Formation of the development strategy of the agro-industrial complex of the Tambov region on the basis of the scenario approach

O Yu Antsiferova¹*, E A Myagkova¹ and K V Tolstoshein¹

¹ Department of Management and Business Administration, Michurinsk State Agrarian University, 101 Internatsionalnaya str., Michurinsk 393760 Russia

E-mail: anciferova-olga-70@mail.ru

Abstract. The aim of the study is to substantiate the strategic parameters of the development of the agro-industrial sector in the region. In accordance with it, the need to develop a strategy based on inertial, local innovation and the system innovation development scenarios is substantiated. The features of each of the scenarios were determined, relating to the rate of increase in production, as well as the satisfaction of regional needs for these products. The analysis of forecast scenarios for the development of agricultural sectors was carried out on the example of dairy cattle breeding, which showed that the potential created by this industry in the Tambov region is sufficient to implement an innovative approach to solving technological problems of increasing production efficiency.

Market relations underlying the organization of all relationships in the economic space imply varying degrees of uncertainty. In this regard, possible trends in the development of the situation can be diverse and should take into account the minimum requirement for ensuring the stability of the functioning of production units. This is what determines the need to use a scenario approach to substantiating strategic development prospects. Development scenarios are not plans, the implementation of which is mandatory in a “pure form”, but they set the limit values to which one should strive at each moment of time.

It is necessary to take into account the fact that the strategic effect consists of the success of the implementation of measures to increase production based on the expanded reproduction of a tactical nature, but is not reduced to the simple sum of their effects. In the development of various branches of the agro-industrial complex, and especially the livestock industries, the time factor is of paramount importance. The level of ensuring the food security of the region and the quality of life of people depends on how quickly the issue of full provision of the population with food in accordance with medical standards is resolved. Since the functioning of industries is determined by the peculiarities of agricultural production, the acceleration of its development can be carried out only on the basis of increasing the intensity of its management.

In the future, there are two types of options for the development of industries – inertial and innovative. The inertial option provides for the preservation of the existing trends in the growth of the economy of the industry, but, unfortunately, does not imply the solution of its structural tasks – eliminating the threats of the depletion of the use of natural resources and the socio-economic crisis in rural areas [1].
The approach to the innovative development of the agro-industrial sector assumes priority improvement of the technical and technological base of the industries through their modernization and partial renovation, improvement of production processes, transition to resource-saving and environmentally friendly technologies, increasing the level of mechanization, automation and computerization of production processes; diversification of the production of agricultural products and reducing the environmental burden on the environment. In general, this will contribute, on the one hand, to an increase in labor productivity in agriculture, and on the other, to a decrease in the severity of social problems in rural areas.

The main conditions for the implementation of the inertial variant of development are:

- Limited opportunities to attract large investments;
- Unavailability of local innovation in production.

The conditions for the implementation of an innovative development scenario include:

- Availability of highly qualified personnel or the possibility of its involvement;
- Implementation of continuous monitoring of the development of innovative solutions;
- Availability of resource potential in the required volume;
- Systematic innovation.

The choice of the scenario for the development of agricultural sectors is determined by the criterion of socio-economic feasibility, as well as the results of the analysis of the influence of stimulating and restraining factors on production processes in the industry (Table 1). At the same time, the development forecast, regardless of its organizational and economic characteristics, must necessarily take into account the technological specifics of the reproduction of the resource base in a particular industry.

### Table 1. Constraining and stimulating factors for the selection of options for the strategic development of the agro-industrial sector (for example, dairy cattle breeding).

| Inertial type of strategic development | Innovative type of strategic development |
|---------------------------------------|----------------------------------------|
| Deterrent factors of choice           | Stimulating factors of choice           | Deterrent factors of choice | Stimulating factors of choice |
| - Moderate exchange rate imbalance;   | - Implementation of the austerity strategy of the business entity; | - Lack of well-established mechanisms for the transfer of innovation to the production sector; |
| - Limited own resources;              | - Possibility of expanding modernization measures in time. | - Lack of mechanisms that encourage business to invest in the development of advanced technologies; |
| - High vulnerability to the onset of critical phenomena of internal or external origin. |                          | - Partially solved the problem of investment security industry; |
|                                       |                          | - Low industry profitability. |
|                                       |                          | - Modeling of organizational and economic development based on a program-target approach; |
|                                       |                          | - Increased risk management capabilities; |
|                                       |                          | - Government support for technical re-equipment; |
|                                       |                          | - Availability of intellectual property protection mechanism. |

In accordance with the Strategy of Social and Economic Development of the Tambov region until 2035, agricultural producers were tasked to increase crop production (up to 6 million tons of grain, 9 million tons of sugar beet) and livestock production (milk up to 525 thousand tons, meat - up to 1
million tons) by 2030. This will allow agriculture to become the leading sector of the economy of the region and the production index to increase to 105.5% [2].

