD is defined, as well as the areas to which they are directed. Specific measures taken by governments to stimulate the development of small farms have been outlined. Reasonable conclusions have been formed based on the study. The direction of future research is seen in the assessment of the export potential of small farms in terms of range, volume of export deliveries and geographical direction of movement of their products.

Key words:

Small Farm, Agro-Industrial Development Programs, Food and Nutritional Security, Food Sustainability Index, International Funds.

1. Introduction

In the practice of functioning of the world agro-industrial complex (AIC) the thesis about the key role of food supplying of small farms has long been confirmed in the world. The perception of small farms as poor is contrasted with the functioning of small farms in countries such as Japan, Norway, the Republic of Korea and Switzerland. Vietnam and Thailand are showing significant success in

the development of the country's economy due to agriculture.

Large agricultural enterprises do not always benefit from economies of scale; small farms often have higher yields per hectare. After all, in fact, small farms are often more productive per hectare, provided that agro-environmental conditions and access to technology are the same, employment on the small farms per hectare is usually provided to a greater extent than large industrial farms, which allows to achieve the best results.

The necessity of the farm development in the structure of the country's economy is caused by the fact that agriculture is just a business, regardless of the scale of its realization. After all, when small farms succeed, additional funds can be used to transform rural areas into a thriving economic growth.

In addition, when the rural economy is developed, it leads to an increase in demand for locally produced goods and services, which in turn leads to an increase and growth in employment in non-agricultural enterprises that provide services for processing agricultural products and small-scale production.

The developed rural economy contributes to the growth of demand for goods and services of local production. This, in turn, leads to an increase in employment in non-agricultural enterprises, providing services for processing products of the agricultural sector, as well as small-scale production.

Purpose of the article: to study the role of farming in ensuring food security and food stability based on the analysis of the Food Sustainability Index (FSI).

Research objectives of the article are as follows:

- to determine the dependence of food security on the level of economic development of the national economy;
- to indicate the dominant trends in changing the correlation between the size of the farm and its productive area of land;
- to assess the state system of support for farming in the context of the development of globalization trends.

2. Literature Review

The processes of globalization lead to the transformation of modern economic systems. Sustainable development of

territories is the priority of transformation. It provides the comprehensive formation of relevant regional programs of national economics, aimed at prioritizing regional social-economic growth by stimulating entrepreneurship in various sectors of the economy, and especially in agriculture. Industrial production is concentrated in large cities (industry has launched the creation of modern large cities) and relatively closed areas (around mineral deposits). However, rural areas remain only a center for providing raw materials for the light and food industries and a source of labor resources for industry. Chemicalization of agricultural production has led to negative environmental consequences in the consumption of agricultural products. Therefore, the development of agriculture at the regional level focuses on small farms. Due to the cost of agrochemical technologies, farmers are developing the production of environmentally friendly end products of crop and livestock production; consequently, this contributes to increasing employment on farms and improving the living standards of the rural population.

Despite the technological development of agriculture, the trend of its mechanization and chemicalization, which contributes to its high productivity, the problem of food security in the coming decades remains one of the most important issues of nowadays [1]. Small farms play an important role in reducing poverty, providing the population with means of subsistence, and increasing the well-being of rural residents. In the process of overcoming the severe consequences of the crown crisis, weaknesses and gaps were identified in all areas - in particular, in the economic sphere [2].

According to the definition provided by the Food and Agricultural Organization of the United Nations, small farms include land area that is not more than 2 hectares, not including fishermen and other small food producers [3]. The vast majority of small business owners live in rural areas, although urban and suburban farms are becoming an increasingly important source of supply for urban development. Women play a crucial role in the system of small business owners and are responsible for producing food crops, especially where the farming system includes both food and cash crops [4].

Investigations, conducted by the International Institute for Environment and Development, emphasize the need to develop small-scale agricultural structures [5]. According to its viewpoint, small-scale farming is crucial for food production and livelihoods for millions of people in developing countries. Small farms are becoming very common in Europe, where they play an important role in providing healthy food, income and additional opportunities for people in rural areas.

