

Innovation Activity in Regional Agriculture: Evaluation of Management and Proprietors' Readiness

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Abstract—The core idea of the article below is the existence of complicated array of deterrent factors that influences innovation activity of agriculture organizations, and subjective, psychological factors among those factors as well. The main goal of this work is to assess the top management and proprietors' of AIC enterprises readiness to implement the innovations. As a research' working hypothesis used the decisive role of human factor in answering the question whether to innovate or not. Research hypothesis was tested by representative sample survey formed from AIC enterprises' top managers, small and medium sized agribusiness enterprises owners. Use of standardized methodic of psychological testing of main innovation readiness components let us to estimate an overall level of innovation readiness as fairly low. The most problematic component appeared to be an organizational readiness, especially in comparison with relatively high results of personal and cognitive readiness. The novelty if idea offered for discussion among scientific community lies in that for AIC organizations innovative activity increasing by state authorities offered more directive approach to these organizations as an object of government regulation and the system of economic incentives for innovative behavior, such as system of standards of innovative activity, which, being unfulfilled, would block the opportunity to access the programs of state support of agriculture for such organizations. Scientific and educational value of author's proposals is in opportunity to use them in scientific researches in field of innovative activity if agricultural enterprises and in profile universities educational process.

Keywords—*innovation, readiness for innovation, innovative behavior, agri-food sector, agricultural enterprises, stimulation of innovation.*

I. INTRODUCTION

As known, for several decades in Russia an integral part of community of economists researchers, enterprises management and state regulators discourse is a necessity to overcome the gap in labor productivity between Russia's economy and economies of developed and even some developing countries. Discussion of lowering capital productivity started in 1970-s, continued in form of calls to "intensification" and "acceleration" that finally failed, it goes

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on today in terms of innovation implementation and building a new, more effective economy based upon higher technological orders achievements. Innovation implementation problem, especially breakthrough innovations, supposed to be system and complicated, it demands long and thorough work to be done, and, first of all, preparation, infrastructural work. Still the conclusion of this problem is a matter of future.

This statement is insured by official statistics. The GDP share of R&D inner costs in Russia in 2010-2017 fluctuated in the interval 1.01-1.13%, while it was 2-2.5 times higher in China (2.01-2.05%), USA (2.74-2.80%), Germany (2.79-2.87), South Korea (3.47-4.29%), and Japan (3.36-3.58%) [1].

Another peculiarity of domestic experience of innovative activity is significantly less, in comparison with developed economies, share of private business in R&D funding – 28%, while state funding gives up to 68% [2]. This fact may be interpreted in two ways. Traditional explanation based on liberal speculations about necessity to reduce the share of state in economy, and in that way the mentioned fact considered as an argument for too high presence of state in economy of Russia. This explanation, to our mind, seems to be too far from reality. We incline to the view that this fact shows that the structure of Russia's economy formed by 1990-s policies is specialized in commodities export and goods with low share of value added. It was or at least seemed to be actual as a part of existed globalized system of international division of labor, but, as a consequence, it formed a specific mentality of proprietors and management in Russia that has a little interest to innovate.

A complexity of situation in innovation implementation in agriculture, as well as in other branches and sectors in Russian economy is underlined by many researches, as well as ones conducted a long time ago [3-5] and ones being done nowadays [6-11].

There are difficulties in modernization of Russia's agroindustrial complex (AIC). These difficulties caused by a complex of factors, study of which supposed to be of significant scientific and practical interest, especially in regional level (in case of Kurgan region as one of the most

problematic regions of Ural Federal District) and are subject of work presented below.

II. THEORY

When studying the massive of factors that influence innovative and investment activity, different classifications of these factors and approaches to group may be met. A widespread methodology of STEP-analysis should be mentioned first. Due to this approach, all factors that affect enterprise internal environment and its innovative activity as well, refer to social, technological, economic and politic groups of factors [12,13].

In the context of Russian regions research the work of O. Mariev and I. Savin should be noticed [14]. In authors' opinion, innovative activity factors are, in general, purely economic: net profit, aggregated companies debt, share of small enterprises in regional product, shares of private and municipal investments into companies fixed capital. As another important control parameter of innovative activity authors also propose to use an age of firm. This appears to be a controversial decision, because this parameter, taken alone, cannot lead to reliable estimate of innovative activity of the firm, and, taken together with other factors, does not change the estimation result.

Other researchers highlight such important innovative activity factors as institutional environment parameters, which become crucial in countries with catching up development. These are factors of business climate and market "game rules" [15].

Controversial, as some researchers point, the influence of subsidies and state support measures to innovative activity of regional AIC [14,16,17]. Many foreign firms that met lack of state support show significantly less innovative activity than firms that received it. In general, researches conducted abroad consider factors of state support and its availability as ones that matter [18].

