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Factors Affecting Innovations Development in Priority Industries of a Region

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ABSTRACT

In the era of world economy globalization the success of a country or a region is based upon constant innovations updating aimed at achieving maximum productivity, competitiveness, development of human capital. In this respect a wide use of innovations is the most efficient and effective means of solving social and economic problems also in agricultural sector. Thus the priority is to identify the factors holding back the development of innovation in agricultural sector as well as the factors contributing to their development. The statistical data used in identification of these factors are not always reliable and sufficient, it is also necessary to apply other means of obtaining and processing of information via discriminant, cluster and factor analysis.

Keywords: Innovation, Agro-industrial Complex, Branches of Agriculture
JEL Classifications: Q11, Q13, O31

1. INTRODUCTION

The demand for innovations in Russia is still quite low and tends to purchasing of ready equipment abroad rather than introducing own new solutions (Vladimirova and Dyagel, 2011). Despite low innovation activity, innovation processes at the present stage can be noticed in all sectors and industries of Russia including the regions with priority agricultural sector (Zavodsky, 2008).

The difficult way of innovations development in agro-industrial complex contributes to the choice of different models of innovation development applied in agricultural sector (Problems and Perspectives of Innovation and Creative Economics Development, 2011). The choice of a model involves system integration of science, technology and agriculture. This needs a clear and consistent management of the sector, encouragement of science and technology and maintaining of a stable flow of effective innovations in agriculture (Soboleva, 2012a).

In the period of difficult social and economic development of agro-industrial complex in Russia there are negative factors significantly affecting innovation development restraint in agro-industrial complex, they are conditionally divided into four classification groups (Shibaikin, 2011):

1. Financial-and-economic: Unprofitableness of the plants, low financial responsibility, low level of profitability, low level of fixed capital expenditures, long payoff period of innovations;
2. Scientific-and-technological: Weak material and technical base, technical and technological weakness, high percentage of manual operations;
3. Personnel related: Decrease of employees in agriculture, low level of qualification and education, of the employees, migration of rural population;
4. Psychological: Sluggishness in perception of innovations, unreadiness for implementation of innovations.

Innovative activities in agriculture are carried out in different directions which can be grouped into four: Selective - genetic, production and technological, organization and management, economic and socio-ecological (Long-term Forecast of Scientific and Technological Development of the Russian Federation, 2015).

The choice of the direction and innovation policy on the regional level almost entirely depends on current economic situation of a region, its traditional scientific and industrial potential, and understanding of current demands for innovation strategy by regional political leaders (Ivanova et al., 2008).

Current social-economic situation in agriculture shows the application of outdated technologies, plants variety and cattle breeds, imperfect methods and forms of production and management (Popov, 2011).

There are no developed mechanisms of promotional activities, system of scientific and technical information corresponding to the market system, no tested effective scheme of scientific and promotional institutions cooperation.

Extremely low innovation activity is also related to imperfection of management and economic mechanism of innovations assimilation. This leads to more degradation in branches of the complex, increase of production cost and low competitiveness, slows down social and economic development of countryside, and drops quality of rural living (Schelchkov, n.d.).

With market relations the problem of expanding of technological development in agricultural industry becomes even more important. The innovation structures created in the period of planned economy don't correspond to the demands of developing market economy; the management of innovation process is depersonalized.

Thus, the use of outdated technologies and energy-intensive equipment, imperfect management methods aggravate degradation of agricultural sector. In current situation the intensification of innovation activities should be taken as promising way of agricultural industry development (Strebkov, 2009).

It should be mentioned that Russian agriculture operates in more difficult weather conditions than in market economy countries. Thus 30-40% of power resources in agriculture are spent on heating of premises. The total energy cost of 1 tonne of conditional grain unit in Russia is more than 5 times higher than in the USA (Burtseva et al., 2008). At the same time energy consumption of production is an important factor of products competitiveness.

It means that the problem of energy efficiency in agriculture should include consistent solution of three problems: Development and gradual implementation of management-economic, legal and regulatory activities; introduction of energy-saving technologies with wide use of secondary energy resources; the change of computer technologies with fundamental decrease of energy costs.

We will focus on the new tendency of Russian energy sector – increase of decentralized production of electricity and heat by green energy power stations (Strebkov, 2009).

We carried out researches on implementation of technological innovation – alternative energy sources. The researches contribute to the improvement of technical and economic potential of agricultural industries on the basis of energy saving technologies use with implementation of renewable energy sources that reduce the cost of agricultural products and enhance the efficiency and competitiveness of agricultural companies.