In the study, the degree of compliance of the forecast parameters of the development of individual sectors of agriculture in the region with their estimated values was calculated, calculated on the basis of trend equations that take into account the preservation of process conditions. For example, in dairy cattle breeding there is a “gap” between those calculated using the trend equations and the predicted values of the indicators — the number of forage cows, the gross milk yield and the milk yield from 1 forage cow. On average, differences in the productivity of cows were 6.5%, 6% in the number of cows and 1.2% in gross milk yield (Table 2) [3].

Thus, calculations show that in the Tambov region, while maintaining a stable situation orienting the development of dairy cattle breeding and maintaining the import substitution policy, the level of provision of the region’s population with milk and dairy products (in terms of basic fat milk) in accordance with medical recommendations can be achieved by 2022. However, if we take into account the concept of innovative development of the industry adopted in the region, which implies the construction of 16 dairy complexes for 1200 cattle each [2], then, according to our calculations, which provided for a linear trend in the development of dairy cattle breeding in the region by 2025 dairy producers can “reach” the interregional level of imports, and gain a foothold on it by 2030.

At the same time, studies have shown that commodity producers may encounter such problems as the expediency of increasing the area of sowing and livestock animals while achieving high rates of crop yields and animal productivity and the efficiency of using expensive equipment from reconstructed and modernized organizations.

**Table 2.** Compliance of the calculated and forecast parameters of the development of dairy cattle breeding in the long-term perspective for the period up to 2030 by agricultural organizations and peasant farms of the Tambov region*.

| Indicators                     | Trend Equation | 2018 Payment | 2018 Forecast | 2020 Payment | 2020 Forecast | 2025 Payment | 2025 Forecast | 2030 Payment | 2030 Forecast |
|-------------------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Livestock of furious cows, heads | y=59,1+3.28*t  | 51,1          | 54,3          | 64,2          | 68,0          | -             | 100,8         | -             |               |
| Gross milk yield, thous. c Milk yield from 1 fodder cow per year, kg | y=229,8+26,9*t | 245,3         | 246,8         | 339,2         | 330           | 469           | -             | 648,6         | -             |
| Milk production per 1 inhabitant of the region, kg Consumption of milk and | y=4428+104*t   | 4793          | 5073,1        | 5278          | 4986          | 5827          | -             | 6434          | -             |
| Population of the region, thousand people | -              | 1037,02       | 1019,13       | 974,876       | 937,587       |               |               |               |               |
| Milk production per 1 inhabitant of the region, kg Consumption of milk and | -              | 236,5         | 238,0         | 332,8         | 323,8         | 481,1         | -             | 691,8         | -             |
| - | 165,6 | 166,6 | 266,3 | 259,0 | 408,9 | - | 622,6 | - |
dairy products  
(in terms of 
basic fat milk)  
per 1 
inhabitant of 
the region per 
year, kg  
Milk nutrition 
level, %   

| Milk nutrition level, % | 59.1 | 59.5 | 95.1 | 92.5 | 146.0 | 194.6 |

* The calculation of the estimated population in the Tambov region (http://tmb.gks.ru/wps/wcm/connect/rosstat_ts/tmb/ru/statistics/ (circulation date 06.04.2016))

To solve these problems, it is necessary to consider the correct organization of production processes and the possibility of selling agricultural products at high prices. And if the first direction – increasing the efficiency of production – is completely dependent on on-farm decisions and staff qualifications, the second is on the market conditions and is in no way subordinated even to the associative efforts of agricultural producers [4].

It should be noted that the preservation of economic independence of the overwhelming majority of participants in the market for agricultural products, on the one hand, provides the freedom of choice to wholesalers – buyers of this product, and, on the other – allows to destruct the raw materials base of regional processing enterprises, which, due to the decline in the solvency of the population, are also forced to optimize their own production program towards those types of products that are in demand in the retail market. In other words, in the current crisis conditions, market mechanisms are not able to regulate price proportions in the agricultural market, which requires government intervention [7-9].

In determining the strategic parameters of the development of agricultural production, many researchers use the scenario approach [5]. In the course of the study, we used the example of dairy cattle breeding in the Tambov region to substantiate the parameters for the development of this industry until 2030, taking into account three scenarios: inertial, local innovation, system innovation.

In determining the development parameters for each scenario, the rate of increase in the production of milk and dairy products, as well as the satisfaction of regional needs for these products, was taken into account.

The inertial option implies maintaining the rates of increasing in the productivity of cows and preserving their livestock, local innovation – partial improvement of the production process through the phased introduction of innovative solutions, usually covering individual technological operations, which, on the one hand, makes it possible to preserve and increase the achieved acceleration of the milk production increment, and, on the other hand, to optimize investments in industry facilities; system innovation provides for a complete renewal of the resource base of dairy cattle breeding through the construction of complexes and farms that create the best microclimate in the livestock building, mechanization and automation of working processes, the use of cows with high genetic potential of productivity [3].

