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**Экономика сельского хозяйства**

# Farmers' Willingness to Cooperate: The Case of Tatarstan

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**Abstract**

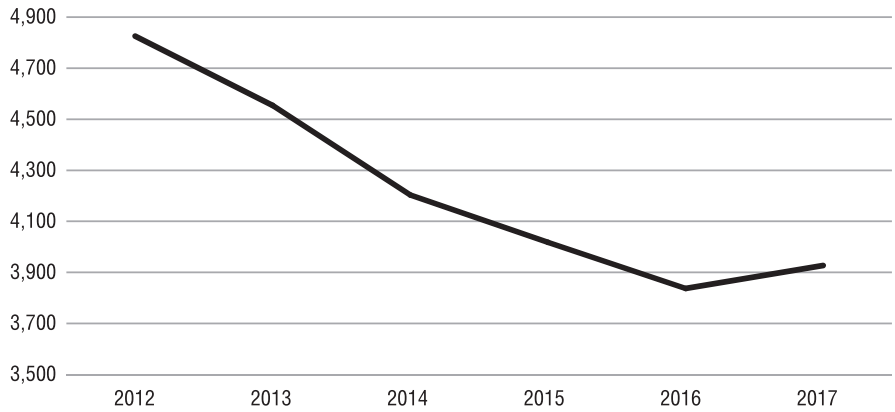
Despite the purposeful governmental programs, agricultural cooperation in Russia is not developing—on the contrary, the number of cooperatives has been continuously declining. This study investigates the reasons for farmers' refusal to join cooperatives. A prepared questionnaire was distributed in one of the Russian regions (the Republic of Tatarstan), and the collected data were analyzed via the cross tabulation method and logit analysis. According to the study results, the major reasons for not cooperating are as follows: respondent farmers lack the experience of cooperation, they have problems trusting each other, they are not socially active in their communities, and they rarely have a higher education. The study results recommend that the Ministry of Agriculture, willing to develop agricultural cooperation, pay special attention to educating farmers in terms of cooperation. Particular work should be done in teaching farmers to work in groups, trust each other, and organize systems of cooperative ventures in a way that would exclude cheating and free-riding behavior on the parts of both the cooperative members and the leaders. Stimulating social activities among farmers in rural areas might also increase cooperation. In addition, there is a need for agricultural consulting services offering high quality educational courses explaining the advantages of cooperatives and profits that they may provide to the members.

**Keywords:** agricultural cooperatives, farmers' willingness to cooperate, the Republic of Tatarstan.
**JEL:** Q13, Q12, Q18.

## Introduction

Cooperation has been a popular tool among agricultural producers all across the world over many centuries. It helps to strengthen the economic potential and market power as well as keep small and middle agricultural producers viable and competitive against large producers and monopolistic market structures, and gain collective bargaining power and vertical integration [Hagos, 2003; Abate et al., 2014]. Cooperation helps to increase profits and prosperity of its members by reducing transaction costs in the production process [Smith, 1979], mitigating risks and uncertainty for smallholders [Zeuli, Radel, 2005] as well as improving their active social position, influencing agricultural and rural policy [Zheng et al., 2011], enforcing innovation and efficiency gains [Abate et al., 2014], etc. Russian government has elaborated a system of measures to encourage farmers to organize in groups and establish cooperatives. Presidential Decree No. 204 dated May 7, 2018 on the National Goals and Strategic Objectives of the Development of the Russian Federation for the Period up to 2024 and the Strategy of Sustainable Development of Rural Areas of the Russian Federation for the Period up to 2030 are aimed at fulfilling this purpose.

Nevertheless, many farmers across the regions of the Russian Federation refuse to join cooperative societies despite the obvious advantages of this form of business and various technical and financial government support that it implies [Golovina, Nilsson, 2009; 2011]. Only 1% of households, 2% of farming units, and 5% of agricultural enterprises are members of agricultural cooperatives in Russia. In spite of the supporting policies from 2012 through 2017, the number of agricultural cooperatives declined from 4,825 to 3,927 (Figure 1).




*Source:* [Antonova et al., 2020].

Figure 1. **Number of Agricultural Consumers' Cooperatives in the Russian Federation** (Y-Axis), **2011–2018**

In recent years, the private farming sector in Russia has changed in terms of human capacity. In 2013, Azer Efendiev and Pavel Sorokin showed that there is a positive change in farmer attitudes toward entrepreneurship and individualism compared with a similar survey in 2000 [Efendiev, Sorokin, 2013]. These authors state that the long-claimed communalism of Russian rural dwellers may be partly disappearing while individualism and entrepreneurial activity are growing rapidly. [Wolz et al., 2016] conclude that private farmers in Russia are becoming increasingly business-oriented, which gives rise to both informal and formal organizations in rural areas. This should logically lead to an increase of cooperation potential, which, however, is not occurring. [Golovina, Nilsson, 2009] state that newly organized top-down cooperatives (established by a government initiative) in Kurgan region in Russia are not effective because farmers' willingness to cooperate in such organizations is low. [Kurakin, Wisser, 2017] argue that the effectiveness of top-down organized cooperatives in Belgorod region in Russia is not as low as in Kurgan region. Nevertheless, the stable reduction of cooperatives in Russia on average, according to the state statistics indicated on Figure 1, lends support to the message of [Golovina, Nilsson, 2009], i.e. ineffective top-down cooperatives suffer from shorter life cycles. [Golovina, Nilsson, 2009; 2011] recommend creating cooperatives in a bottom-up way, when farmers take the initiatives of establishing cooperatives. However, something is hindering Russian farmers from organizing cooperatives and becoming members of such. [Golovina, Nilsson, 2009] determine the following as reasons for that: (1) insufficient level of knowledge about cooperation, (2) deficiency of self-government skills, (3) psychological unavailability of self-supporting cooperation and partnership, (4) absence of cooperative education and shortage of professionals to manage agricultural cooperatives, (5) financial problems, (6) disparity between agricultural and industrial product prices, (7) weak protection of the domestic market from imported raw products, and (8) imperfections in the legislation and the regulatory framework for cooperatives. In [Golovina et al., 2018], the authors state that Russian farmers reject cooperation because of (1) low trust, (2) absence of cooperation experience, (3) absence of knowledge in cooperative management, and (4) financial problems.

