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# IMPORTANCE OF FARMER – INSTITUTIONS RELATIONSHIP INTENSITY FOR FARM DEVELOPMENT

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**Abstract.** The aim of the paper is to assess importance of the relationship, at various levels of its intensity, between farmers and the institutional environment of agriculture for farm development. The data source derives from the results of questionnaire surveys conducted among farmers – owners of agricultural holdings in the south-east of Poland, i.e. the area of Świętokrzyskie, Małopolskie and Podkarpackie provinces.
The research results demonstrated that the degree of intensity of farmers` interactions with institutions is directly linked to resources, organization of the production process and the production performance of the agricultural holdings. High intensity of farmer-institutions interactions facilitates the process of introduction of changes in agricultural holdings with the use of the European Union financial support. However, the rule applies mainly to the larger-in-size and economically stronger holdings and may consequently lead to growing polarization of farms in the highly fragmented structure of agricultural holdings in the south-east of Poland.

**Key words:** farmers, institutional environment of agriculture, development of agricultural holding.

## INTRODUCTION

The process of integration of Poland with the European Union (the EU) has revealed the role of institutional environment for the functioning of food markets and sustaining the process of development of rural areas. This area has been subject to fundamental

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changes following the rise of new economic conditions, particularly the necessity to introduce specific institutional arrangements required by the EU. The issue refers primarily to governmental institutions, yet it also determines the process of development of the trade-supply environment. In the opinion of Kołodziejczyk and Wasilewski, the drawback of the process is, for the time being, the practice of provisional establishment of organizations which are to implement the temporary policies and the lack of strategic plan which would facilitate the process of creating institutional environment so as to enhance the development of agribusiness and rural areas [Kołodziejczyk, Wasilewski 2005].

As institutions (organizations) make a complex system of mutual interactions, their activities may induce positive changes in some spheres of agribusiness, yet they may also slow down some positive processes in others. As it was verified by foreign experiences, the presence of institutions generally improves the economic situation of business entities but this refers primarily to economically stronger market players. The process is noted to be taking place in Poland as well [Fahlbeck 2004].

Economics more and more willingly verify the positive impact of organizational, consultancy and management institutions on growth processes of business entities [Stiglitz 1999]. It is of particular importance in the case of agriculture for its specific traits like the role of the natural environment, the seasonal character of agricultural production, and low price and income elasticity of demand for food. The recent changes in business economics assign institutions, particularly in agribusiness, a new challenging task of mobilizing optimal support for the attainment of strategic goals like securing sufficient quantity and quality of food and provision of public goods (landscape, biodiversity, the unspoilt natural environment). The general framework in favour of this mission is offered by counselling which can contribute to the economic empowerment of rural communities by improving production efficiency and supporting the EU programmes beneficiaries. Potential for the development of the agricultural and food-processing sector is further determined by financial institutions and units of local and agricultural self-government.

Institutional environment of agribusiness, which can effectively bring about changes at various levels of the industry's structure, can be divided into external and internal. A special role is assigned to government agencies like the Agricultural Market Agency (Agencja Rynku Rolnego – ARR), Agency for Restructuring and Modernisation of Agriculture (Agencja Restrukturyzacji i Modernizacji Rolnictwa – ARiMR), Agricultural Property Agency (Agencja Nieruchomości Rolnych – ANR), Agricultural Counselling Centres (Ośrodki Doradztwa Rolniczego – ODR) and local agriculture chambers; yet, in practice, these institutions serve principally the needs of large agricultural holdings [Miś 2009] which denotes a growing polarisation among farms.

The rise of new challenges to the institutional environment was accompanied by a notion of the diminishing role of farming and agricultural income in the economy of rural areas. Under these circumstances institutions were increasingly expected take on a role of the creator of new forms of business activity, which was particularly important for these farms whose entry into the agricultural market seemed problematic. The main advantages of the institutional environment are reduction of transactional costs, evolution of production structures and provision of public goods.

