

## Forecasts of the food market and its alternative scenarios



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**Annotation:** *Each region of the Fergana Valley is characterized by its strong management centers, the diversity of natural resources, the general agro-climatic factors, the availability and the potential for the creation of a finished product production system. For this reason, it is advisable to work out prospective directions for the deployment and development of productive forces. At the same time, it is important to fully utilize the capabilities of the main sector in the organized economic system of the region. The future development of productive forces in this area is inseparably linked with agro-industrial production and its sectoral and regional improvement.*

*In addition, the interregional production system, which is based on the continuous growth of food production in the regions, the intensification of intersectoral communications, the expansion of the role of intensive factors, in turn, will increase the demand for complex scientific forecasts. At this stage, the scientific forecasting should reflect the activities of the food market and facilitate the expansion of foreign markets. The region's participation in the world economy opens the way for further stages of social and economic development. At the same time, the emphasis should be on the sustainable improvement of the elastic business structure, adapted to the changing competition inherent to the market economy.*

*The main task of the food market in the Ferghana Valley in the near and long-term perspective is to increase production efficiency and bring the level of material welfare of the population to the world's leading countries on the basis of equalizing social and economic development in the regions. This, in its turn, is a very complex and urgent issue, not only with the radical changes in the economy, but also with a change in the lives of the whole society and, consequently, the acceleration of its development.*

*In this regard, this article elaborates the forecasts of the food market in the Ferghana Valley for 2020-2030 and its alternative scenarios. The first scenario is based on a retrospective analysis of food production in the Ferghana Valley. In the second scenario, the population's food supply is calculated based on the minimum consumer budget, while the third scenario provides the regions' food supply coefficients and supply estimates. On the basis of the analysis of the forecast parameters of the Ferghana Valley Food Market and its results, scientific-practical conclusions have been developed.*

**Key words:** *food market, agriculture, agro-industrial complex, Fergana Valley, region, population, forecast.*

### **Introduction**

In the near future, the solution of the food problem will be related to trends in agricultural development. Growth rates of food production are expected to be lower than population growth. The food problem in the world is so acute that radical changes are taking place in approaches to addressing the food crisis and food security. Due to the global population growth and the shortage of basic foodstuffs, export and import operations are becoming one of the key factors in the development and development of interstate economic relations. Given the complexity of the current and expected trends in the formation of global resources, food and raw materials security in the countries will be

ensured both now and in the future through domestic production. This will prevent dependence on the global market situation and ensure full utilization of the existing potential of the sectors of the agro-industrial complex.

In this regard, the President of the Republic of Uzbekistan Sh.Mirziyoev noted that "... it is necessary to pay special attention to the solution of the problem of food security and the establishment of strict control over the production of genetically modified products. The growing import of fruits and vegetables in the domestic markets in recent years should certainly alert us. To prevent this, first of all we need to restore the ancient varieties that have disappeared, to rational and effective breeding work, to widely introduce scientific achievements and innovations in the field." [1] From the foregoing, the analysis of the scientific and practical problems related to the improvement of market mechanisms and analysis of the factors affecting the functioning of the food market in the Ferghana Valley, the development of regional evaluation criteria, and the development of solutions.

### **Literature Review**

Research in the Russian Federation shows that the food market, like other markets, is a socially important market that influences the formation of regional reproductive conditions, which determines the economic environment and, to a large extent, the standard of living. The food market is a single dynamic system that provides interaction between sellers and buyers in determining the volume and composition of production, as well as achieving the required quality and price, based on the rational formation and distribution of primary and secondary processed food resources [3]. In many cases, the food market is viewed as a complex system of complexity. In particular, the food market is a system of economic relations that shapes the demand and supply of foodstuffs among producers, market infrastructure entities and consumers, as well as within these groups [4]. Also, the food market is organized for production, exchange, distribution and consumption of food for agricultural producers, food processing and processing industries, infrastructure entities, economic relations between the state and the end consumer of products. is seen as a complex system of socio-economic relations [5]. Recent research has shown that the food market is a spatial reproductive system that is a relatively independent part of the national economy that performs specific economic, social and political functions that link economic relations between subjects of food production and consumption. [6].

