Forecasting and Planning of Agricultural Production of the Region

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Abstract— The article deals with the attempt to give scientific conclusion of available material and experience on forecasting the development of agricultural production taking into account specific peculiarities of the region and to formulate basic methodical regulations of short-term, medium-term and long-term forecasting. The four factor economic-mathematical model of forecasting volumes of production of agricultural production, considering not only the main productive factors (labour resources, land resources, main funds) but investment constituent as well has been proposed. This economic-mathematical model allows to find optimal variant of administrative decision which provides development of agrarian production and effective achievement of aims in the economy of the region. The complex of actions on realization of system of reforms in the agriculture of the Republic of Crimea which contains system analysis, modeling and using standard systems has been suggested.

Keywords— forecasting, planning, economic-mathematical model, correlation-regressive analysis, agricultural production, development of the region.

1. ECONOMY AND PRODUCTION
1.1. REGIONAL ECONOMY

From the point of view of anticrisis management of socio-economic development of certain region it is important to forecast changes of volumes of production in the sectors of regional economy. Reliability of forecasting is defined by the quality of appropriate economic-mathematical models and information. Forecasting of volumes of production in home agrarian sector, in particular at the level of regions has to be based on the information about its dynamics in the past and about changes of factors, defining production costs, and also maintenance of natural resource base and ecosystem.

A lot of research works of home and foreign authors have been devoted to the questions of forecasting economy. The scientific basis of knowledge, dealing with theoretical and methodological aspects of forecasting, its specifications in modern management, as well as considering branch aspects has been developed. The works of Eremenko O.V., Rudenko D.V. [1], Ganieva I.A. [2], Agapova T.N., Medvedeva N.A. [3], Folk O.V. [3], Baidakova A.N., Babkina O.N., Zvyagitseva O.S. [6], Ivanova N.V., Osmolova K.M. [18], Barishnikov N.G., Samigina D.Y. [15], Kuznetsov V.V., Gaivoronskaya N.F. [8] deal with theoretical and methodological fundamentals of forecasting. The problems of estimation of factors of production and technological modification are fully presented in works of the following scientists: Mamonova M.E., Pestova A.A., Sabelnikova E.M., Apokina A.Y. [4], Zykina D.A., Pogidayeva N.A[17], Renaud-Gentié [20]. The increasing importance of economic-mathematical modeling and scenario forecasting, planning and analysis of economic processes has been marked in the works of scientists Samoilov V.N., Dronova M.V. [13], Suhanova I.F. [14], Shatohin M.V., Novoselsky S.O., Duplin V.V. [15], Norwood, F. Bailey, Jayson L. Lusk [19].

However, the problems of methodological and methodical provision of forecasting agricultural production taking into account innovative-investment impulse of development in a certain region have not been properly investigated. Besides, in spite of a great number of works on problems of forecasting of agricultural production, practical aspects of regional planning, which are necessary for the development of agriculture of the Republic of Crimea have not been properly investigated.

The aim of research has become solving of scientific problem connected with the development of theoretical and methodological principles of forecasting of agricultural production and the development of methodical and practical recommendations on justification of long-term prognoses of agricultural production of the Republic of Crimea and terms of their realization. Consequently, the basic task of the research is defining the set of factors influencing predominantly on the dynamics of agricultural production within the limits of the long agricultural cycle using multifactorial correlative analysis.

In modern economy forecasting plays an important role, which is stipulated by the practical significance of prognoses. In scientific literature much attention is given to the study of «future» namely to the notion “forecasting». More frequently this category is regarded on the basis of form of prediction.

Prediction is representation of future possible reality that is based on cognition of certain conformities of changes of nature and society. Taking into consideration aims of cognition of future different forms of predicting can be defined:

Hypothesis – is a scientific foresight on purely theoretical level. More often by hypothesis one may interprete opinion of one or more scientists (experts) in regard to changes of some indexes un future. The hypothesis gives qualitative description of the object which expresses its natural conformity.

Prognosis – is a scientific conclusion of different judgements about possible states of the given object in future.
In this case prognosis characterizes the future not only from qualitative but also from quantitative side. Prognosis is provided with greater reliability and certainty than hypothesis.

Plan is image of the future, complex system of measures aiming to achieve specific goals. Plan defines an object as a system of target indexes of some economic system, pointing methods and stages of their achievements and expectation of certain results. It is traditionally accepted that prognosis precedes planning and vice versa prognosis may follow planning defining probabilities of achieving scheduled points.

Planning and prognosis may use the same methods and techniques, they may be based on common informational basis. Prognosing is the research bases for planning. Substantial difference between prognosis and plan is in that prognosis and plan is in that prognosis characterizes probable change of object in future, and plan characterizes a certain standard (goal setting). The basic requirement to plans is obligatory supply of resources while prognoses can do by incomplete presence of resources. Thus hypothesis, prognosis and plan are closely interrelated and their interlink is prognosis [18].

Among present economic-mathematical models the methods of statistical (structural) modeling are successfully used in practice. Economic-mathematical are the models which on the basis of using equations of regressions describe dependence between infect and output data. In order to achieve effective modeling, it is necessary to formulate the aim of a certain model, being a simplified variant of real systems precisely. The general aim of modeling is study, explanation, design and forecasting.