Imperfections in the legislation and the regulatory framework for cooperatives as well as economic and financial problems hindering the development of agricultural cooperation in Russia are precisely discussed in [Antonova et al., 2020]. This includes such factors as (1) double taxation of cooperative members; (2) full legal liability of cooperatives; (3) state subsidy requirements distorting the nature of cooperatives and subverting their efficiency; etc. However, the sociopsychological factors of cooperation were only examined within Kurgan region in Russia

[Golovina, Nillsson, 2009]. The current study contributes to the discussion of these factors in Tatarstan Region in Russia.

The sociopsychological factors of agricultural cooperation are investigated in a number of international studies. [Stallman, James, 2015] conclude that farmers who believe to receive benefits from cooperation, have farms similar to their neighbors, are active members of community organizations, and trust agricultural extension agents are more willing to cooperate than farmers who do not share these characteristics. [Nugusse et al., 2013] find that the most important variables that significantly influence the likelihood of rural people to join cooperative societies are access to information, membership in rural associations, frequency of attending public meetings or workshops, household head's education level, access to alternative credit sources, access to training (exposure visits), distance to a market, access to infrastructure, farmland ownership, and size of farmland. We employ the results of the discussed studies to determine Russian farmers' reasons for refusing cooperation.

The Republic of Tatarstan in Russia was chosen to be the study region. Tatarstan is the fourth biggest agricultural region in Russia[1] and its agriculture is typical for the Central European part of the country. Agriculture in Tatarstan is almost equally shared between crop production (49%) and livestock farming (51%). The volume of agricultural production in Tatarstan in monetary terms increased from 34.9 billion rubles in 2001 to 213.7 billion rubles in 2015. In 2013, Tatarstan was representing about 2.7% of registered agricultural cooperatives among 85 regions of the Russian Federation [Yanbykh et al., 2014]. Small and middle agricultural producers in the Republic of Tatarstan enjoy state support in a form of subsidies and grants. Subsidies are intended for keeping dairy cattle, buying heifers and first-calf heifers, juvenile poultry, building small-scale milk farms, and buying fuel and lubricants. A special type of subsidies is granted to agricultural cooperatives. Agricultural cooperatives receive grants for strengthening equipment and buildings. However, cooperative grants are scarce and restricted to a small number of cooperatives which have won the competition. For example, only two agricultural cooperatives out of 96 existing in Tatarstan in 2015, nine cooperatives out of 140 existing in 2016, and nine cooperatives out of 94 existing in 2017 received grants for strengthening their equipment and buildings. Ten out of 20 cooperatives which received grants were set up no later than 1.5 years before the date of grant announcement [Yanbykh et al., 2014]. This study investigates agricultural producers in Tatarstan in terms of their willingness to cooperate.

We build our model using a theory from three bodies of literature that may provide insight into a farmer's desire to become a member of

[1] https://ab-centre.ru/page/selskoe-hozyaystvo-tatarstana.

a cooperative. First, we propose predictor variables from the collective action literature which explains a person's willingness to become part of a group or a person's willingness to cooperate with others to achieve a common goal. Second, we have explored the literature on transition economies which describes the system of existing cooperative institutions in a transition economy. Finally, we consider the agency theory describing the principal-agent relationships, which may impact a farmer's decision to join a cooperative.

## 1. Conceptual Framework

In the present study, we investigate farmers' decision to cooperate for inputs purchase, machinery pools, processing and sales of farm products. Our model can be expressed as a farmer's decision to cooperate being a function of a set of predictor variables, farmer characteristics, and farm characteristics.

Our study is an exploratory one, since little is known about Russian farmers' willingness to cooperate within consumer cooperatives. Therefore we create our model by using theoretical concepts from collective action theory, agency theory, and studies on transition economics. We start by forming predictor variables from the collective action theory, which attempts to explain a persons' willingness to be in a group, or to cooperate with others in order to achieve a common goal, such as to purchase farm inputs and to sell farm outputs. Next, we continue to form the predictor variables from the literature on agricultural cooperatives in transition economies, and from the agency theory.

[Cook, 1995; Staatz, 1987] have found that farmers' desire to cooperate can be explained by collective action theory, i.e. with a person's willingness to become part of a group or a person's willingness to cooperate with others to achieve a common goal or to solve a mutual problem. [Stallman, James, 2015] have found that farmers are willing to cooperate when (1) they perceive that they will receive a positive benefit from cooperation; (2) they have similar backgrounds and goals; (3) they feel that they can trust other members of the group; and (4) they have strong social ties in their community or in other groups. According to the four theoretical assumptions above, we formulate hypotheses H1–H6 (adapted from [Stallman, James, 2015]):

**H1.** Farmers who are willing to cooperate are more likely to join cooperatives than farmers who are not willing to cooperate.

**H2.** Farmers who work with other farmers are more likely to be members of cooperatives than those who are not collaborating with others.

**H3.** Farmers who believe that the cooperative is a tool which will help organize their business more effectively are more likely to join cooperatives than those who do not believe that the cooperative is an effective tool.

**H4.** Farmers who believe that their neighbors and other farmers in their community are usually trustworthy are more willing to cooperate than farmers who believe that their neighbors and other farmers in their community are not so trustworthy.

**H5.** Farmers who perceive that their farm operations are similar to the farm operations of other farmers within a certain geographical location will be more willing to cooperate compared to farmers who perceive that their farm operations are different from farm operations of other farmers within the geographical location.

**H6.** Farmers who are active participants in community organizations are more likely to be members of cooperatives than those who are not active participants in community organizations.

Our hypotheses H7–H8 address the agency problems and risks that arise due to differences in goals of the principal and the agent [Borgen, 2004; Minguez-Vera et al., 2010]. For example, members of cooperatives may suffer from goals which the leaders pursue not in favor of the cooperative's members.

**H7.** Farmers who trust the leaders of their community are more likely to be members of cooperatives than those who do not trust their leaders.

**H8**. Farmers who believe that they control cooperative activities are more likely to be members of cooperatives than farmers who do not believe that they have any control.