In the context of Uzbekistan, the food market has been studied as a category describing a particular type of economic relations of commodity production [7]. Research has been carried out in the context of farmers' market development [8]. Seasonal price fluctuations in the farmer's market have also been studied [9]. There are also studies focusing on the development of the food market in the structure of the consumer goods market [10]. In most cases, food market research has been conducted at the level of individual segments [11]. There is also a dissertation research that directly describes the food market. At the same time, the economic essence of the food market includes the areas of infrastructure designed to support and manage the sustainable development of market relations in food production, consumption, and food production and sales [12]. In addition, the formation of the food market is directly related to its participation in the

wholesale trade, which is seen as a system for the sale of goods by agricultural producers of different types of ownership [13].

At the same time, the selection of the theme in the Ferghana Valley is based on the analysis of inter-regional and inter-sectoral economic relations, the analysis of natural and socio-economic factors, and the development of alternative forecasts for the near and far periods.

### **Research methodology**

Applying systematic analysis to food market research methods is important. In Uzbekistan, for example, the Ferghana Valley is considered a whole region, but has also been studied at different stages and sizes - Andijan, Namangan and Ferghana regions. It has become possible to allocate production costs, take into account cost categories and market needs. As a result, the criteria for ensuring the effective functioning of the market are scientifically sound, based on the purpose of the food market, development challenges, population needs, and regional distribution. At the same time, sectoral and regional comprehensive food research methods have been used. The methods of this research are focused on the deployment of productive forces based on market principles, and vertical and horizontal economic relations have been explored on the basis of the natural and socioeconomic resources and specialization of the region. In particular, through retrospective analysis, trends in the near and far future are identified. Dynamics of population growth was determined using the forecast method and scenario scenarios for future levels of food availability were developed.

### **Analysis and Results**

The bulk of the food stock in our country is formed by domestic production and partly through imports. The acuteness of the food problem has been completely eliminated, but the consumption of products is below normal and there is a need to radically improve the quality of nutrition.

Accordingly, it is necessary to create conditions to increase the production of foodstuffs to the extent that they can meet scientifically justified needs and to maintain the solvency of the population sufficient to provide sound nutrition.

Peculiarities of the development of the food market in the Fergana Valley are inseparably linked with the profound qualitative changes taking place in the economy and social life. These are, first, changes in the demographic situation in the region, natural growth and migration movements, secondly, the extent of existing natural resources and their use in production, thirdly, the use of scientific and technological achievements, and the fifth, addressing social and environmental needs. The indicators of participation in the domestic and foreign markets are, sixth, due to the sustainable development of the process of intensification of the entire national economy.

Properly identifying the key trends in the development of the food market in the Ferghana Valley are inextricably linked with the regional economies. This is because the economies of the regions, based on the interconnected and peculiarities of the natural integrated country, serve to maximize the full use of the existing natural, social and economic opportunities and to enhance the distribution of labor. In addition, the region's economy, along with the creation of a highly efficient production system and the uninterrupted development of its development, also provide the necessary opportunities for the implementation of socio-economic policies appropriate for each region.

One of the problems of theoretical, methodological and practical nature is the view of the Fergana Valley region as a unified natural unit, the implementation of sectoral and regional forecasts. This requires the establishment of a scientific basis for the forecasting of productive forces for the Fergana Valley regions, with the aim of defining the strategic direction of a common social and economic development.

A retrospective approach to scientific forecasting is essential to provide food for the population of the Fergana Valley region and, therefore, to provide scientifically grounded developments.

Usually 15–30 years of past (retrospective) development is usually sufficient to predict. It is precisely this historical period that provides the basis for the assessment of the current situation and its prediction for the next several years. It should be noted that the duration and duration of the forecasting are limited to the life cycle of the projected event and the recovery time. This, of course, requires retrospective, stability of the baseline transition, and internal and external conditions.

We use retrospective analysis of forecasting for the first scenario. The retrospective analysis method is divided into stages. It explains the development, current status and peculiarities of food production. Particularly important is the study of the stages of formation, distribution of economic categories, the emergence of a certain integrity and systematicity. Also, as a methodology for predicting regional development, an analysis of the distribution of labor spanning from 10 to 30 years can identify trends in the near and far future.

Table 1 shows that the average growth rate of potato production in 2000-2018 or 28 years was 2.3 times in Andijan region and 1.8 times in Namangan and Ferghana regions. Taking into account the average growth rate of potato cultivation, Andijan region will produce 371,900 tonnes of potatoes in 2020, 418,900 tonnes in 2025 and 465,800 tonnes in 2030.