Agricultural models are the basis for activity, management and interference into agricultural ecosystems. Namely they help to make a correct decision, they serve as an adviser in managing the system and they also enable to forecast the results of interference into system. The most interesting are multivariate models which enable to justify the influence of several factors on the object of prognoses. The research of various processes including economic ones, as a rule begins with their modeling, i.e. reflection of real process by means of proper mathematical tools. In this case equations or inequalities that reflect correlation between indexes and their influence on the value of the effective variable are compiled.

Yet’s consider the of multivariable linear regression in MS Excel using function «LINEAR». The sought-for function looks like \( y = \) – production of agricultural factors influencing it accordingly \( x_1, x_2, x_3, x_4 \). Statistical data \( y, x_1, x_2, x_3, x_4 \) during the period 2012-2017 are presented in Table 1.

| Table 1. Factors influencing on the volume of production of agricultural products in the Republic of Crimea |
| Factors | Name of factor |
| \( y \) | Products of agriculture, million rubles |
| \( x_1 \) | Cost of capital assets, million rubles |
| \( x_2 \) | The number of employed, thousands of people |
| \( x_3 \) | Sown areas, thousands hectares |
| \( x_4 \) | Investments in capital assets, million rubles |

On the basis of calculation we will build multiple regression with the of function «LINEAR» in MS Excel, which will look as following:

\[
y = x_1 + x_2 + x_3 + x_4 + \theta \quad (1)
\]

By the results of calculations, the first indicator of estimating the capacity of this model is the ratio of correlation \( R \) (from 0 to 1) that characterizes interrelation of values \( x \) and their influence on \( y \). If the value of the ratio is closer to 1, the influence of factors on the value of prognosis is great. In our case the ratio of correlation characterizes dependence of \( y \) to \( x \) and makes \( R=0.99 \).

Construction of productive function is conversion of real data model information on the base of statistical data by means of regressive analysis.

| Table 2. Products of agriculture and resources used for their production in the Republic of Crimea [11]. |
| Year | Cost of capital assets, mln. rub., \( (x_1) \) | Quantity of employed, thous. of people, \( (x_2) \) | Sown areas, thousands hectares, \( (x_3) \) | Investments in capital assets, mln. rub., \( (x_4) \) | Product of agriculture, mln. rub., \( (y) \) |
| 2012 | 24867,2 | 18,2 | 779,8 | 2330,9 | 65155,0 |
| 2013 | 25194,0 | 18,3 | 754,5 | 2242,0 | 65928,0 |
| 2014 | 19891,1 | 18,3 | 731,8 | 2406,7 | 47095,9 |
| 2015 | 22390,2 | 17,7 | 711,0 | 2141,2 | 63523,4 |
| 2016 | 35271,4 | 21,6 | 774,1 | 2169,1 | 67100,6 |
| 2017 | 35894,3 | 19,6 | 768,1 | 2344,5 | 57518,1 |

By modelling a four factor function we may make a conclusion about the influence of each factor of model on the result index – production of agricultural products.

\[
y = -0.00692024 \times_1 -2688,704 \times_2 +255,949 \times_3 +76,6493 \times_4 +93585.96 \quad (2)
\]

The developed productive function is a simulation model of the process of production by means of which it is possible
to define the expected resulted in case of change the applied resources. Therefore, forecasting of major indexes for a period, namely productive volume of agricultural production and justification of concept of development of branch and the region as a whole is a specific field of practical appliance.

The basic theses of concept are:
- the development of agricultural industry must be priority in the region;
- the development of agriculture must provide maintenance and recovery of ecosystem as a means of production and an important element of supplying system;
- trends on the markets of power and material and technical resources make the transition of agricultural production to power-and resource saving technologies indisputable;
- the development of agriculture must be oriented on the production of quality goods on international standards;
- the development of agriculture must be guided by bringing in intellectual and financial investments for modification of exciting tools and purchasing new ones;
- state administration of agriculture must take place due to delivery of state and regional programs of the development of agriculture;
- technological modification of agrarian branch must provide substantial growth of productivity of human labour, increase of its scientific and intellectual capacity by attracting IT specialists.

2. CONCLUSION

Thus on the basis of research we can draw the following conclusions:

At the present stage of development of economy, the problems of making and perfection of forecasting of the whole system of material production on the basis of increase of scientific validity of prognoses are extraordinarily actual. Modeling of prognoses, defining the strategy of the development of the of the economy of the region with the perspective of considering probable variants is one of the ways of perfection of management of national economy including its important element – planning. The basis of all prognoses of the whole material production are branch and regional prognoses. Estimation of variants of the economy development is determined by the system of indexes of efficiency, where the indexes of production of goods have a major role.

Agriculture as one of the branches of material production occupying in average 13% in the structure of gross domestic product of the Republic of Crimea must develop on the basis of further increase of production of goods. Forecasting of production of goods in agriculture of the region has its own specific features which must be taken into account in methodology of its forecasting.

The development of agricultural production can be expressed by the system of agrarian indexes and their means of measurement reflecting quantitative and qualitative characteristics of production process. The analysis of the applied experimental indexes makes it possible to consider that the prognoses of production of agricultural goods have to be founded on the following indicators: costs of capital assets, mln. rubles, number of the employed, thousands people, sown areas, thousands hectares, investments in capital assets, mln. rubles. This supposition has been confirmed on the basis of deterministic analysis of influence of factors on the volume of production of agricultural products as well. In the result of consideration indexes of production of plant-growing products in agricultural of the region period 2012-2017 the increasing tendency of its change has been revealed.

References


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