Literature on Russian agricultural cooperatives [Golovina et al., 2013, 2014; Lerman, Sedik, 2014a, 2014b; Sutherland, 2008; Wolz et al., 2016] confirms that the institutional system in Russian agriculture, as well as the way of living in rural areas, has been very much affected by the past socialist era. The rural population still remember the Soviet system of collective farms and often associate cooperatives with the organization form of kolkhozes and sovkhozes, or Soviet consumer societies. Modern producer cooperatives resemble very much the system of kolkhozes and sovkhozes, thus causing confusion. Understanding of the true nature of cooperatives is rare among the rural population; an exception might be knowledge received by farmers traveling abroad and communicating with foreign farmers. That being so, we formulate the next hypothesis (H9):

**H9.** Farmers who possess sufficient information on how to organize and manage an agricultural consumers' cooperative will more likely be members of cooperatives than farmers who do not possess sufficient information on how to organize and manage an agricultural consumers' cooperative.

Some studies have detected non-formalized collaboration between farmers in Russia [Gardner, Lerman, 2006; Davydova, Franks, 2006; Mamonova, Visser, 2014]. Independently of whether farmers cooperate informally or formally, we are interested in how the duration of their

collaboration with each other impacts their decision to join cooperatives. Does long-term collaboration lead to the recognition of benefits of cooperation and therefore to official membership in cooperatives, or not? Do members of cooperatives have a long-term collaboration experience with others, or they are mostly newcomers in cooperation? For that we put forward H10:

**H10.** The more years of cooperation experience a farmer has, the more likely they will be a member of a cooperative.

Within the National Agricultural Development Program, the Russian government subsidizes agricultural cooperatives in their technical and financial needs [Yanbykh et al., 2014]. Thus, essentially, state support for farmers is partially channeled through cooperatives. The Program contributes to the farmers' incentive to organize cooperatives in order to utilize the available funds. Such cooperatives often do not reflect the nature of true cooperation and tend to exist until the state funding is over. Therefore, farmers who report that state support is an important reason to join a cooperative, very similarly, have weak knowledge about cooperation and dubious reasons for setting up or joining a cooperative (H11).

**H11**. We hypothesize that farmers who perceive state support as unimportant are more likely to be members of cooperatives than those who believe that state support is important.

Social capital theory predicts that proximity supports cooperation because of the lower cost of information exchange and reciprocity. [Sexton, Sexton, 1987] observe that cooperatives are often set up inside local areas, which suggests higher coordination costs across larger geographical distances. Due to lower coordination costs within reference groups, members of cooperatives often share similar demographic and social characteristics [Petruchenya, Hendrikse, 2014]. [Fischer, Qaim, 2014] have detected a negative effect of distance on regular participation in meetings in Kenya. [Liang, Hendrikse, 2013] propose reasons for coordination costs being lower for farmers within local areas, namely similar nature conditions, same cultural and economic backgrounds of farmers, high degree of kinship, and same dialect among members. Therefore we hypothesize that (H12):

**H12:** The nearer farmers are located to each other, the more probably they will be members of cooperatives, and vice versa.

Strategic location of a cooperative, especially toward the main market, roads and other services, also matter for membership in a cooperative. [Nugusse et al., 2013] have found that the likelihood of joining cooperatives is lower for households that lie within a 15 km radius from the market than those outside of this radius. The authors state that households located around the main market prefer to participate in small businesses rather than spend time in cooperatives (H13).

**H13:** Farmers who are located further away from the market are more likely to be members of a cooperative than farmers who are located near the market.

We hypothesize that the less knowledge a farmer has about production, processing and marketing processes, the more incentives they have to cooperate with others. In a cooperative, one may receive help and highly skilled consulting services not available to single producers. On the other hand, the more experienced the farmer is the fewer incentives they will have to cooperate (H14).

**H14:** Those farmers who have a longer time period of experience in agriculture will have fewer incentives to cooperate than farmers who have a smaller time period of experience in agriculture.

We hypothesize that such characteristics as the farm's sales **(H15)**, farmer's age (**H16**), and higher education **(H17)** have a positive effect on a farmer's decision to cooperate. [Stallman, James, 2015] have detected a positive impact of **(H15)** and **(H17)** on the willingness to cooperate; however, these factors are not significant in their study.

Values attached to the investigated variables are summarized and explained in Table A1 of Appendix.

## 2. Data

We conducted a survey of the farmer population in the Republic of Tatarstan. We surveyed heads of farming organizations including (1) farming units officially registered as farmers, (2) farming units officially registered as individual entrepreneurs (sole traders), and (3) farming units officially registered as agricultural enterprises. Only small-scale agricultural producers are included in the respondent sample (up to RUB 30 million in sales per year). Large agroholdings are not included in the sample because they are self-sufficient units and do not have incentives to cooperate. We also exclude households not registered as agricultural producers.

Out of the farming sector described above, we interviewed respondents from 16 Tatarstan districts: the Pestrechinsky, Baltasinsky, Buinsky, Zelenodolsky, Vysokogorsky, Leninogorsky, Drozhzhanovsky, Aksubaevsky, Laishevsky, Kanashsky, Kazansky, Arsky, Bavlinsky, Krasnokamsky, Aktanyshsky, and Rybnoslobodskoy districts. Farmers in these districts were chosen randomly depending on their availability, reach and accessibility. Interviews were held via personal contact of the study authors with the respondents. The authors visited farms in the corresponding districts or interviewed farmers during their visit to the Tatarstan Ministry of Agriculture, the Kazan Cooperative Institute, and the Kazan State Agrarian University. Each interview had a duration of about 30 to 60 minutes. 51 respondents out of the total 160 are members of agricultural cooperatives, whereas 109 respondents are non-cooperated agricultural producers. The sample was restricted to

160 respondents because among the large number of contacted farmers only 160 were available for personal interviews.

The study survey includes general and specific questions about farmers' willingness to cooperate in order to manage certain activities of their businesses. The survey questions were generated according to the hypotheses described in the section above. The definitions and summaries of our predictor variables as well as control variables are given in Table A1.