At the same time, state support may become a stimulus to opportunistic behavior of its recipients, which expresses in passive innovative behavior, unwillingness to change the longstanding tech and business practices, compensating the decrease in competitiveness to foreign competitors with support and protectionism measures [19].

Among most recent papers devoted to studying innovative activity factors, the work by A. Pushrarev should be noted. In this work being offered such groups of factors as firms internal indicators (profit, form of proprietorship, size, import-export activity involvement, indicators of costs and results...), institutional factors (investment attractiveness of region, business climate, politic climate in the country, access to financial resources, openness of economy), human capital factors, agglomeration effects factors, state support factor, and, finally, other factors [20].

Careful examination of classifications presented above, allows us to conclude that they have a definite disproportion in favor of objective factors. These are factors that don't depend upon perception, attitudes, value orientations of the subject that owns or manages the enterprise. Without diminishing the value of objective factors, it should be pointed out that subjective factors are definitely those which determine one's behavior, including innovative behavior, and this fact reflects in the behavior of firms.

Partially predominance of objective factors may be explained by presence of significant array of quantitative indicators among them; these indicators are suitable for econometric processing with less squares method or other, more complicated non-linear and multifactor models. Presence of formalized criteria allows proposing recommendations to business with sufficient degree of reliability. On the other hand, as fairly highlight many researchers, orientation to exclusively quantitative data deters recognition of ways in which behavior of involved people impacts firm [21-24].

An accent to objective, quantitative methods in evaluation and prediction of innovative activity, and moreover, in attempts to manage it leads to overlook the simple fact that final decision about whether innovate or not, which innovation from those that are available, to choose, and the manner of implementation makes by a person [25]. A person may act irrationally from the formalized model point of view. In particular, he may take into account the factors excluded from formal model and due to this decline "machine-generated", schedule decisions, as it happens with phenomena of managerial intuition; choosing from a couple of comparable by quantitative indicators projects he will finally choose a project that corresponds with his values and attitudes most of all; in some cases values and attitudes may completely block some directions of innovative activity [26-28].

A decision-making person (DMP) may adhere any strategy of behavior, as well as strategy that do not obey basic postulates of certain model. For example, the postulate that firm always seeks the maximum profit may be unjust for small and medium business which proprietor is satisfied with reached balance of income and risk and evaluates further investment of his personal time and abilities into income increasing as not exceeding the alternative value of this very time [29].

Among DMP's relative to innovation implementation may be defined the following groups of stakeholders: business proprietors and top management. They may use the services provided by consultants; decisions taken transfers to implementers by chain of command.

III. PROBLEM STATEMENT

Tasks of this article come directly from the research hypothesis which may be formulated in following terms: innovative activity of AIC enterprises depends both from objective and subjective factors. Innovative behavior of DMP's and it's different types (that we are going to describe) are the consequence of combination of their personal characteristics, values and attitudes, which may be described in general as innovative readiness of DMP's.

Thus, following tasks of research may be stated:

- To define the circle of DMP's and their types of innovative behavior;
- To define, based on sample of DMP's, their psychological parameters, mostly corresponding with certain type of innovative behavior;
- To make a conclusion about possibility to spread results obtained upon higher level than simple sample;
- To typify DMPs to groups with similar set of parameters and innovative behavior;

- To develop recommendations for innovative activity stimulation based on obtained results.

IV. METHODOLOGY

Answering a question about typology of innovative behavior we propose to proceed that innovative behavior is a particular case of behavior of person, so it may be described with the help of approaches used to study of behavior itself, with the only difference that mentions the specifics of innovative activity.

We developed a two-scaled model of innovative behavior of DMPs at the level of a firm (fig. 1).

As control parameters that let the values of system's state variables, which may be used for further describing of innovative behavior types were taken such factors as "innovation implementation readiness" and "scale of innovations preferred".

When evaluating the generalized readiness to implement innovations it is possible to use existing standardized methodic, for example, the methodic of evaluation of innovation readiness by Panteleeva-Knisheva [30-32].

To evaluate the scale of innovations preferred we designed a specialized questionnaire. It based on questions that let to evaluate the respondent's choice between three degrees of innovation scale: particular, improving and breakthrough. A maximal amount of points respondent can get is 240 pts, a minimal amount is 80 points. Low scale of preferred innovations lays between 80-130 pints, average scale corresponds to 140-200 points, and above-average is more than 200 points.