Regarding the geographical location of agricultural producers, according to studies conducted by Fanzo, J., the vast majority of large farms with a size of more than 50 hectares are located in North and South America, Australia

and New Zealand [6]. They produce 75-100% of all cereals, livestock products and fruits. Small farms of less than 20 hectares are located in sub-Saharan Africa and Asia, including Southeast Asia and China. Small producers generate 75% of the world's food stocks, 50-65% of which are major food groups. At the same time, small farms in the same regions produce about 30% of most food products, which also occupies a significant share. The share of small farms in these regions provides the production of about 30% of most food products. This is a significant contribution to the production structure of the agro-industrial complex of this geographical region.

Nowakowski, K. notes that small farms face a number of obstacles in the process of maintaining their own livelihoods, as they have to cope with the changing climate, drought, severe storms and rains at their own expense. In addition, it is extremely difficult to find regular customers, as the global food supply system requires a constant flow of quality products throughout the year, despite the seasonality [7].

However, not only these factors threaten small farms, but possibility of their development makes some farms vulnerable to risk, which can provoke the continuation of policies aimed at survival. It maintains the poverty of small owners [8].

Lowder, S., Skoet, J. and Singh, S. believe that despite the key role of small farms in achieving global food security and nutrition, they are a vulnerable group that is often neglected in development policy development [9]. The situation is exacerbated by the fact that the vast majority of small farms exist in poor and starving countries.

3. DATA AND METHODS

In the process of investigating small farming, the modeling method has been used, because farming is, in fact, a small model of the agro-industrial complex, which reflects all the patterns of this production only on a much smaller scale.

The application of the method of analogies is due to the fact that a small farm is an integral part of the agro-industrial complex and uses the developed technological operations of agricultural production.

Due to the impossibility of taking into account all the factors that determine the behavior of small farms (food potential of soils, seasonality of agricultural production by geographical and climatic parameters, the level of use of innovative agricultural technologies, etc.), the method of abstraction has been used. In addition, methods of analysis, synthesis, formalization, logical abstraction, theoretical cognition, monograph, systematization and classification, abstract logic, etc. have been used in the academic paper.

The following indicators are analyzed in the article in order to reflect comprehensively the research topic:

1) Food Sustainability Index [10];

- 2) Share of farms by region;
- 3) Worldwide distribution of farms and farmland, by land size class;
- 4) The number of programs implemented by IFAD at the end of 2019 in the regional context, as well as their sectoral distribution [11].

4. RESULTS OF THE STUDY

The world's population is growing every year and the resources' consumption is also growing. Given the fact that the basic human need is the need for food, the problem of food availability necessary for normal life is acute. At the same time, the key source of food replenishment is the agro-industrial complex and its development should be one of the main areas of economic activity of each country. Taking into account the growing role of food security in all

countries, the Food and Agriculture Organization of the United Nations (FAO) has introduced the concept of "sustainable food system". It means the state's achievement of a state of food and food supply that does not violate economic, social and environmental future generations.

In order to assess the sustainability of food industries, the Food Sustainability Index (FSI) is determined, the implementation of which is the result of a joint project of the Economist Intelligence Unit with the Barilla Center for Food & Nutrition (BCFN) Foundation. FSI is based on 58 indicators and studies the degree of existing food sustainability on three main components, defined as its foundations: Sustainable Agriculture, Nutrition Challenges and Food Loss and Waste [12]. In order to formulate conclusions about the food sustainability of different countries in Table 1, this indicator is analyzed in terms of its components for 2018.

Table 1: Food Sustainability Index, 2018

Country	Overall	Food loss and waste	Sustainable and agriculture	Nutritional challenges
Australia	71.8	77.5	73.4	64.6
Belgium	66.2	55.1	74.6	68.8
Bulgaria	54.5	52.4	53.7	57.3
Brazil	65.5	69.1	64.2	63.2
Canada	75.3	82.1	73.0	70.9
Croatia	71.4	77.1	66.3	70.9
The Czech Republic	73.5	80.4	74.5	65.6
France	76.1	85.8	71.0	71.4
India	66.4	81.1	65.5	52.5
Japan	73.8	71.6	73.4	76.5
Jordan	62.8	65.4	64.0	58.8
Lebanon	62.4	64.5	65.1	57.6
Morocco	63.5	62.1	69.4	58.9
Mozambique	63.0	76.9	68.4	43.7
Poland	71.3	71.5	78.0	64.3
Russia	56.1	58.0	53.9	56.5
South Africa	56.4	60.5	52.4	56.3
Spain	70.9	78.9	66.6	67.3
Uganda	68.7	77.1	68.9	60.2
United Kingdom	70.0	78.9	61.5	69.7
The United States	68.6	77.7	68.6	59.5
Zambia	67.2	77.9	72.7	51.1