## 3. Method

The database obtained through the questionnaire has been investigated within three types of analysis. First, we discuss the answers according to their percentage volume in two respondent groups, i.e. cooperator farmers and non-cooperator farmers. Next, we conduct a cross tabulation analysis across the collected answers, and last, we discuss the results of the logit regression of the achieved database.

The cross tabulation method is chosen to identify the impact of factors on membership in cooperatives. Cross tabulation is a joint frequency distribution of cases based on two or more categorical variables. The joint frequency distribution is analyzed with the Pearson's chi-square test to determine whether the variables are statistically independent or they are associated. Finally, a logistic regression model is used to clarify the relationships contained in contingency tables. In this analysis cross tabulations are used to develop the contingency tables for two categorical variables: membership in a cooperative and another factor suggested by the theories. The chi-square test for independence is used to identify the presence of a significant relationship between the two categorical variables [Sufahani et al., 2016]. The significance level chosen for the two-tailed chi-square test is 0.05. Using the estimated chi-square parameters we identify factors that are associated with cooperation practices of Russian farmers.

By using the logit analysis we reach the following three goals: first, we collect a number of uncorrelated factors significantly impacting the decision and willingness of farmers to cooperate. These detected factors should be addressed by the policy on cooperative development. Second, we range these factors according to their impact on the result. And third, we create a classification instrument aiming to evaluate the farmers to offer them more suitable education programs on agricultural cooperation. We chose the logit analysis to show the values of the endogenous variable in a binary form.

## 4. Results

Descriptive statistics are summarized on Figure 2 below, which indicates answers of the interviewed respondent farmers in percentage to total. Cooperator farmers lead in almost all the selected parameters,

i.e. 88% of cooperators wish to cooperate, whereas only 36% of non-cooperators have this desire. 84% of cooperators consider cooperation an effective tool, whereas only 50% of non-cooperators share this opinion. 88% of cooperators trust other farmers, whereas only 55% of non-cooperators trust other farmers. 82% of cooperators trust the leaders of their cooperatives, and only 55% of non-cooperators trust the leaders of their communities. 63% of cooperators' farms are similar to the other farms in their area, whereas only 54% of non-cooperators' farms are similar to the other farms in their area. 34% of cooperators and 59% of non-cooperators have markets within the distance of 20 kilometers. 86% of cooperators are involved in at least one farmer or rural organization, while only 24% of non-cooperators are involved in any organizations. 57% of cooperators are well-informed about cooperation; 42% of non-cooperators state that they are also well-informed. 57% of cooperators consider themselves to be able to control the leaders of their cooperative, whereas only 34% of non-cooperators can say that they are able to control the leaders of their communities. 51% of cooperators have agricultural experience of more than 10 years, whereas only 40% of non-cooperators have been involved in agriculture for such a long period. 59% of cooperators have sales of more than 500 thousand rubles per year, while non-cooperators are definitely poorer, and only 29% of them have this amount of sales. Similar percentages of cooperators and non-cooperators have more than 75% income from agriculture (71% and 67% respectively). Finally, state support is more important for cooperators (45%) than for non-cooperators (17%).

The fact that among the cooperator farmers only 88% of respondents have a willingness to cooperate and only 78% jointly work with others is weird. As many as 12% of cooperators wish to collaborate but are not doing that. In this study, we seek to find the reasons why they do not collaborate. This result might be related to the study by [Golovina, Nilsson, 2009] about top-down cooperatives. The authors comment that there are cases when farmers are motivated to join cooperatives for other reasons than collaboration, e.g. they come together for getting financial resources in a form of state subsidies issued to cooperatives. Such cooperator farmers do not have a willingness to cooperate (12%), do not trust each other (18%), do not consider cooperation as an effective tool (16%), and consider direct state subsidies for cooperative organizations important for cooperation (44%).

Next, we conduct the cross tabulation analysis using the collected database. This analysis indicates that cooperators and non-cooperators differ from each other significantly in regard to farm and farmer characteristics.

According to the cross tabulation analysis, larger farmers are more likely to be members of cooperatives than smaller farmers. Socially active farmers, involved in various village activities, are more likely to be mem-

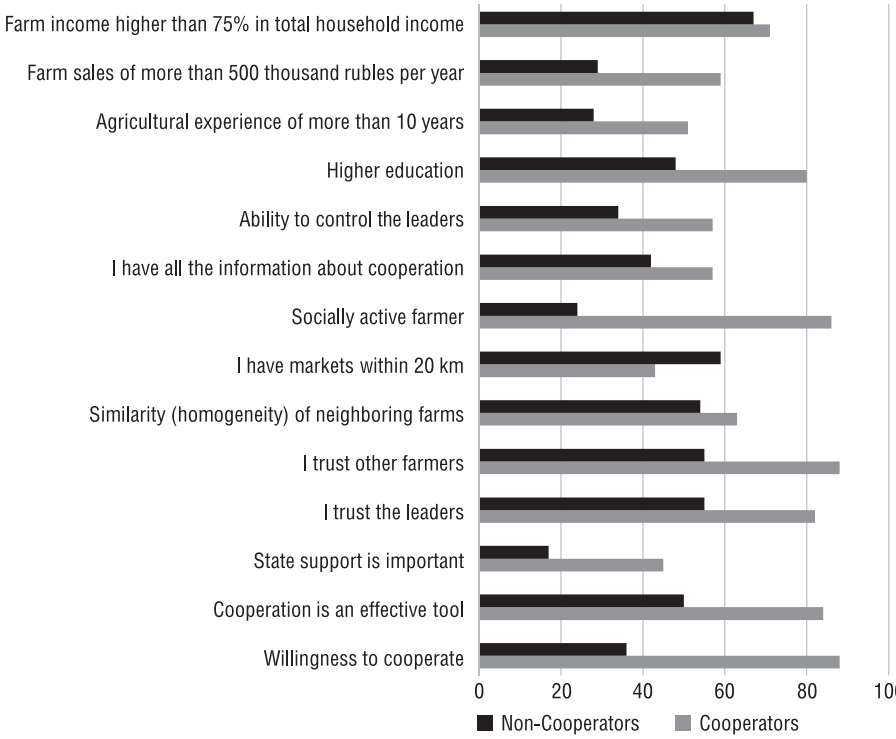



Figure 2. **Answers of Respondent Farmers in Percentage to Total**

bers of cooperatives than farmers who are not taking care of their communities. The majority of cooperators have a diploma of higher education. Cooperators and non-cooperators are not significantly different from each other in regard to farmers' age and experience in agriculture. Distance between farmers and distance to the market, coincidentally, do not impact membership in cooperatives, which is contradicting to other studies (e.g., to [Nugusse et al., 2013]). Homogeneity (similarity) of farms, as well as knowledge about cooperatives, does not have an impact on membership in cooperatives in Tatarstan. Therefore, the results of our analysis do not support hypotheses H5, H9, H12, H13, H14, and H16. Further we discuss the results of the cross tabulation analysis in more detail.