The fragmented structure of agriculture in the south-east of Poland makes it difficult to reduce transaction costs for the lack of integration within the sector itself. In this con-

text the issue of provision of public goods seems less controversial as small multifunctional agricultural holdings are naturally better suited to do it. However, other researches show that it has been the large agricultural holdings that have managed to make use of the EU agri-environmental funding most often and effectively [Czudec et.al 2008, Czudec, Zając 2010]. However, it is small, not large farms that continue to remain the dominant element of the European model of farming [Czudec 2009].

The growing liberalization of the food and farm market presents a challenge of increasing competition which in turn enhances the development of food-security oriented agribusiness. Simultaneously, public goods should be provided by smaller agricultural holdings where extensive production is justified by variety of social functions.

In the light of the above considerations, the need for more detailed research on the institutional environment of agriculture, particularly the fragmented one, in the process of its transformation seems highly justified. The issue is even more noteworthy as the wait-and-see attitude frequently adopted by farmers leads to diminished competitiveness of this kind of agriculture in the European model of agriculture.

## THE AIM, RESOURCE USED AND RESEARCH METHODOLOGY

The aim of the paper is to assess importance of the relationship, at various levels of its intensity, between farmers and institutions for development of agricultural holdings.

The main hypothesis that has been used to write the paper holds that the higher intensity of the farmer-institutions relationships (cooperation) using the EU financial support, the more beneficial the cooperation proves for the farmers and the more sweeping changes take place in their holdings.

The data source derives from the results of questionnaire surveys conducted in 2007*. They were a part of a sample-based research and the method used was that of proportional stratified random sampling. The questionnaire surveys were carried out among farmers – owners of agricultural holdings in the south-east of Poland, i.e. the area of Świętokrzyskie, Małopolskie and Podkarpackie provinces. The sampling unit was an agricultural holding. The sampling population consisted of 541.1 thousand holdings. Out of this total population the sample was chosen using the random sampling method which accounted for the size and internal diversification of units (with regard to the size of arable land in the holding) to make the research results representative for the whole population. The choice of units for the sampling furthermore accounted for spatial design of the units, i.e. proportion of the size of the agricultural holdings population in the respective provinces – within the set sampling sections. Altogether, the survey was conducted on a sample of 856 farmers**.

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** More on the sampling method used see [in:] Czudec et.al 2008, pp. 15–17.

For the sake of the research the intensity (of farmer-institutions relationships) rate in the range between 0 and 1 was tabulated. The value was determined by the number of institutions farmer maintained contact with and their frequency. It was based on a rating scale which assessed the intensity of farmer-institution relationships. Farmer was granted 1 point for each institution he got in touch with and another point(s) in the range 1–5 contingent on the contact frequency. Following the results of the questionnaire survey the maximum value of contacts and frequency was set at 64 points. For this threshold the value of intensity rate was set at 1 and its value was 0 if there were no relationships between farmer and institutions whatsoever [Czudec et.al 2008].

It is worth pointing out that the survey takes into account formal institutions which constitute the direct environment of agriculture at local level. Their range includes banks, agricultural counselling centres, local branches of ARiMR, a regional branches of ARR and ANR, regional or local development agencies, local self-governments, district employment agencies, agriculture chambers, farmer trade unions, business, trade and industry chambers, credit guarantee funds, trade organisations, consulting agencies, foundations, associations, R-D centres, enterprise development agencies, etc. Typical market sphere institutions like food and agricultural wholesale companies, agricultural commodity markets, private agricultural produce purchase companies, and producer-marketing farmer groups have been not considered for the research as they are elements of farmers' business activity and merely its marketing "extension", and thus do not make the institutional environment of agriculture.

The analysis of the presented correlation between the intensity rate and production input properties of the holdings, specific characteristics and results of the production may resort to a variety of research methods, yet most of them impose certain requirements on the used data set. Due to lack of normal distribution of the main parameter i.e. intensity rate of farmer-institutions relationships, which was proved by a $\chi^2$ significance test, and qualitative character of many other variables, the authors have decided to use a non-parametric significance tests $\chi^2$ and Spearman's rank correlation coefficient.