Despite the high efficiency of the proposed energy-saving technology it is still not implemented due to various factors. As a result we offer technology of identification of agricultural companies' innovation activities factors.

2. METHODS

The proposed technology involves identification of factors having both negative and positive influence on innovation activities of companies as well as the readiness of companies' managers for development, introduction and use of innovations. The methods of discriminant (Burtseva et al., 2008), factor (Burtseva, 2007) and cluster (Blyumin et al., 2004) analysis have been offered in the thesis to identify the factors influencing innovation activities of industrial companies (Figure 1).

Renewable energy sources quite well compete with traditional energy sources of gas and thermal power stations. But there are factors that hold back the process of their implementation for agricultural consumers. The main goal of our research is identification of these factors.

With regard to alternative energy sources and within the scope of methodological basis of the main areas research, our research was carried out in the following sequence.

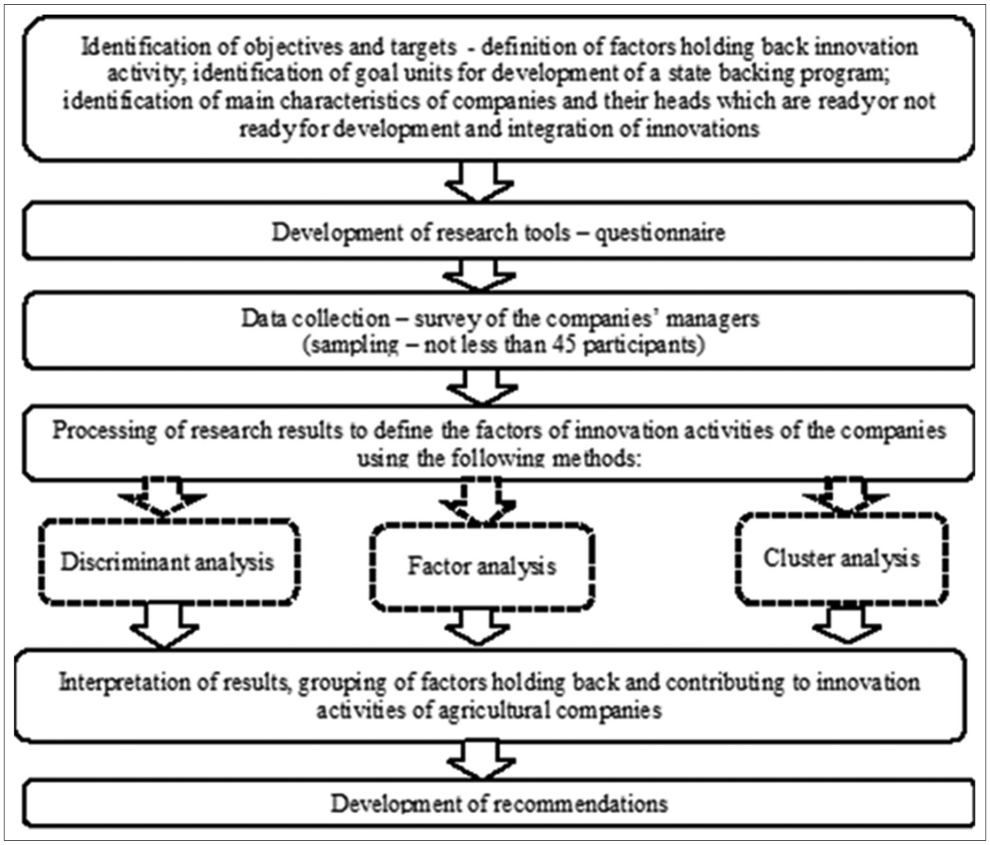
3. RESULTS AND DISCUSSION

At the first stage we worked out the list of main factors that significantly affect the introduction of renewable sources by managers of agricultural companies. The list of main components was defined on the basis of exploratory research at the preliminary stage of the project. The survey of agricultural companies' managers was used as a method of research. The score of selected variables has been made on the basis of expert evaluations which are based on research of experts' opinions on the object of study. Expert method is aimed at attracting a limited number of professionals. The research is based on one of the methods of individual evaluations collecting - the method of experts' interviewing (Lutoshkina, 2012). The experts were the heads of agricultural companies familiar with this industry.

At the second stage a group of 40 people was formed. 15 components, affecting the introduction of renewable energy sources, estimating its understanding (X_1-X_{15}) were defined on the basis of research.

At the third stage the results of research of the factors affecting implementation of alternative energy source were analyzed by factor method of main components analysis in Minitab 14

Figure 1: Identification of innovation activities factors of agricultural companies



software to identify the most important factors interfering with implementation of energy saving technology, which need attention in developing of positive understanding program.