In general, the forecast of the first scenario is positive. If we project the population's food supply patterns, a little different conclusions can be drawn.

The basic premise of the scientific forecast is the ability to take into account the process closely related to the demographic situation in the Ferghana Valley. The widespread advocacy of forecasting problems in addressing demographic problems can also be expected. This is especially true for regions with high growth rates. Because, if current rates of natural growth last for another 20-30 years, socioeconomic problems may accumulate.

The second scenario predicts production volume by the proportion of future population to the minimum consumer budget. For this purpose, the forecast is made first per capita and then for the entire population period. This method allows modeling demand for foodstuffs with sufficient accuracy and forecasting trends for the near future.

In the second scenario, when determining the development and prospects of the food market, it is necessary to first determine the future population size. In fact, the driving force behind any market is its population and its growing needs. Therefore, based on the economic and mathematical model of population growth in the region, we will make scientific estimates of population size in the coming years.

A function of time is chosen using the least squares method of demographic statistics and mathematical statistics, relying on research in economic and mathematical

modeling of population growth in the Ferghana Valley. For this purpose, based on the data of the State Statistics Committee of the Republic of Uzbekistan, we will present the

**Table 1**

**Scenario 1: Food production forecasts in the Ferghana Valley based on a retrospective analysis (thousand tons)<sup>1</sup>**

Product type	Region	The average growth rate in 2000-2018, times	In fact	Forecast indicators		
			2018 year	2020 year	2025 year	2030 year
Potatoes	Andijan	2,3	325,0	371,9	418,9	465,8
	Namangan	1,8	242,6	264,2	285,7	307,3
	Fergana	1,8	256,8	279,6	302,5	325,3
Vegetable	Andijan	2,2	1539,5	1744,8	1950,0	2155,3
	Namangan	1,6	749,5	799,5	849,4	899,4
	Fergana	1,8	837,3	911,7	986,2	1060,6
Meat (live weight)	Andijan	1,6	146,1	155,8	165,6	175,3
	Namangan	1,6	140,3	149,7	159,0	168,4
	Fergana	1,6	165,6	176,6	187,7	198,7
Milk	Andijan	1,7	926,9	999,0	1071,1	1143,2
	Namangan	1,6	678,1	723,3	768,5	813,7
	Fergana	1,6	1012,8	1080,3	1147,9	1215,4
Eggs (million)	Andijan	2,5	616,7	719,5	822,3	925,1
	Namangan	3,9	526,7	696,4	866,1	1035,8
	Fergana	2,4	481,6	556,5	631,4	706,3

data: in 1990 the population was 1789.0 thousand people in Andijan region, 1,551,800 people in Namangan region, and 2214,600 in Ferghana region, in 2018. 3066.7 thousand people, 2752,7 thousand and 3683,1 thousand persons. Or, in the Ferghana Valley, the population was 5555,400 in 1990 and 9,502,500 in 2018 (Table 2).

<sup>1</sup> Based on data from the State Statistics Committee of the Republic of Uzbekistan.

Table 2

The population of the Fergana Valley in 1990-2018 (thousand people)<sup>2</sup>

Region	1990 year	2000 year	2010 year	2018 year
Andijan	1789,0	2216,5	2672,3	3066,7
Namangan	1551,8	1953,2	2379,5	2752,7
Fergana	2214,6	2697,5	3229,2	3683,1
<b>Fergana Valley</b>	<b>5555,4</b>	<b>6867,2</b>	<b>8281,0</b>	<b>9502,5</b>

Find the mathematical model of population growth as follows:

$$y = ae^{k(x_i-1990)}$$

Based on this function, the population of the Ferghana Valley can be predicted for the next 10 years. Based on the estimation and coefficients of the system of normal equations, the population of the Ferghana Valley will reach 11815,300 people by 2030, or by 124.3% compared to 2018. By 2030, the population growth rate will be 124.4% in Andijan region, 126.2% in Namangan and 122.9% in Fergana region. The coefficients for the mathematical model were analyzed using Fisher's statistics, which is noteworthy with a probability of 0.95 (Table 3).