Farmers' willingness to cooperate with each other leads to membership in a cooperative. 63.21% of non-cooperators do not have a willingness to cooperate, whereas 88% of cooperators have a willingness to cooperate. 12% of cooperators who do not have a willingness to cooperate will very likely reject their membership in the nearest future (Table A2).

Sometimes farmers collaborate with each other informally, while not being members of cooperatives. We have found that the bigger number of collaborators a farmer has, the more probably they are a member of a cooperative. 75.23% of non-cooperators do not collaborate with others, whereas 78.43% of cooperators collaborate with others (Table A3). How-

ever, there is still a small number of farmers (24.77%) collaborating with others informally without being members of agricultural cooperatives.

Farmers are more likely to be members of cooperatives if they believe that cooperation helps them to be more effective in their business. 84.31% of cooperators believe that cooperation is an effective tool, whereas only 50.93% of non-cooperators believe the same (Table A4).

Trust to other farmers has a significant impact on membership in a cooperative (Table A6). 82.35% of cooperators trust each other, whereas 43.52% of those who are not cooperating do not trust other farmers.

Membership in a cooperative is highly dependent on the involvement of farmers in social activities, which we determine by membership in any other community organizations apart from a cooperative (Table A10). 86.27% of cooperators are involved in social activities, whereas 75.7% of non-cooperators are not involved in any.

Trust to leaders is important for membership in a cooperative: 90% of cooperators trust the leaders, whereas only 56.07% of non-cooperators trust the leaders. Among all respondents, 90.38% of those who do not trust the leaders are non-cooperators (Table A7).

There is a correlation between two variables such as trust to farmers and trust to leaders. 21.66% out of all respondents do not trust anybody, whereas 53.5% of all respondents trust both the farmers and the leaders. However, the dependency between membership in a cooperative and trust to leaders is higher than that between membership in a cooperative and trust to farmers (Table A8). Therefore, in the regression analysis we only include one of these variables, namely trust to leaders.

The possibility to control cooperative activities has an impact on trust to leaders (Table A9). 78.79% among all respondents who may control the cooperative's activities trust the leaders. However, 21.21% of such respondents do not trust the leaders. 62.2% among all respondents (cooperators and non-cooperators) who do not have a possibility to control the cooperative's activities still trust the leaders, which means that either they are totally satisfied with the way the leaders act and therefore do not have a need to control them, or they were giving false answers.

The number of years of cooperation experience with other farmers has an impact on cooperative membership (Table A11). The highest percentage (42.58%) of all respondents—both cooperators and non-cooperators—have jointly worked with other farmers within the interval of 3 years. The smallest percentage (7.74%) of all respondents have jointly worked with others within the interval of 10 years. The highest percentage of cooperators (15.48%) have jointly worked with other farmers within the interval of 3 years. Among cooperators, only one farmer has stated that they have never worked with other farmers. Among non-cooperators, 62.49% have an experience of jointly working with other farmers, which means that non-formalized collaboration

among farmers exists in Tatarstan region. However, the farmers are not willing to formalize their joint partnership in a form of membership in a cooperative to certain reasons.

The majority of farmers (73.42%) have responded that state support for cooperatives does not impact their decision to be members of cooperatives. 46% of cooperators state that subsidies for cooperatives impact their decision to be members of cooperatives, whereas the other 54% of cooperators state that government subsidies do not have an impact on their membership (Table A5).

62.75% of cooperators have total farm's sales of more than 500 thousand rubles per year (Table A12). On the contrary, 66% of non-cooperators have total farm's sales of less than 500 thousand rubles per year. This indicates that larger farmers have more incentives to join cooperatives.

Higher education has a significant impact on membership in a cooperative (Table A13). 80.39% of cooperators have a diploma of higher education. Only 51.46% of those who are not members of cooperatives have higher education.

Farmer's age is not important for becoming a member of a cooperative (Table A14). This variable is not statistically significant. The average age of both cooperators and non-cooperators does not differ much.

An implication of true hypotheses according to the cross tabulation analyses is given on Figure 3 below.

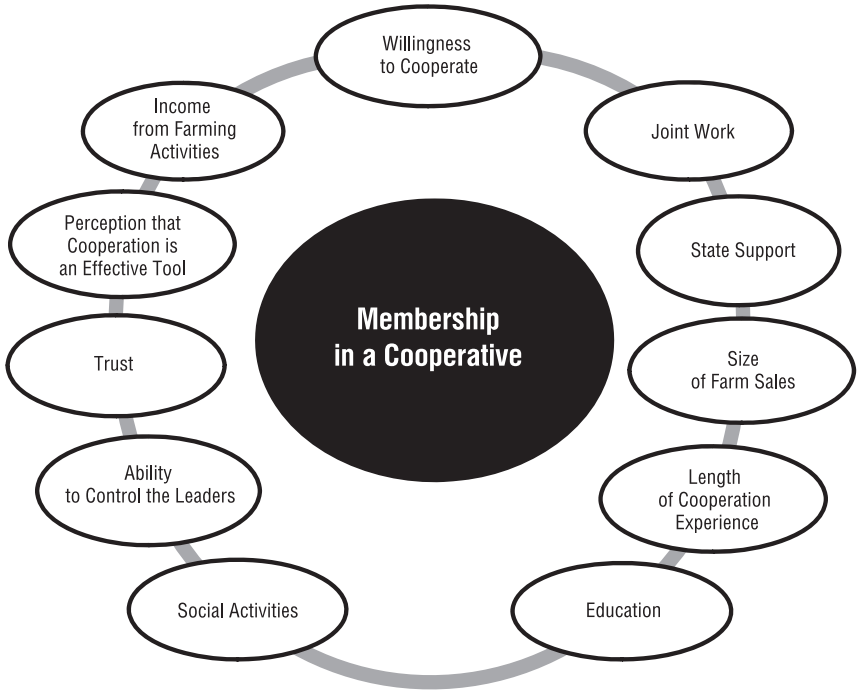



Figure 3. **Factors Impacting Membership of Farmers in Agricultural Cooperatives**

Further on we perform the logit regression analysis including those variables which occurred to be significant in the cross tabulation. The dependent variable in the logit regression is membership in a cooperative.