Factor analysis is frequently used to reduce the number of variables and keep as much information as possible (Kim et al., 1989). In marketing research there are two most frequently used factor analytic procedures – analysis of main components and analysis of general factors (Mironova, 2009).

By reducing the number of variables, factor analysis tends to make the remaining variables meaningful and easy to operate, so that several variables can partially measure the same characteristic (factor) (Ganebnykh, 2014; Plyuta, 1980).

At the fourth stage the factor analysis software first of all calculates the correlation matrix.

From the data of correlation matrix (Table 1) it is clear that particularly high correlation is between X_1 and X_2, X_1 and X_3, X_2 and X_3, X_2 and X_4, X_2 and X_{11}, X_4 and X_5, X_4 and X_6, X_5 and X_6, X_5 and X_{15}, X_6 and X_{12}, X_7 and X_{10}, X_7 and X_{13}, X_{11} and X_{14}, X_{14} and X_{15}. Therefore correlation coefficients closer to 1 describe the interconnection level between grouped variables and grouping factors (Ivanov and Matveev, 2011), i.e., that the procedure of factor analysis can be used for analysis of our data.

To define the number of factors in each running of the program the following rule was applied: The percentage of explained factor dispersion should be more than 100%/the number of variables = 100%/15 = 6.6%, i.e., the factors with more than 6.6% are taken into the count.

Besides "Eigen value" index with value of more than 1.0 to be taken into account can be used.

In our case for the second stage of factor analysis on the basis of scree plot diagram it is recommended to select 2.3 or 7 factors (Figure 2), the value of "Eigen value" and "Value, %" confirm such selection ("Eigen value" of factors - 2.29; 2.03; 1.66; 1.42; 1.33; 1.11; 1.01; "Value, %" - 15.3%, 13.6%, 11.1%, 9.5%, 8.9%, 7.4%, 6.7%) (Table 2). So it is decided to include four factors into the model.

At the fifth stage interpretation of the analysis results is carried out, based on the most important aspects such as factor loading, entities and values of explained dispersion. Factor loading is a linear correlation between variables and factors. Entity is a value of dispersion of a certain variable, which this variable shares with other variables. The percentage of explained dispersion is proportional to quadratic sum of factor loading so it partially depends on the number of variables, factor loadings of which are not high. The variable entity in fact is equal to quadratic sum of factor loading of this variable. Factor loading shows which variables correlate with each factor and the level of this correlation. Later this information is used for subjective factor definition and naming.

On the basis of factor model analysis it can be concluded that relatively high value of correlation for Factor 1 can be seen between variables X_4 (problems with technical support), X_5 (lack of information related to small hydro power plant), X_9 (lack of water

Table 1: Correlation matrix

Observations	Correlation analysis														
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
X_1	1.0														
X_2	0.329	1.0													
X_3	0.222	0.258	1.0												
X_4	0.013	0.323	−0.057	1.0											
X_5	−0.226	−0.103	−0.003	0.331	1.0										
X_6	−0.142	−0.232	−0.039	0.252	0.217	1.0									
X_7	0.148	0.059	0.019	−0.087	−0.115	0.187	1.0								
X_8	−0.139	−0.088	0.292	−0.069	0.039	0.171	−0.080	1.0							
X_9	0.088	−0.204	0.221	−0.324	−0.214	−0.206	−0.255	−0.055	1.0						
X_{10}	0.139	−0.097	0.026	−0.054	−0.430	0.115	0.278	0.018	−0.092	1.0					
X_{11}	0.180	0.392	0.156	−0.008	−0.008	0.100	0.063	0.001	−0.072	0.078	1.0				
X_{12}	0.051	−0.053	0.003	0.094	−0.029	0.297	0.011	0.171	0.150	0.066	0.033	1.0			
X_{13}	0.078	−0.190	−0.211	−0.145	0.091	0.022	0.202	−0.172	0.152	−0.083	−0.110	0.129	1.0		
X_{14}	0.054	0.097	0.013	−0.049	0.061	−0.057	0.114	0.061	−0.078	0.019	0.209	0.050	−0.053	1.0	
X_{15}	−0.087	0.153	0.045	0.350	0.335	0.057	−0.123	0.033	−0.192	−0.203	0.142	0.146	0.048	0.247	1.0

Table 2: Preliminary evaluation of entities

Value	Preliminary evaluation of entities; eigen value of correlation matrix: Sum=15														
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}
Eigen value	2.29	2.03	1.66	1.42	1.33	1.11	1.01	0.80	0.76	0.63	0.56	0.47	0.38	0.26	0.21
Value, %	15.3	13.6	11.1	9.5	8.9	7.4	6.7	5.3	5.1	4.3	3.8	3.1	2.6	1.8	1.5
Cumulative, %	15.3	28.9	40.00	49.50	58.40	65.80	72.50	77.80	82.90	87.2	91.00	94.10	96.7	98.5	100.00

resources for installation of equipment with capacity requirements), X_{10} (possible obstruction from traditional energy suppliers), X_{15} (the least interest is the equity drawdown of electricity in cost value).