The analysis of the data presented in the table makes it possible to draw a conclusion about an ambiguous tendency of an index of food stability in terms of separate countries. In particular, the Food Sustainability Index of countries such as India, Jordan, Uganda and Zambia is within the level of countries such as Belgium, Spain and the United States. This suggests that the level of sustainability of the food industry does not depend on the rate of economic growth of the country, as the level of development for the example of Zambia and Belgium is at diametrically opposite ends. At the same time, in terms of the constituent

elements of the Food Sustainability Index, these countries are ahead of developed ones. A clear example of this is the indicator for the component Food loss and waste for Zambia, which is at 77.9, while in the United States it is 77.7; in Japan 71.6%, Belgium 55.1, and in Australia 77.5. A similar trend applies to countries such as Mozambique - 76.9 and India, where the value of Food loss and waste in general reached 81.1.

Sustainable and agriculture is the other component of the index that we have mentioned before. Here the upper values are somewhat at the lower level. In particular, among the

proposed list of countries, Poland was the most important - 78.0, as well as Belgium and Japan - 74.6 and 73.4. The lowest values of indicators are seen in Bulgaria, Russia and South Africa. In Zambia, the component of Sustainable and agriculture is 72.7, Uganda - 68.9, Morocco - 69.4, and for India - 65.5. The final element of the studied index is Nutritional challenges, the highest values of which are seen in developed countries and the lowest in Africa and Asia.

At the same time, it is believed that the development of farms in the structure of the agro-industrial complex of countries allows achieving a higher level of food and nutrition supply. Therefore, let's consider their share in the structure of regions using Figure 1.

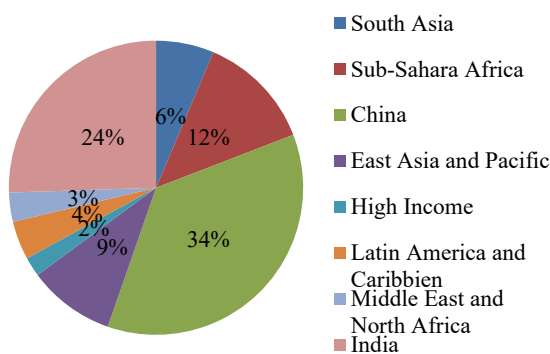


Fig. 1. Share of farms in different regions of the world, Eurostat (2019)

Thus, analyzing the data shown in the figure, we can conclude that the largest share of farms is in China and India: 34% and 24%. They are followed by Sub-Saharan Africa - 12% and East Asia and Pacific - 9%. In addition, 6% is in South Asia. The smallest farms are developed in high-income countries - 2%, and Middle East and North Africa - 3% [13].

According to data published by the FAO, small farms are beginning to act as a driving force in the structure of the country's agro-industrial complex. The largest concentration of small farms is observed in Africa, Latin America and East Asia. Their concentration is much lower in the countries of the former socialist camp (Table 2) [14].

Table 2: Countries where most of the farms are small

Region	Countries
Africa	Algeria, Angola, Botswana, Congo, Guinea, Guinea-Bissau, Lesotho, Madagascar, Mali, Morocco, Mozambique, Namibia, Zambia
Americas	Chile, Guyana, Panama, Paraguay, Peru, Venezuela
Asia	Iran, Jordan, Kyrgyzstan, Lebanon, Malaysia, New Zealand, Turkmenistan, Yemen
Europe	Bulgaria, Czech Republic, Russia

An analysis of the statistics presented in Tables 1 and 2 makes it possible to conclude that the countries with the most developed small farms have a high level of food and food sustainability (Morocco, Mozambique, Zambia and Jordan).

At the same time, the data published in the annual report of Eurostat for 2019 show the following correlation between the number of farms and their area (Table 3).