The stepwise variable selection has shown that the farm's sales variable (FS) is not statistically significant, and therefore it was excluded from the model. The final logit regression model, implicating the dependency of the binary variable of membership in a cooperative (M) from the independent variables, such as the number of collaborating farmers indicated as "joint work" (JW), trust to leaders (TL), years of cooperation experience (YC), social activities (SA) and a diploma of higher education (HE), is as follows:

$$P(M) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 JW + \beta_2 TL + \beta_3 YC + \beta_4 SA + \beta_5 HD)}},$$

where

$\beta_i$ — model parameter estimates,

$P(M)$ — possibility value of membership in a cooperative,

JW, TL, YC, SA, HE — exogenous variables described in Table A1.

Results of the logit regression (see Table 1 and Figure 4 below) show that socially active farmers, who are involved in community organizations such as civic groups, are more likely to become members of cooperatives than farmers who are not involved. Social activities are actually a factor that impacts farmers' decision to join a cooperative the most. Its impact is two times bigger than the impact of trust, joint work and the length of cooperation experience.

Farmers who have a higher education are more likely to be members of cooperatives than those who do not have a higher education. Higher education teaches one the abilities to work with literature, to learn new things, to deal with complicated information, to tackle complex problems, and to communicate with people. Farmers with such skills are more successful in group work. The variable in question is less important than the social activities variable, but also almost twice as important as joint work and length of cooperation experience. Higher education is more important than trust for membership in a cooperative.

Trust to leaders is the third important factor in the model. Farmers who are members of cooperatives were asked to indicate their trust to the cooperative leaders. Farmers who are not members of cooperatives were asked to indicate their trust to the leaders of the rural community. Those farmers who assign a high trust potential to the leaders are cooperators to a higher extent than those who find such trust difficult.

Farmers collaborating with other farmers for selling, buying and other purposes have higher potential of becoming cooperators than those not collaborating.

And, last, farmers who have more years of cooperation experience have a higher potential of being members of cooperatives than those who have a smaller number of years of cooperation experience.

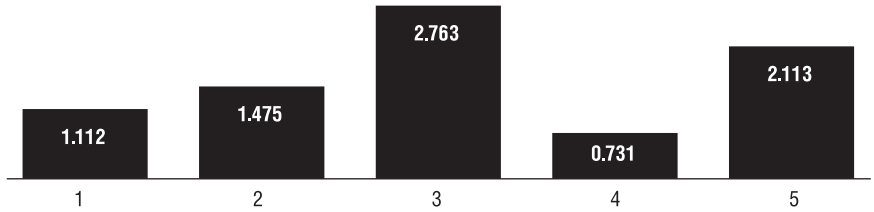
The social activities variable and the higher education variable have the highest impact on the probability of a farmer becoming a member of an agricultural cooperative venture.

Table 1

**Results of the Logistic Regression**

| | Intercept | Joint Work | Trust to Leaders | Social Activity | Years of Cooperation Experience | Diploma of Higher Education |
|---|---|---|---|---|---|---|
| Estimate | –6.627** | 1.112** | 1.475* | 2.763** | 0.731* | 2.113** |
| Standard Error | 1.172 | 0.337 | 0.675 | 0.613 | 0.339 | 0.672 |
| z | –5.657 | 3.303 | 2.186 | 4.507 | 2.154 | 3.144 |
| p-Level | 0.00 | 0.001 | 0.029 | 0.000 | 0.031 | 0.002 |
| Odds Ratio | — | 3.0 | 4.4 | 15.8 | 2.1 | 8.3 |

*Note.* Level of coefficient significance: * — coefficient is significant at the 5% level; ** — coefficient is significant at the 1% level.




*Note.* The meaning of the columns are the values of beta coefficients of the following variables: 1 — joint work with other farmers, 2 — trust to leaders, 3 — social activities of farmers, 4 — years of cooperation experience, 5 — diploma of higher education.

Figure 4. **The Value Impact of Factors Determining Membership in Agricultural Cooperatives**

The endogenous variable cut-off identified as the positive outcome (cooperation) is attached the value of 0.5. Under these conditions this model allows one to predict the decision of a given farmer to become a member of an agricultural cooperative with 76% accuracy, and to predict the absence of incentives of a given farmer to cooperate with 92% accuracy (Table 2).

Table 2

**Prediction Results — Total Sample**

| | Predicted to Cooperate | Predicted to Not Cooperate | Percent — Correct |
|---|---|---|---|
| Cooperation | 38 | 12 | 76.0 |
| No Cooperation | 8 | 94 | 92.2 |

*Notes.* Odds ratio: 37.208. Percent correct: 86.84%.

To obtain an unbiased assessment of the model quality (elimination of overfitting) the total sample was divided into the training sample (75% of observations) and the test sample (25% of observations). Evaluation of model parameters in the total sample and the use of these parameters in the test sample classification have shown that the quality of

classification during the model's application is not reduced. Thus, this model correctly forecasts farmers' willingness to cooperate with 93% accuracy, and not to cooperate with 80% accuracy (Table 3).

Table 3

**Prediction Results — Test Sample**

| | Predicted to Cooperate | Predicted to Not Cooperate | Percent — Correct |
|---|---|---|---|
| Cooperation | 28 | 2 | 93.3 |
| No Cooperation | 2 | 8 | 80.0 |

*Notes.* Odds ratio: 56.0. Percent correct: 90.0%.