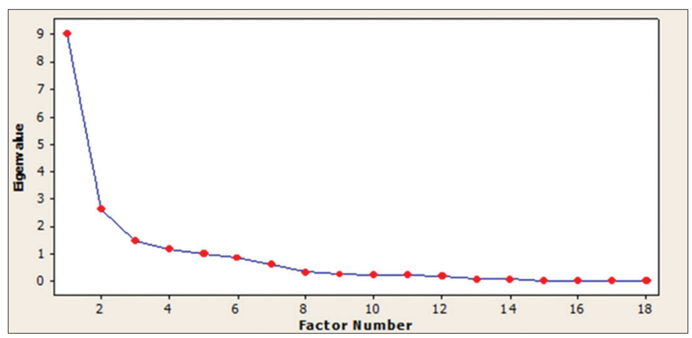
These variables in general underline the importance of components like lack of technical support, lack of water resources for installation of equipment with capacity requirements, lack of knowledge in the field of small hydro power plants, possible obstruction from traditional energy suppliers, i.e., the components that determine the influence on small hydro power plants introduction, that is why this factor can be called "lack of water resources for installation of equipment with capacity requirements."

Factor 2 is more correlated with variables X_1 (lack of financial resources), X_2 (lack of necessary equipment), X_{11} (high cost of introduction of small hydro power plants). Higher value of variable X_2 means that the agricultural producers don't have all the necessary equipment, and factor X_1 indicates the lack of financial resources for purchasing this equipment. That is why Factor 2 can be called "lack of financial resources" (Table 3).

Factor 3 is more correlated to variables X_3 (lack of time to study this issue), X_7 (lack of legal support), X_8 (lack of administrative resources). Negative value of X_7 means that the less legal support is provided the less is the willingness of agricultural producers to introduce renewable sources. This factor is called "legal support."

Factor 4 is more correlated with variables X_3 (lack of specialists in implementation and maintenance of alternative energy sources), X_8 (lack of administrative resources), X_{12} (quite long payoff period of expenses). This factor can be called "availability of specialists and administrative resources."

Figure 2: The scree plot diagram to define the number of factors



As a result of the analysis four factors (Table 4), which can evaluate the readiness of agricultural producers for implementation of renewable energy sources, were identified, i.e., to develop the program of readiness of agricultural producers for implementation of small hydro power plants the most significant factors are "lack of water resources for installation of equipment with capacity requirements," "financial resources adequacy," "legal support," "availability of professionals and administrative resources."

Increase of attention to the mentioned factors can significantly help agricultural producers to get ready for introduction of power saving technologies.

4. SUMMARY

Thus the proposed technology for identification of factors of agricultural companies' innovation activities defined that not only high capitalized expenses and lack of governmental

Table 3: Model of factors

Observations	Factor 1	Factor 2	Factor 3	Factor 4	Entities
X_1	0.311	0.577	−0.182	0.105	0.474
X_2	−0.196	0.772	0.098	0.243	0.702
X_3	0.209	0.462	0.550	−0.009	0.560
X_4	−0.669	0.204	−0.105	0.164	0.527
X_5	−0.709	−0.216	0.089	0.021	0.558
X_6	−0.252	−0.029	−0.389	−0.623	0.604
X_7	0.250	0.267	−0.628	−0.133	0.545
X_8	0.038	−0.004	0.529	−0.515	0.547
X_9	0.550	−0.148	0.367	−0.128	0.475
X_{10}	0.535	0.209	−0.266	−0.305	0.494
X_{11}	−0.029	0.651	0.057	−0.071	0.433
X_{12}	0.027	−0.007	−0.007	−0.747	0.559
X_{13}	0.043	−0.220	−0.461	0.092	0.271
X_{14}	−0.127	0.324	0.048	−0.136	0.142
X_{15}	−0.651	0.236	0.129	−0.203	0.537

Table 4: Grouping of factors

Dispersion explained by each factor			
Factor 1	Factor 2	Factor 3	Factor 4
2.2878	2.0011	1.6303	1.5091
0.153	0.133	0.109	0.101