Regarding the ability to meet the needs of the population in milk and dairy products in full in accordance with medical recommendations, it should be noted that due to regional milk resources they can be satisfied by 2025. Due to the fact that according to Tambovstat estimates, the population of the region may be reduced by 9%, the Tambov region may act as a seller of 55.4% of the milk produced on the interregional market (Figure 1). But until 2025, the region will be an active importer of dairy products due to the lack of its own production facilities [6].
Figure 1. Forecast of export to the interregional market of milk produced in the Tambov region for the period 2018-2030 on options for strategic development.

At the same time, we note that the adopted policy of widespread development of dairy cattle breeding in regions with favorable climatic conditions, on an industrial basis, makes it possible to supply the processed milk (including in dry form) to the northern territories of the country or compels them to seek reserves for sharp competition, with a large number of dairy plants of the Central Federal District.

With a high probability (provided the population’s solvency is restored), the region’s need for milk by 2030 will increase by 46.3% compared with 2015, which is the basis for creating an adequate production base for this product (Figure 2).

Figure 2. Forecast of intraregional milk consumption in the Tambov region for the period 2018-2030 on options for strategic development.

The intraregional need for raw milk determines the minimum requirements for the agricultural production sector (Figure 3). In the future, it is planned to expand the production facilities of the breeding farms to 4,500 cattle places and up to 5,800 dairy farms in large farms (with at least 400 cows) in the Tambov region [2]. The forecast of gross milk production is calculated taking into account the level of marketability of milk and the current trends in the development of dairy cattle breeding in farms of different categories. Focusing on the innovative path of development of the industry, it is possible to ensure the growth of gross milk production by 2030 by 3.2 times compared with 2015 and by 60.3% compared with the inertial variant.
Figure 3. The forecast of gross milk production in categories of farms of the Tambov region for the period 2018-2030 on options for strategic development.

Increasing milk production in farms of all categories should be carried out on a high-intensity basis, which provides for:

- Strengthening the breeding base of dairy cattle;
- Raising the level of herd reproduction in agricultural organizations and peasant (farmer) farms;
- Increasing the number of dairy cows in agricultural enterprises and peasant (farmer) farms.

Calculations have shown that this will entail changes in the structure of milk production by categories of farms.

Thus, the creation and operation of 16 dairy complexes by 2030 and the strengthening of the production base of peasant (farmer) farms will increase the share of agricultural organizations in the structure of regional milk production to 47.1-49.1% and take the largest share in it. The share of peasant (farmer) farms in the structure of the production of marketable milk will increase from 14.0-17.9% to 37.3-40.9%. It is assumed that the contribution of households to the formation of dairy resources in the region will change dramatically: their share in the structure of milk production decreased from 50% in 2015 to 10.3-15.6% in 2030.

Note that in modern economic conditions, an extended reproduction of dairy cattle in the Tambov region is possible only if the milk production is profitable at the level of 30-35%. Considering the fact that dairies are also put in harsh conditions of “survival” and cannot often offer a reasonable price from the point of view of agricultural producers for the purchase of raw milk, the state can and should implement the stabilization process through direct and indirect support mechanisms [2].

Thus, the development of agriculture in the Tambov region has all the chances for a progressive nature of changes in the strategic perspective. The considered forecast development scenarios have shown that the potential being created is sufficient to implement an innovative approach to solving technological problems of increasing the efficiency of agricultural production.

References
[1] Ksenofontov M Yu, Poskachev M A, Sapova N N, Kozin D E 2018 Scenario forecasting as a tool for developing an agricultural development strategy (http://institutiones.com/strategies/1774-scenarmoe-prognozirovanie-kak-instrument-razrabotki-strategii-razvitiya-selskogo-xozyajstva.html (circulation date 05.02.2016)).
[2] The law of the Tambov region of June 4, 2018 No. 246-L “On the Strategy for the Socio-Economic Development of the Tambov Region until 2035” https://www.tambov.gov.ru/assets/files/strategy/bc9bb531-f06a-4e4e-92ac-f39f924f8bfb.pdf (appeal date 09.03.2018)
[3] Antsiferova O Yu and Myagkova E A 2015 Strategic Planning for Sustainable Agricultural Development Goals International Agricultural Journal 2 p 29-31

[4] Shalyapina I P, Antsiferova O Yu and Myagkova E A 2017 Strategic planning of the enterprise of the agro-industrial complex (SPb, Russia: "Lan" publishing house) p 140

[5] Tolstoshein K V 2015 Effectiveness of the implementation of the development strategy of dairy cattle breeding in the Tambov region International Agricultural Journal 4 p 51-53

[6] Official site of the territorial body of the Federal State Statistics Service in the Tambov Region (http://tmb.gks.ru/wps/wcm/connect/rosstat_ts/tmb/ru/statistics/)

[7] Bogoviz A V, Semenova E I and Alekseev A N 2018 New challenges for regional economy at the modern stage Advances in Intelligent Systems and Computing 622 pp 574-580

[8] 2018 Modeling the management of innovational processes in regional economy Advances in Intelligent Systems and Computing 622 pp 568-573

[9] Bogoviz A V, Chernukhina G N and Mezhova L N. 2018 Subsystem of the territory management in the interests of solving issues of regional development Quality - Access to Success 19(S2) pp 152-156