## 5. Conclusions

Our study confirms the existence of non-formalized collaboration between farmers in Tatarstan, which has also been detected in the studies of [Davydova, Franks, 2006; Gardner, Lerman, 2006; Mamonova, Visser, 2014; Wolz et al., 2016]. This raises the question: why does this cooperation not become official?

The study results show that farmers in Tatarstan have no incentives to cooperate, and even face obstacles hindering the decision to become members of formal cooperatives. Most of the farmers have little or no experience in collaboration with others, and do not trust other farmers (their neighbors) or the leaders of their communities. They are not socially active in taking care of local communities. Very often they have no higher education and therefore have constrained abilities in working with literature, learning new things, dealing with complicated information, managing complex problems, or communicating with people. Cooperators and non-cooperators in Tatarstan are not significantly different from each other in regard to farmers' age, which comes in line with studies across other countries [Bernard et al., 2008; Fischer, Qaim, 2014; Stallman, James, 2015].

Our results do not prove hypotheses offered in international studies such as "the distance to a market" [Fischer, Qaim, 2014; Liang, Hendrikse, 2013; Nugusse et al., 2013; Petruchenya, Hendrikse, 2014; Sexton, Sexton, 1987]. In Tatarstan, the distance to a market does not have any impact on cooperative membership. Cooperatives in Tatarstan are located both near and far away from the markets where they sell agricultural products. Apart from the distance alone, the choice of a market may depend on the cooperative's processing technology and ability to organize logistics and marketing, as well as market prices in different regions of Russia or even abroad.

The hypothesis that farm size has an impact on membership in a cooperative is supported by our study, which contradicts the results by [Stallman, James, 2015]. Our results confirm that farmers with higher

income have a tendency to cooperate. The fact that most farmers in Tatarstan have low incomes explains their refusal to cooperate.

In order to create sustainable agricultural cooperatives, special attention should be paid to educating farmers in terms of cooperation with a focus on group work, mutual trust, and self-organization in a way that would exclude cheating, immoral and free-riding behavior on the parts of both the members and the leaders. Stimulating social activities of farmers in rural areas might also increase cooperation. There is a need for agricultural consulting services offering high quality educational courses explaining the advantages of cooperatives and profits that they may provide to the members.

The model represented in this study may also be used for evaluating farmers' potential to become members of cooperatives. This tool may be used by the initiative group which organizes a cooperative or examines new potential members willing to join the cooperative. Good potential of cooperative membership is demonstrated by farmers who have experience of joint work with other farmers, are open to trusting the members and leaders of a particular cooperative, are socially active and willing to take care of members in their rural locality, and have a higher education or are at least well-informed about cooperatives.

## APPENDIX

Table A1

**Variable Description**

| Variable | Description |
|---|---|
| ***Dependent Variable:*** | |
| ***M*** | **Membership in a cooperative.** A binary variable equal to 1 if the farmer is a member of a cooperative, and 0 otherwise |
| ***Independent Variables:*** | |
| ***JW*** | **Joint work.** Categorical variable representing the number of farmers collaborating with each other. 0 in case of no collaboration; up to four farmers = 1; five and more farmers = 2. |
| ***E*** | **Effectiveness.** Binary variable equal to 1 if the respondent indicates that cooperation is an effective tool for organizing business; 0 otherwise. |
| ***SS*** | **State support.** Binary variable equal to 1 if the respondent indicates that state support does not have an impact on their decision to create a cooperative or to be a member of a cooperative; 0 otherwise. |
| ***TF*** | **Trust to farmers.** Binary variable equal to 1 if the respondent indicates that farmers in their community/cooperative are usually trustworthy; 0 if the respondent indicates that farmers in their community/cooperative are sometimes or rarely trustworthy. |
| ***TL*** | **Trust to leaders.** Binary variable equal to 1 if the respondent indicates that the leaders in their community/cooperative are usually trustworthy; 0 if the respondent indicates that the leaders in their community/cooperative are sometimes or rarely trustworthy. |
| ***C*** | **Control.** Binary variable equal to 1 if the farmer states that they may control cooperative activities, or believes that they may control cooperative activities; 0 otherwise. |

*End of Table A1*

| Variable | Description |
|---|---|
| ***H*** | **Homogeneity (similarity).** Binary variable equal to 1 if the respondent indicates similarity after this statement (1 or 2 on a 5-point scale), "Farms in my community/ cooperative are very much similar to my farm"; 0 otherwise. |
| ***SA*** | **Social activities.** Binary variable equal to 1 if the respondent claims to be an active member of at least one community organization; 0 if the respondent is not a member of any community organizations. |
| ***IC*** | **Information on cooperatives.** Binary variable equal to 1 if the respondent indicates (1 or 2 on a 5-point scale) that they acquire all the necessary information about how to organize and manage an agricultural service cooperative; 0 otherwise. |
| ***GLF*** | **Geographical location of farms.** Categorical variable equal to 1 if the respondent indicates that they collaborate with farms located within the distance of 50 km; equal to 2 if the respondent indicates that they collaborate with farms located beyond the distance of 50 km; and equal to 0 if the respondent indicates that they do not collaborate with other farmers. |
| ***GLM*** | **Geographical location of markets.** Binary variable equal to 1 if the respondent indicates that they have buyers within 20 km of the village; 0 otherwise. |
| ***YF*** | **Years of farming experience.** Categorical variable representing years of farming experience. From 1 to 3 years = 1; from 3 to 10 years = 2; more than 10 years = 3. |
| ***YC*** | **Years of cooperation experience.** Categorical variable representing years of cooperation experience. From 1 to 3 years = 1; from 3 to 10 years = 2; more than 10 years = 3. |
| ***Control Variables:*** | |
| ***FS*** | **Farm's sales.** Categorical variable representing total farm sales from 2017. 1 = RUB 50,000 – 500,000 per year; 2 = RUB 500,000 – 30,000,000 per year. |
| ***FA*** | **Farmer's age.** Continuous variable indicating the respondent's age. |
| ***HE*** | **Higher education.** Binary variable equal to 1 if the respondent claims the presence of a diploma of higher education; 0 otherwise. |

*Table A2*

**Summary Frequency Table for Hypothesis 1**

| | Respondents | No Willingness to Cooperate | Willingness to Cooperate | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 67 | 39 | 106 |
| Count | Cooperators | 6 | 45 | 51 |
| Count | All Groups | 73 | 84 | 157 |
| Total Percent | | 46.49% | 53.5% | |

*Note.* Pearson's chi-square: 36.6289, df = 1, $p < 0.001$.