At first the examined population of 856 agricultural holdings was divided into three subgroups according to the intensity rate of their owner's relationships with institutions: the benchmarks used to split terciles had values 0.33 and 0.47 in the range from 0 to 1. Subsequently the above subsets of farmers evidencing low, medium and extraordinary level of interaction with institutions became the focal point of the analysis to determine the number of agricultural holdings with regard to their production input properties and production characteristics and production results. The above features became criterion for another division within the original three subsets defining the farmer-institution intensity rate. The number of the second parameter-related categories depended on the number of the criterion variants; as for the continuous parameters, the holdings were divided into three subgroups with regard to tercile values.

The basis of the adopted methodology was the assumption that the farmer-institutions intensity rate impacts the development of agricultural holdings; however, the authors also assumed that sometimes the correlation might be affected by certain specific properties of agricultural holdings and the main task of the statistical analysis is to demonstrate the existing regularities in this respect.

The main methodological tool used to examine the above relationships was a non-parametric significance test $\chi^2$. The data used to make the test calculations was grouped in two-dimensional arrays; however, due to the fact that the farmer-institutions relationship intensity rates were divided in three categories, the number of categories for the second variable was determined by the variable values. Prior to analysis of the variables gathered in the two-dimensional arrays, the authors supported the null hypothesis on their independence. Assuming that $p_{ij}$ denotes the probability that a randomly chosen element belongs to category $i$ and $j$ with regard to the two features accounted in the table, while $p_{i.}$ and $p_{.j}$ are their respective marginal probabilities, the null hypothesis can take the following form [Jóźwiak, Podgórski 1998]:

$H_0$: $p_{ij} = p_{i.}\, p_{.j}$ for a $i, j$ index pair,

whereas the alternative hypothesis takes the form:

$H_1$: $p_{ij} \neq p_{i.}\, p_{.j}$ for some index pairs of $i, j$.

We estimate the marginal probabilities:

$\hat{p}_{i.} = n_{i.} / n$

and

$\hat{p}_{.j} = n_{.j} / n$.

where: $n$ – sample size.

The values expected in the analysed table, assuming independence of the variables, are calculated according to:

$$\hat{n}_{ij} = n\hat{p}_{i.}\hat{p}_{.j} = n(n_{i.}/n)(n_{.j}/n) = (n_{i.}\, n_{.j})/n.$$

The $\chi^2$ test statistics can be calculated from the formula:

$$\chi^2 = \sum_{i=1}^{k}\sum_{j=1}^{l}\frac{(n_{ij} - \hat{n}_{ij})^2}{\hat{n}_{ij}}.$$

The numbers of degrees of freedom are assumed to equal $(k - 1)(l - 1)$.

The null hypothesis was rejected at the significance level $\alpha = 0{,}05$, when $\chi^2 \geq \chi^2_{\alpha,\,(k-1),(l-1)}$.

In order to define the degree of correlation between the tested variables, the Pearson's contingency coefficient C was used [Sobczyk 1996]. For values in the <0, 1> range it was calculated from the formula:

$$C = \sqrt{\frac{\chi^2}{\chi^2 + n}}.$$

As this coefficient value depended on the number of rows and columns, it was divided by its estimated upper limit which was determined from:

$$C_{\max} = \frac{\sqrt{\frac{k-1}{k}} + \sqrt{\frac{l-1}{l}}}{2}$$

Further studies of the above dependencies occasionally revealed a need to define the kind and closeness of relationship between the agricultural holding area and the tested variables. Taking into account the fact that the distribution of the holding area significantly varied statistically from normal distribution, the Spearman's rank correlation coef-

ficient was used to define the relationship. Prior to calculation of the coefficient, the size-related variables are assigned to successive ranks. When the same value appears twice or more, which actually happened in the analysis, they are granted the average value in the ranks which they would be assigned if they were adjacent but had different values. The same ranks make associated ranks. In this case there is a need to introduce modifications to the calculation of the rank correlation coefficient. Hence, the Spearman's rank correlation coefficient was calculated from the formula [Steczkowski, Zeliaś 1997]:

$$\tilde{\rho}_s = \frac{\sum_{i=1}^{n} a_i^2 + \sum_{i=1}^{n} b_i^2 - \sum_{i=1}^{n} d_i^2}{2\sqrt{\sum_{i=1}^{n} a_i^2 \sum_{i=1}^{n} b_i^2}},$$