Table 3: Worldwide distribution of farms and farmland, by land size class

Indicator	<1	1-2	2-5	5-10	10-20	20-50	50-100	100-200	200-500	500-1000	>1000
Share of farms	70	14	10	3	2	1	1	1	1	1	1
Share of agricultural area	7	4	6	4	5	4	8	6	7	11	39

Thus, according to the data presented in the table, we can conclude that farms with an area of less than 1 ha account for about 70% of all farms in the world; however, at the same time they operate only 7% of all agricultural land. Slightly larger farms - from 1 to 2 hectares, account 14% and they have 4% of the land. Let's sum up the two positions. Small farms occupy 84% of the total farm, but they cultivate only 12% of agricultural land.

Farms with an area of 2-5 hectares account for 10% of all agricultural land and they cultivate only 6% of all available land intended for agriculture.

At the same time, the largest farms, the size of which is more than 1000 hectares and the total number of which is within 1%, occupy more than 38% of all agricultural land in the world. Consequently, the efforts of international organizations and governments, especially whose key

sector of development is agriculture, aimed at increasing the productivity of small farms, which territories are usually less than 2 hectares. They are guided by the fact that in order to stimulate the development of these farms, and, as a result, to reduce poverty, it is enough to increase their productivity or increase the level of income they receive. At the same time, insufficient attention is paid to the development of medium and large farms, which occupy the main area of agricultural land. Only a coordinated policy towards all participants in the agro-industrial complex of the countries will be able to ensure a real result.

Taking into consideration the spread of small farms, any changes in their activities significantly affect the livelihoods of rural areas. Small farms predominate in developing countries, where there is a high level of poverty, limited access to markets and low investment opportunities.

The outlined aspects together create ideal conditions for the global exploitation of these countries. This trend is not new; it has long been practiced to buy or lease land in other countries by such countries, as China or Japan. A great number of population in these countries and the limited land resources have necessitated the outsourcing of food production in other countries [3].

Over the last decade, buying land in the south of our planet has become more popular. We are talking about Africa, Latin America, Central and Southeast Asia. The catalyzer for accelerating land purchasing has been the understanding by the governments of their inability to ensure security and stability of food and nutrition supplying [1]. On the other hand, this trend has a significant negative impact on the difficult conditions of small farms, destroying any opportunities for development. The situation is so because agricultural land is usually bought by medium and large farms.

The problem of passing family agro business to the next generation also has an unconditional negative impact on the activities of small farms. After all, the existence of an effective scheme of transferring from one generation to another significantly affects its long-term sustainability. The situation is exacerbated by the fact that over the years the average age of farmers increases, which indicates the lack of management transition from the older generation to the younger.

In addition, the lack of young generation in the management of small farms has a negative impact on the usage of innovative technologies in their activities, which in turn affects their productivity. Ultimately, this trend will lead to a general decline in small farms, which requires further measures to address the existing problem of inheritance. A clear example of combating this situation is the Rural Development Program, implemented by the EU in Greece, Ireland, Norway, Spain and a number of other countries, aimed at encouraging early retirement of farmers [15; 16]. In addition to this program, EU pursues an active policy of stimulating the development of agriculture in European countries, including the development of the most important participants - small farms. According to the European Commission, the total number of programs in the agricultural sector is 118 [15]. An interesting fact is that the deadline for most of them is 2020, so in the near future we will be able to assess their effectiveness.

In addition, active support for the development of small farms is provided under the patronage of The International Fund for Agricultural Development (IFAD), which began its activities in 1974 [17]. In its annual report, IFAD reports on the results of common work with governments to implement development programs. The number of programs in the regional context as of the end of 2019 is reflected in Figure 2.

Thus, analyzing the data in the figure, we can conclude that the largest number of programs is implemented in Asia and

the Pacific. The total number is 59. In East and South Africa the number is 43. At the same time, the smallest number is in Latin America and the Caribbean - 28.