Table 3

Population forecasts in the Ferghana Valley (thousand people)<sup>3</sup>

Region	2018 year	Forecast indicators			Percentage in 2020 versus 2018	Percentage in 2025 versus 2018	Percentage in 2030 versus 2018
		2020 year	2025 year	2030 year			
Andijan	3066,7	3175,2	3480,7	3815,6	103,5	113,5	124,4
Namangan	2752,7	2857,9	3150,6	3473,3	103,8	114,5	126,2
Fergana	3683,1	3801,5	4148,1	4526,4	103,2	112,6	122,9
<b>Fergana Valley</b>	<b>9502,5</b>	<b>9834,6</b>	<b>10779,4</b>	<b>11815,3</b>	103,5	113,4	124,3

Using a mathematical model, one can predict population numbers at different times. This will allow determining the size of the food market in the future, the volume and composition of the food market. Based on this, the need for new jobs, the amount of food

<sup>2</sup> Based on data from the State Statistics Committee of the Republic of Uzbekistan.

<sup>3</sup> Based on data from the State Statistics Committee of the Republic of Uzbekistan.

production and the use of land resources are also important in terms of population growth. Therefore, economic growth in the regions of the republic should be focused on high rates of real incomes of the population, in particular, to guarantee the required level of demand for food.

We calculate the minimum consumer budget for food supply based on projected indicators of the population. For example, by 2020 the population of Andijan region will be 3175.2 thousand people, and the minimum annual consumption budget for potatoes will be 63.5 kg. So, by 2020, potato production should reach  $3175.2 \times 63.5 / 1000 = 201.6$  thousand tons. In the same way, production forecasts for other products can be calculated for the next years (Table 4).

**Table 4**

**Second scenario: Projections of food availability in Ferghana Valley based on the minimum consumer budget <sup>4</sup>**

Product type	Annual minimum consumer budget norms, kg	Region	In fact, a thousand tons	Forecast indicators, thousand tons		
			2018 year	2020 year	2025 year	2030 year
Potatoes	63,5	Andijan	325,0	201,6	221,0	242,3
		Namangan	242,6	181,5	200,1	220,6
		Fergana	256,8	241,4	263,4	287,4
Vegetable	171,5	Andijan	1539,5	544,5	596,9	654,4
		Namangan	749,5	490,1	540,3	595,7
		Fergana	837,3	652,0	711,4	776,3
Meat (live weight)	45,6	Andijan	146,1	144,8	158,7	174,0
		Namangan	140,3	130,3	143,7	158,4
		Fergana	165,6	173,3	189,2	206,4
Milk	119,3	Andijan	926,9	378,8	415,2	455,2
		Namangan	678,1	340,9	375,9	414,4
		Fergana	1012,8	453,5	494,9	540,0
Eggs (million)	205	Andijan	616,7	650,9	713,5	782,2
		Namangan	526,7	585,9	645,9	712,0
		Fergana	481,6	779,3	850,4	927,9

<sup>4</sup> Based on data from the State Statistics Committee of the Republic of Uzbekistan.

In the second scenario, the coefficient of food production in relation to the minimum consumer budget is 1.0. This opens the possibility of exporting the coefficient greater than 0.8 and the efficient use of available resources of food production.

In order to assess the future market situation, we use the first and second scenarios to determine the ratio of food production to the minimum consumer budget. At the same time, the coefficient of production on the ratio of the minimum population budget to the minimum consumer budget is 1, with the coefficient less than 1 and the excess of the product (Table 5).

**Table 5**

**Third scenario: Food supply coefficients and supply forecasts in the Ferghana Valley <sup>5</sup>**

Product type	Region	Coefficient of supply				The difference in the level of supply, "-" , "+" thousand tons			
		2018 year	2020 year	2025 year	2030 year	2018 year	2020 year	2025 year	2030 year
Potatoes	Andijan	1,669	1,845	1,895	1,922	130,3	170,3	197,9	223,5
	Namangan	1,388	1,456	1,428	1,393	67,8	82,7	85,6	86,7
	Fergana	1,098	1,158	1,148	1,132	22,9	38,2	39,1	37,9
Vegetable	Andijan	2,927	3,204	3,267	3,294	1013,6	1200,3	1353,1	1500,9
	Namangan	1,588	1,631	1,572	1,510	277,4	309,4	309,1	303,7
	Fergana	1,326	1,398	1,386	1,366	205,6	259,7	274,8	284,3
Meat (live weight)	Andijan	1,045	1,076	1,043	1,007	6,3	11	6,9	1,3
	Namangan	1,118	1,149	1,106	1,063	14,8	19,4	15,3	10
	Fergana	0,986	1,019	0,992	0,963	-2,3	3,3	-1,5	-7,7
Milk	Andijan	2,534	2,637	2,580	2,511	561,0	620,2	655,9	688
	Namangan	2,065	2,122	2,044	1,964	349,7	382,4	392,6	399,3
	Fergana	2,305	2,382	2,319	2,251	573,4	626,8	653	675,4
Eggs (million)	Andijan	0,981	1,105	1,152	1,183	-12,0	68,6	108,8	142,9
	Namangan	0,933	1,189	1,341	1,455	-37,6	110,5	220,2	323,8
	Fergana	0,638	0,714	0,742	0,761	-273,4	-222,8	-219	-221,6