where:

$$\sum_{i=1}^{n} a_i^2 = \frac{n^3 - n}{12} - T_x,$$

$$\sum_{i=1}^{n} b_i^2 = \frac{n^3 - n}{12} - T_y,$$

$$\sum_{i=1}^{n} d_i^2 = \sum_{i=1}^{n} (R_{1i} - R_{2i})^2$$

$$T_x = \frac{1}{12} \sum_{j=1}^{k} \left( t_j^3 - t_j \right),$$

noting that the formula for $T_y$ is identical with the formula for $T_x$, and

$n$ – sample size,

$R_{1i}$, $R_{2i}$ – ranks for the first and second variables respectively,

$t_j$ – the number of associated ranks in the $j$ group,

$k$ – the number of groups of associated ranks.

The Spearman's rank correlation coefficient calculated according to the above formula implies direction of the analysed features (positive or negative agreement among ranks) and its absolute value between the <0, 1> range indicates strength of the relationship. In order to carry out the statistical evaluation of coefficient significance the statistical Student's t-test is used:

$$t = \tilde{\rho}_s \sqrt{\frac{n-2}{1 - \tilde{\rho}_s^2}},$$

which provides basis to verify the null hypothesis $H_o$ : $\rho = 0$ on independence of analysed variables in population with regard to the alternative hypothesis $H_1$:$\rho \neq 0$ which assumes the presence of some link between the variables.

The null hypothesis was rejected, like previously, at the significance level $\alpha = 0.05$, when $t \geq t_{\alpha,\, n-2}$., where $n - 2$ denotes the number of degrees of freedom variations.

## THE RESEARCH FINDINGS

The conducted research proved that individual agricultural holdings in the south-east of Poland are highly diversified with regard to many selected features related to the farmer-institutions relationship intensity level. The following features should be noted above all others: the size of arable land in the holding, economic strength of farm measured in ESU (European Size Unit), sales volume of agricultural production and amount of the EU financial support. Farmers evidencing more intense relationships with local institutions tend to have larger (in terms of size) and economically stronger holdings, obtain higher returns from the sale of its agricultural production and higher financial support from the EU funds (Table 1).

Another fact worth noting is that the holdings which maintain more intense relationships with local institutions tend to evidence more frequent changes in number of production activities and production input resources. The changes usually involve extension of agricultural machinery resources, land resources, livestock and its building resources as well as increase in the number on production activities in farm (Table 1).

The above findings denote that more intense relationships of farmers with the institutional environment of agriculture positively affects structural transformation and modernization of holdings in the south-eastern region of Poland, and it refers primarily to bigger in size and economically stronger agricultural holdings. Furthermore, it should be noted that farmers who maintain more intense relationships with institutions constantly keep looking for new market opportunities and in their farms processes in favour of production versatility outweigh those in favour of production specialization.

The research findings prove the proposed hypothesis that the higher the intensity rate of relationship (cooperation) between farmers local institutions, the more substantial benefits (effects) they derive from the cooperation and the more sweeping changes take place in their holdings with the use of the EU financial support.

The analysis attempted to carry out the statistical evaluation of significance of the relationships and their direction. It should be noted that on the one hand the intensity of relationships between farmers and various institutions is determined by the farmer's set of unique traits; on the other hand it is determined by the features of the holding itself. Hence, a correlation between the farmer-institutions intensity rate and the production input resources, production process properties and production performance was to be established. Taking into account the above relations, one of the analysed variables was always the value of the farmer-institutions relationship intensity rate, and the other was the examined factors.

For the sake of comparison of the analysis results, all statistical values of the significance test $\chi^2$ and contingency coefficients $C$ were juxtaposed in Table 2.

Taking into account the age of the person in charge of the holding, farmers between 40–49 years of age tended to get in touch with various kinds of institutions the most frequently; the older farmers, the least frequently. The findings of the $\chi^2$ test suggest in this case a statistically high relationship between the farmer's age and the intensity of their relationships with institutions; however, the correlation itself was relatively low and its value determined by the Pearson's contingency coefficient $C$ equalled 0.18.