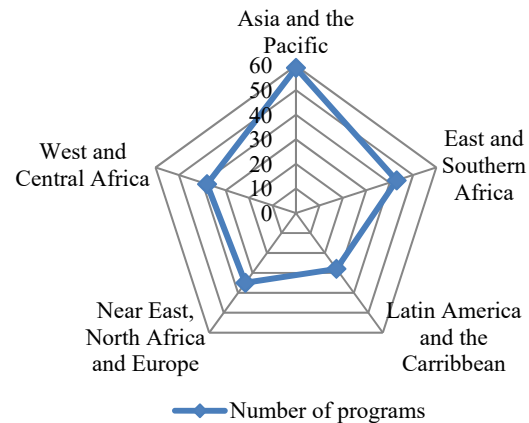


Fig. 2. Number of programs implemented by IFAD by region, IFAD (2019)

At the same time, it should be noted that the programs implemented by IFAD have an extremely wide range of distribution. In particular, as a percentage, they relate to the following areas (Figure 3).

Thus, according to the data shown in the figure, the key direction of the programs is the management of agricultural and natural resources, which are targeted at 33% of the list. This is especially true in the context of increasing limited resources. In addition, 18% of programs focus on market development and related infrastructure. 9% of programs are targeted at small farms, which is also an important indicator of the importance of the development of this sector. The total amount of funding for all programs according to the annual report for 2019 is 8.6 billion dollars.

In addition, governments are taking specific measures to stimulate the development of farms, as well as to prevent the transition of the population from their working place in agriculture to services:

1. Introducing country-specific institutional and cultural restrictions that help to keep people on farms by controlling migration between villages and cities through language, racial and cultural barriers, and legal restrictions on resettlement (China).
2. Creation of an inheritance system, which provides for the division of the farm among several heirs.
3. Establishing restrictions on land market operations: restrictions on farm size (India) or systems of hereditary land rights that limit the possibility of further land consolidation (Africa).

4. Existence of religious and cultural restrictions on the employment opportunities of women in proper sectors except agriculture.

5. Functioning of inadequate social security systems, in which early retirement of farmers is considered as a protective pension.

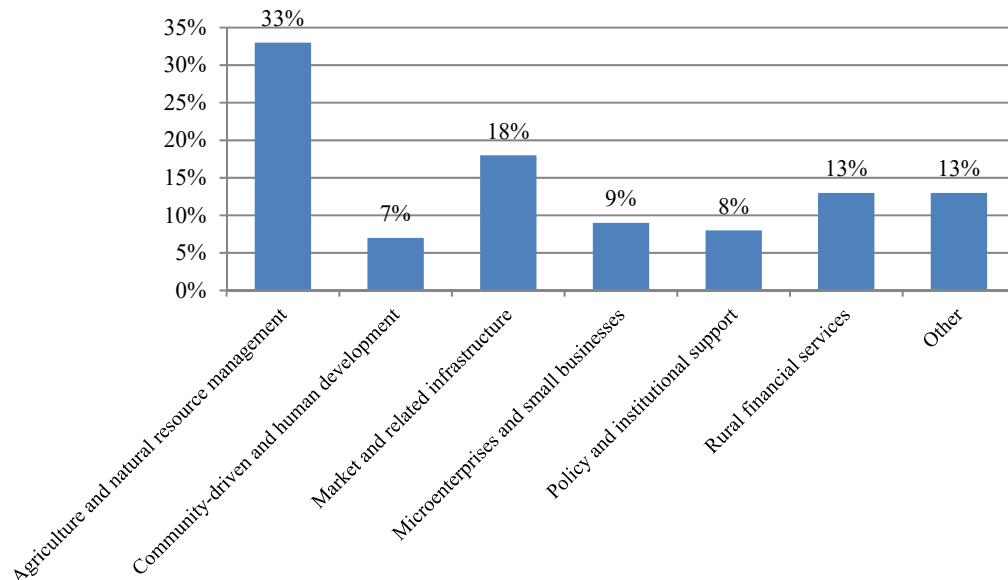


Fig. 3. Sectors targeted by the program as a percentage by the end of 2019 IFAD (2019)

5. Discussion

Based on the study, we can conclude that the development of small farms is extremely important in the structure of the agro-industrial complex of any country. The success of their activities largely depends on the food and nutrition stability of the country, the level of employment, especially in rural areas, as well as the level of independence of the state. So, every year the process of buying and renting agricultural land is steadily growing. A lot of countries are on the way to provide themselves with food not only in the current period, but also in the long run.