Standard rates of factors value				
Observations	Factor 1	Factor 2	Factor 3	Factor 4
X_1	0.128	0.292	−0.131	0.067
X_2	−0.094	0.383	0.023	0.155
X_3	0.097	0.214	0.330	−0.041
X_4	−0.292	0.110	−0.073	−0.091
X_5	−0.309	−0.108	0.051	0.028
X_6	−0.101	0.004	−0.214	−0.391
X_7	0.102	0.153	−0.378	−0.067
X_8	0.036	−0.014	0.353	0.370
X_9	0.250	−0.087	0.245	−0.114
X_{10}	0.236	0.113	−0.149	−0.205
X_{11}	−0.014	0.326	0.018	−0.055
X_{12}	0.029	0.003	0.032	−0.499
X_{13}	0.016	−0.096	−0.274	−0.038
X_{14}	−0.054	0.163	0.024	−0.093
X_{15}	−0.280	0.120	0.074	−0.129

financial support but also the lack of necessary labor, material and financial resources as well as weak legal support interfere with innovation implementation in the industry. The analysis allowed to determine the priority areas of innovation activities development in agricultural sector. To prepare agricultural manufactures for implementation of innovation technologies it is not necessary to develop activities for each target segment; to develop the program it is important to pay attention to the governmental support for implementation of innovation technologies that will enable a company to minimize own investments and decrease the production cost in the future.

REFERENCES

Blyumin, S., Sukhanov, V.F., Chebotarev, S. (2004), Economical Factor Analysis: Monograph. Lipetsk: Lipetsk Ecological and Humanities Institute. p148.

Burtseva, T. (2015), Financial risks and their affect on the competitiveness of business organizations. Innovative Development of Economy, 3(27), 23-28.

Burtseva, T., Kuznetsova, A.V., Mironova, N., Berezina, E. (2008), Perceptual map of dairy products producers on the market of Kirov region. Regionology, 4, 186-192.

Ganebnykh, E. (2014), Assessment of the factors defining efficiency of franchise offers. Fundamental Research, 3, 315-320.

Ivanov, A., Matveev, I. (2011), World power at the turn of the second decade of currant century. World and National Economy, 3(19), 24-29.

Ivanova, N., Dezhina, I., Shelyubskaya, N., Papia, L. (2008), Innovations. The analysis of innovation policy and evaluation of its results. Russia, 5, 56-72.

Kim, J.O., Muller, C., Klekka, W.R., Oldenderfer, M., Blashfild, R.K. (1989), Factor, discriminant and cluster analysis. Moscow: Finance and Statistics.

Long-term Forecast of Scientific and Technological Development of the Russian Federation. (2015), Available from: http://mon.gov.ru. [Last retrieved on 2016 Feb 01].

Lutoshkina N.K. (2012), Identification of key target segments for planning programs to improve the efficiency of price and nonprice competition in the banking market of individuals (on materials of the Kirov Region), Advanced Science, 1(1), 167-178.

Mironova, N. (2009), Strategic Management of Corporate Identity on the Market of Dairy Products in Kirov Region. Dissertation.

Plyuta, V. (1980), Comparative multivariate analysis in economic research. Methods of Taxonomy and Factor Analysis, Moscow: Statistika.

Popov, I. (2011), Expediency of agricultural clusters formation. BOSS.

Problems and Perspectives of Innovation and Creative Economics Development. (2011), Moscow: BIBLIO-GLOBUS Publishing House LLC.

Schelchkov, V. (n.d.), Theoretical basis of innovation activities development in agriculture. Bukvi. Available from: http://www.bukvi.ru/ekonomika/investicii/teoreticheskie-osnovy-razvitiya-innovacionnoj-deyatelnosti-v-selskom-xozyajstve.html. [Last retrieved on 2016 Jan 20].

Shibaikin, V. (2011), Innovation development of agriculture: Priorities and mechanisms. Economics of Agricultural and Processing Companies, 9, 44-48.

Soboleva, O. (2012a), Innovation processes management in Kirov region. Advanced Science, 1, 35-40.

Strebkov, D. (2009), Innovative energy technologies. In: Agriculture in Modern Economy: New Role, Growth Factors, Risks. Moscow, Russia: All-Russian Institute of Agrarian Problems and Informatics Named After Nikonov A.A.

Vladimirova, O., Dyagel, O. (2011), About the classification of factors forming innovation perceptibility of a region. Journal of Corporate Finance Research, 12, 18.

Zavodsky, V. (2008), Technology of innovation process management. Innovations, 3, 108-116.