By 2020, meat production in Ferghana region will reach 1 in self-sufficiency, however, due to high population and growth rates, it will not be able to provide meat products in 2025-2030. At the same time, egg production rates are below 1.0. In the

<sup>5</sup> Based on data from the State Statistics Committee of the Republic of Uzbekistan.

Andijan region, a vegetable production ratio of 3.0 is retained, which is explained by the efficient use of greenhouses and land resources. High share of households in milk production in all regions provides a factor of 2.0 or higher in all years.

Or, this calculated coefficient determines the following levels of the region's supply relative to the minimum consumer budget:

- production of potatoes in Andijan by 170.3 thousand tons, in Namangan - 82.7 thousand tons, and in Fergana - 38.2 thousand tons, by 2030 - 223.5 thousand tons, 86.7 thousand tons and 37, respectively. Over 9,000 tonnes are produced;
- Excess production of vegetable products by 2030 will increase exports to Andijan by 1,500,900 tons, Namangan by 303.7 thousand tons and Fergana by 284.3 thousand tons.
- Excess of milk production in 2020-2030 will lead to the development of processing enterprises;
- Despite the fact that Andijan and Namangan regions are self-sufficient in the forecast period, there is a deficit of 1.5 thousand tons in 2025 and 7.7 thousand tons in 2030;
- High level of egg production remains in Andijan and Namangan regions. In the Fergana region, in 2020, compared to the minimum consumer budget, there will be \$ 222.8 million. pieces, in 2025 219.0 mln. units and \$ 221.6 million by 2030. deficiency of eggs.

In general, planning the import and export of foodstuffs should take into account the current economic situation, the state of the domestic market, and the specifics of the regions. Exports and imports of food are likely to be revitalized in the future.

The above-mentioned issues require the strengthening of inter-regional economic relations and are an integral part of the socio-economic development of the country's food market. The study of this problem is based on a comprehensive analysis and projections of the demographic situation, natural resources and other conditions directly and indirectly related to the movement of the food market. The analysis of Fergana Valley food market projections is based on the following socio-economic results:

- Referring to the Fergana Valley regions as a single economic unit, the implementation of sectoral and regional forecasting is one of the problems that are of theoretical, methodological and practical nature. This requires the establishment of a scientific basis for the forecasting of productive forces for the Ferghana Valley regions, and it is desirable to identify the strategic directions for a common social and economic development;
- Development and implementation of socio-economic development programs in regions of the Ferghana Valley, leading to its limited, scientifically grounded, unreliable;
- Progn Food market forecasting in the Fergana Valley region includes a set of problems that are closely intertwined with specific features. Specifically, it is necessary to identify the most efficient economic sectors for the region, to determine their future orientation and development paths, to take into account existing demographics, historical development, participation in interregional economic relations, natural resources, domestic and foreign markets. .

### **Conclusions and Suggestions**

Based on the analysis of the Fergana Valley food market forecasts and results, it is possible to develop the following scientific conclusions and recommendations:

- Progn The Fergana Valley food market projection is characterized by an integrated approach, and represents a qualitatively new stage of socio-economic development. At the same time, the emphasis should be on accelerating the development and accelerating the territorial arrangement of economic sectors on the basis of the further development of existing industries;
- Determining the most effective agricultural crop variants on the basis of forecasting sectoral and regional structure of agro-industrial production, identifying optimal ways to increase gross yields and productivity, and providing the population with food based on intensive technologies;
- The deepening of the distribution of foodstuffs and the division of labor through the domestic production of the regions are important for the development of economic relations;
- Food security and export will be improved if the agricultural production location meets the needs of the national and regional markets;
- it is advisable to arrange inter-regional exchanges, taking into account natural and economic conditions, population density and accumulation of certain types of products.

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