Innovation implementation readiness	High	High readiness to innovate, but partial innovations preferred: "Perpetual improvements" as they seen in Kaizen paradigm"	High readiness to innovate, improving innovations preferred: "Good is better than Excellent"	High readiness to innovate, breakthrough innovations preferred: "Revolutionary". Possible adventurism tendency.
	Average	Average readiness to innovate, partial innovations preferred: "Moderate trifle changer"	Balanced type of innovative behavior	Average readiness to innovate, sufficient depth of preferred innovations: "If change something, let the game will be worth the candle".
	Low	Passively-avoidant type of innovative behavior: "No good can come of this"	Passively-conservative type of innovative behavior ("expectant")	"Daydreamer" type of innovative behavior: high emotional and motivational readiness combined with relatively low cognitive, personal and organizational readiness; possible difficulties of implementation tend to be underestimated (Dunning-Kruger effect)
	n/a	Low (partial innovations)	Average (improving innovations)	High (breakthrough innovations)
Depth of preferred innovations				

Fig. 1. Possible combinations of innovation implementation readiness and scale of preferred innovations.

An experimental sample was formed by persons occupied in Kurgan region AIC. In the sample were included proprietors of small and medium business (20%), enterprise CEO's (30%) and vice-CEOs (50%). Sample volume is 100 respondents, thus allowed us to use parametric criteria during statistical processing of obtained data.

V. RESULTS

Performed research allowed us to make some conclusions. First, overall readiness to implement innovations appeared to be fairly low (table 1).

TABLE I. SAMPLE CASE DISTRIBUTION

Score	Number of cases	Share, %	Cumulative Share, %
<i>Integral estimate of innovation implementation readiness</i>			
120<x<=140	4	4.00	4.00
140<x<=160	19	19.00	23.00
160<x<=180	33	33.00	56.00
180<x<=200	29	29.00	85.00
200<x<=220	15	15.00	100.00
<i>Emotional readiness</i>			
10<x<=20	3	3.00	3.00
20<x<=30	4	4.00	7.00
30<x<=40	37	37.00	44.00
40<x<=50	44	44.00	88.00
50<x<=60	11	11.00	99.00
60<x<=70	1	1.00	100.00
<i>Motivational readiness</i>			
10 <x<=20	4	4.00	4.00
20<x<=30	6	6.00	10.00
30<x<=40	19	19.00	29.00
40<x<=50	51	51.00	80.00
50<x<=60	19	19.00	99.00
60<x<=70	1	1.00	100.00
<i>Cognitive readiness</i>			
20<x<=30	2	2.00	2.00
30<x<=40	16	16.00	18.00
40<x<=50	39	39.00	57.00
50<x<=60	35	35.00	92.00
60<x<=70	8	8.00	100.00
<i>Personal readiness</i>			
10<x<=20	4	4.00	4.00
20<x<=30	5	5.00	9.00
30<x<=40	23	23.00	32.00
40<x<=50	42	42.00	74.00
50<x<=60	19	19.00	93.00
60<x<=70	7	7.00	100.00
<i>Organizational readiness</i>			
10<x<=15	1	1.00	1.00
15<x<=20	10	10.00	11.00
20<x<=25	14	14.00	25.00
25<x<=30	18	18.00	43.00
30<x<=35	20	20.00	63.00
35<x<=40	19	19.00	82.00
40<x<=45	8	8.00	90.00
45<x<=50	9	9.00	99.00
50<x<=55	1	1.00	100.00

Acquired average score of innovation readiness' main components allow us to characterize with 95% confidence corresponding parameters of general subset, thus enables us to make statistically significant inferences from obtained experimental data (table 2).

TABLE II. SAMPLED VALUES OF INNOVATION READINESS

Component name	Average	Lower confidence limit (95%)	Upper Confidence limit (95%)	Standard Deviation
Emotional readiness	41.13	39.39	42.87	8.7636
Motivational readiness	42.93	40.93	44.93	10.0626
Cognitive readiness	49.11	47.28	50.94	9.2473
Personal readiness	44.32	42.15	46.49	10.9598
Organizational readiness	32.51	30.76	34.26	8.8346

Study of main components of innovation implementation readiness allows making the foregoing conclusions: emotional readiness in analyzed sample is average (41 point out of 70 possible); 81% of cases allocated between 30-50 points. As far as emotional readiness may be a sign of distinct interest to new technologies implementation and new modes of operation, it is clear that the interest to innovations in selected sample is far from high.

Average score of motivational readiness in selected sample slightly differs from emotional readiness score and sustains of 42.9 points. Where the differences really are, is the distribution of cases. A group of 40-50 points (above-average motivational readiness) got 51% of cases, plus 19% were allocated in 50-60 points interval; that shows a relatively high motivational readiness of people involved, coming from fairly strong intentions to achieve a success, and, secondarily, gain satisfaction from self-fulfillment and personal growth.