*Table A3*

**Summary Frequency Table for Hypothesis 2**

| | Respondents | Absence of Collaboration | Collaborate with Five Farmers | Collaborate with More than Five farmers |
|---|---|---|---|---|
| Count | Non-Cooperators | 82 | 17 | 10 |
| Count | Cooperators | 11 | 17 | 23 |
| Count | All Groups | 93 | 34 | 33 |
| Total Percent | | 58.13% | 21.25% | 20.63% |

*Note.* Pearson's chi-square: 44.0949, df = 2, p = 0.000000.

Table A 4

**Summary Frequency Table for Hypothesis 3**

| | Respondents | Cooperation Is Not Effective | Cooperation Is Effective | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 53 | 55 | 108 |
| Count | Cooperators | 8 | 43 | 51 |
| Count | All Groups | 61 | 98 | 159 |
| Total Percent | | 38.36% | 61.64% | |

*Note.* Pearson's chi-square: 16.3309, df = 1, p = 0.000053.

Table A 5

**Summary Frequency Table for Hypothesis 11**

| | Respondents | State Support Is Not Important | State Support Is Important | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 89 | 19 | 108 |
| Count | Cooperators | 27 | 23 | 50 |
| Count | All Groups | 116 | 42 | 158 |
| Total Percent | | 73.42% | 26.58% | |

*Note.* Pearson's chi-square: 14.1321, df = 1, p = 0.000171.

Table A 6

**Summary Frequency Table for Hypothesis 4**

| | Respondents | No Trust to Farmers | Trust to Farmers | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 47 | 61 | 108 |
| Count | Cooperators | 9 | 42 | 51 |
| Count | All Groups | 56 | 103 | 159 |
| Total Percent | | 35.22% | 64.78% | |

*Note.* Pearson's chi-square: 10.1627, df = 1, p = 0.001434.

Table A 7

**Summary Frequency Table for Hypothesis 7**

| | Respondents | No Trust to Leaders | Trust to Leaders | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 47 | 60 | 107 |
| Count | Cooperators | 5 | 45 | 50 |
| Count | All Groups | 52 | 105 | 157 |
| Total Percent | | 33.12% | 66.88% | |

*Note.* Pearson's chi-square: 17.7054, df = 1, p = 0.000026.

Table A 8

**Summary Frequency Table for Dependency Between TF and TL**

| | Respondents | No Trust to Leaders | Trust to Leaders | Row — Totals |
|---|---|---|---|---|
| Count | No Trust to Farmers | 34 | 21 | 55 |
| Count | Trust to Farmers | 18 | 84 | 102 |
| Count | All Groups | 52 | 105 | 157 |
| Total Percent | | 33.12% | 66.88% | |

*Note.* Pearson's chi-square: 31.4736, df = 1, p = 0.000000.

Table A 9

**Summary Frequency Table for Dependency Between Control and TL**

| | Trust Leaders // Control Possibility | No Possibility to Control | Full Control | Row — Totals |
|---|---|---|---|---|
| Count | No Trust to Leaders | 31 | 14 | 45 |
| Count | Trust Leaders | 51 | 52 | 103 |
| Count | All Groups | 82 | 66 | 148 |
| Total Percent | | 55.41% | 44.59% | |

*Note.* Pearson's chi-square: 4.75781, df = 1, p = 0.029168.

Table A 10

**Summary Frequency Table for Hypothesis 6**

| | Respondents | Not Involved in Social Activities | Involved in Social Activities | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 81 | 26 | 107 |
| Count | Cooperators | 7 | 44 | 51 |
| Count | All Groups | 88 | 70 | 158 |
| Total Percent | | 55.70% | 44.30% | |

*Note.* Pearson's chi-square: 53.7613, df = 1, p = 0.000000.

Table A 11

**Summary Frequency Table for Hypothesis 10**

| Respondents | Never Worked with Others | Worked with Others for About 3 Years | Worked with Others for About 10 Years | Worked with Others for More than 10 years |
|---|---|---|---|---|
| Non-Cooperators | 39 | 42 | 20 | 3 |
| Cooperators | 1 | 24 | 17 | 9 |
| All Groups | 40 | 66 | 37 | 12 |
| Total Percent | 25.81% | 42.58% | 23.87% | 7.74% |

*Note.* Pearson's chi-square: 29.5893, df = 3, p = 0.000002.

Table A 12

**Summary Frequency Table for Hypothesis 15**

| | Respondents | Total Farm's Sales of Less than 7,150 Euros | Total Farm's Sales Per Year of More than 7,150 Euros | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 66 | 34 | 100 |
| Count | Cooperators | 19 | 32 | 51 |
| Count | All Groups | 85 | 66 | 151 |
| Total Percent | | 56.29% | 43.7% | |

*Note.* Pearson's chi-square: 11.3426, df = 1, p = 0.000758.

Table A 13

**Summary Frequency Table for Hypothesis 17**

| | Respondents | No Higher Education | Higher Education | Row — Totals |
|---|---|---|---|---|
| Count | Non-Cooperators | 50 | 53 | 103 |
| Count | Cooperators | 10 | 41 | 51 |
| Count | All Groups | 60 | 94 | 154 |
| Total Percent | | 38.96% | 61.04% | |

*Note.* Pearson's chi-square: 12.0094, df = 1, p = 0.000530.

Table A14

**Summary Frequency Table for Hypothesis 16**

| | Mean Cooperators | Mean Non-Cooperators | t-Value | df | p-Statistics |
|---|---|---|---|---|---|
| Farmer's Age | **46.04** | **43.31** | **1.42** | **149** | **0.16** |

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