Let's consider the main factors that negatively affect the ability of small farms to solve the problem of food security and nutritious stability.

Small farms are characterized by limited fixed assets, primarily productive land and highly efficient mechanisms and vehicles. Powerful and highly efficient agricultural machinery provides economic effect of scale in large agro-holding associations, which puts agricultural production on the flow conveyor cycle.

Small farms cannot fully use modern innovative technologies due to the need for additional technical means and equipment. Ultimately, this increases the payback period of this production. In the market model of the economy, the solution to this problem is seen in the organization of cooperatives; however, this form of

cooperation is used sparingly. The leasing system is characterized as priority in agricultural production; however, it is inefficient for small farms.

A significant number of small farms (84% of the total) own a small part of productive land. Land plots are located in areas unsuitable for the use of high-tech working machines and mechanisms, or inherited from older generations, which have withstood competition from agricultural holdings due to narrow specialization and focus on local end users.

A significant limitation of the development of small farming is its inability to attract labor resources. The level of workers' wages working on farms is much lower than salaries of agricultural companies' workers. Working hours are also longer to compare with large companies; forasmuch as agricultural companies' technological processes are clearly specialized.

The development of farming is also hampered by intra-regional migration processes, language, racial restrictions, as well as religious characteristics and social norms regarding the position of women in society [18]. This factor is inherent in the Arab countries of the Muslim world; however, in developed European countries it in no way affects the development of small farming [19]. Its effect is offset by the possibility of mass involvement of seasonal agricultural workers from the CIS countries, primarily from Ukraine and Moldova.

We agree with the conclusions of Koohafkan [4] on the impact on the development of farming property rights. However, it should be noted that in industrialized countries,

the system of transfer of ownership has been developed and there is a rental mechanism with the transfer of the right of use to existing farmers or agricultural producers of the relevant profile.

McDonagh, J., Farrell, M. and Conway, S. [1], considering the general trend of food land acquisition in other countries, did not single it out as a factor in ensuring food and nutritious security of a particular country. We believe that this problem should be considered much more broadly, primarily from the standpoint of agricultural multinational corporations.

6. Conclusion

The study contains information about the place and role of small farms in the agro-industrial complex of many countries. In addition, the positive aspects of their development for the country's economy in general and the rural population in particular have been identified. The prominent role of small farms in the structure of food and nutrition sustainability of the states was proven. The Food Sustainability Index (FSI) in general and in terms of its components was analyzed.

Based on the analysis, it was concluded that a high level of food sustainability does not always depend on economic growth. A great example of this is the experience of such countries as Zambia, Mozambique, India, Morocco, Uganda and others.

In addition, the study identified the share of farms in the regional context, as well as analyzed countries with the largest number of small farms. Continuing the outlined line of the study, the ratio between the size of the farm and the area of cultivating land is determined by finding that 84% of small farms cultivate only 12% of the land. And at the same time 1% of large farms with more than 1 ha cultivate about 38 % of all agricultural land.

This trend indicates the low competitiveness and production capacity of small farms, which in combination with the problems outlined in the work can have a detrimental effect on their activities. Consequently, there is an urgent need to take concrete measures, especially at the level of proper states. This can be the adoption of various programs for the development of small farms, the creation of funds to invest in their development, conducting training for farm owners on the application of modern approaches to business management, etc. In addition, measures to stimulate the development of small farms should be carried out with the support of international organizations and institutions. We hope that the application of common measures of all interested parts will ensure small farms long-term and sustainable development, because they are the foundation of food and nutrition security of the country. Summarizing the study, it should be noted that the direction of support and development of small farming remains a

priority in the global economy. Small farms occupy an insignificant market segment of world agricultural production, focusing on local regional food security solutions.

The directions of the future research are the assessment of the export potential of small farms in terms of range, volume of export deliveries and geographical directions of movement of their products. Due to the lack of access of small farms to central logistics hubs (ports, railway stations, food storage units and elevators), their logistical support in the perspective of obtaining highly efficient seeds, growth enhancement systems, pest control, storage and sorting systems, transport supplies remains an important problem.

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