Cognitive readiness to innovate is relatively high, too. Sample average is 49.1 points; it is the highest result among all other components of integral indicator. Also notable is the tendency of results concentration in higher intervals: while in 0-40 points interval cumulative sum of observations is only 18%, interval of 40-50 points got 39%, and 50-60 points – 35%, or, if we put the latter groups together, 74% of observations. That shows that knowledge, abilities and skills of DMPs in sample are quite high and, if seen in general, correspond with requirements of our time.

As for personal readiness (sample average is 44.3 points) a concentration of observations between 30-50 points (65% of cases) should be mentioned. This corresponds to an average level of innovation readiness: personal peculiarities that enhance propensity for innovation (such as self-confidence, moderate risk-taking, practicality, radicalism, creativity) manifest clearly but their level is cannot be described as very high.

The lowest score was observed at the last component of innovation implementation readiness, i.e. organizational readiness. Average score of this parameter is 32.5 points, while maximal possible score is 70. More than a half of observations lie below 35 points limit, and 20% of observations – between 30 and 35 points.

There are some possible ways to interpret obtained result. First way is to confess that organizational readiness to implement innovations is really low, and this is determined by objective reasons like AIC overall conservatism, widespread of linear functional structures, oversimplified style of management, when “initiative leads to punishment” and

innovation, once successfully implemented, is taken for granted (while fails in innovations lead to immediate negative consequences to all who was not lucky to have even the slightest relation to an unsuccessful project). Second way of interpretation is a situation of responsibility shifting, which is typical for firms with low corporative culture level: while valuating his own readiness to innovate as relatively high or at least average, respondent shifts a part of his personal responsibility upon a faceless “system”.

Interconnections between parameters included into research plan are presented below.

With 95% confidence there’s a fairly strong and straight ($r=0.631$) correlation between generalized readiness to implement innovations (IIR) and scale of preferred innovations (SPI). Assessed with Statistica 6.0 software, the regression equation is

$$IIR=0.9511 * SPI - 33.609. \tag{1}$$

Adequacy of model built is approved by Student’s t-criteria and close to normal residual’s distribution (fig. 2).

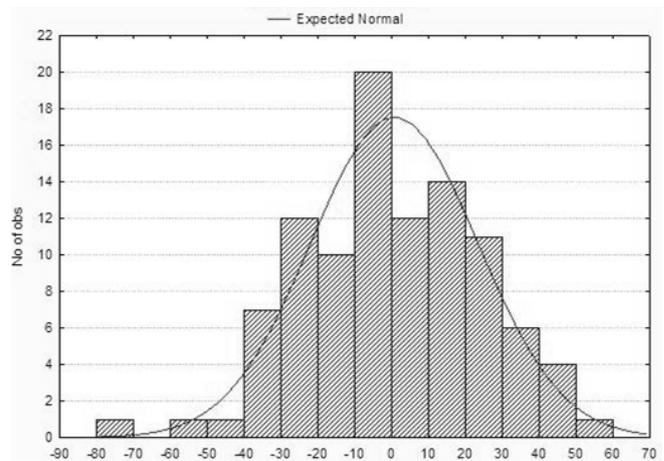


Fig. 2. Raw residuals distribution histogram.

This allows us to conclude that DMPs with higher readiness to innovate would probably prefer innovations of greater scale, while low innovation implementation readiness of others used to be covered by activity in implementation of smaller, insignificant and even pseudo-innovations.

VI. CONCLUSION

The main result of presented research is that Kurgan region AIC decision making persons innovation implementation readiness was estimated. One of research hypothesis was proved: innovative activity of firms in AIC depends, among others, on subjective factors, bound with personal characteristics and management style. In experimental sample the integral readiness to innovate may be described as medium low, especially low result was detected in organizational readiness sphere.

Also should be mentioned found interdependencies of parameters enlisted in research schedule, especially between innovation implementation readiness and scale of preferred innovations.

Another important conclusion is that despite many years of efforts to form a managerial corps able to quick innovations implementation, the final solution of this task is a matter of relatively far future. No less important conclusion is a

possibility to doubt the “textbook” models of economic behavior of “private owners” and “effective proprietors” under market conditions. As well as proprietors of small and medium-sized agribusiness were included into the tested sample, and no bimodal case distribution was found, we may say those proprietors are as far from innovative activity as their managers are. This allows us to bring up an issue about practical value of typical models of proprietors market behavior, according to which, due to competitive force, proprietors are interested in every way to improve competitiveness. Finally, identified patterns of innovative behavior of DMPs in AIC, especially predominance of passive type innovative behavior, leads us to rise an issue of advisability to change existing in AIC approaches to innovative process governing. In particular, we mean advisability to shift the priorities to more directive innovative process manner, with stronger government involvement into investment processes control in AIC, for example, by setting a regulatory system that consists of prescribed innovative and investment activity indicators by state that must be performed if a firm pretends to receive any state support like subsidizing, and, first, investment subsidizing with state participation in added capital.

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