Table 1. Characteristic features of the analysed agricultural holdings
Tabela 1. Cechy charakterystyczne badanych gospodarstw

| Specifications | The analysed agricultural holdings | | | |
|---|---|---|---|---|
| | Total | According to the farmer-institutions relationship intensity rate | | |
| | | to 0.33 | 0.34–0.47 | 0.48 and more |
| Number of farms | 856 | 296 | 273 | 287 |
| Farmer-institutions relationship intensity rate (mean) | 0.41 | 0.23 | 0.40 | 0.62 |
| Mean farmer's age, in years | 44.4 | 46.4 | 43.5 | 43.2 |
| Share of farmers with at least secondary education (percent) | 55.0 | 52.0 | 55.0 | 58.2 |
| Mean farm management experience, in years | 16.5 | 17.4 | 16.0 | 16.0 |
| Share of male farmers (percent) | 69.4 | 62.2 | 72.1 | 74.0 |
| Farm full-time employment (mean) | 1.4 | 1.3 | 1.4 | 1.5 |
| Full-time employment per 100 ha of arable land (mean) | 17.7 | 25.5 | 18.7 | 13.3 |
| The size of arable land in the holding, in hectares (mean) | 7.9 | 5.1 | 7.5 | 11.3 |
| Economic strength of the holding, in ESU (mean) | 8.0 | 4.2 | 8.9 | 11.2 |
| Total volume of agricultural sales in 2006 per holding, in PLN (mean) | 29811.4 | 13901.9 | 33268.0 | 42931.7 |
| Total volume of agricultural sales in 2006 per 1 ha of arable land, in PLN (mean) | 3676.7 | 2485.9 | 4462.0 | 4157.9 |
| Total value of the EU financial support in 2002–2006\| per holding, in PLN (mean) | 28557.7 | 21284.8 | 21970.1 | 37618.8 |
| Total value of the EU financial support in 2002–2006 per 1 ha of arable land, in PLN (mean) | 2001.0 | 1132.7 | 2359.6 | 2555.4 |
| Share of farm income in total family income in 2002–2006 (percent) | 52.0 | 39.6 | 56.4 | 59.0 |
| Change in the number of production activities in farm in 2002–2006 (percent of the holdings) | | | | |
| no change | 78.5 | 80.7 | 83.2 | 71.8 |
| increase | 10.1 | 5.4 | 9.2 | 15.7 |
| decrease | 11.4 | 13.9 | 7.6 | 12.5 |
| Change in labour resources in farm in 2002–2006 (percent of the holdings) | | | | |
| no change | 92.9 | 94.9 | 93.0 | 90.6 |
| increase | 3.1 | 2.0 | 2.9 | 4.5 |
| decrease | 4.0 | 3.1 | 4.1 | 4.9 |
| Change in land resources in farm in 2002–2006 (percent of the holdings) | | | | |
| no change | 70.4 | 79.7 | 72.5 | 58.9 |
| increase | 25.7 | 11.5 | 26.0 | 40.1 |
| decrease | 3.9 | 8.8 | 1.5 | 1.0 |
| Change in livestock building resources in farm in 2002–2006 (percent of the holdings) | | | | |
| no change | 85.4 | 94.3 | 84.2 | 77.4 |
| increase | 14.0 | 5.7 | 15.4 | 21.3 |
| decrease | 0.6 | 0.0 | 0.4 | 1.3 |
| Change in agricultural machinery resources in farm in 2002–2006 (percent of the holdings) | | | | |
| no change | 64.4 | 83.4 | 59.7 | 49.1 |
| increase | 34.8 | 15.2 | 39.6 | 50.6 |
| decrease | 0.8 | 1.4 | 0.7 | 0.3 |
| Change in livestock unit numbers in farm in 2002–2006 (percent of the holdings) | | | | |
| no change | 75.2 | 83.1 | 75.4 | 66.9 |
| increase | 19.5 | 9.1 | 22.0 | 27.9 |
| decrease | 5.3 | 7.8 | 2.6 | 5.2 |

Source: Own research.
Źródło: Badania własne.

Table 2. The relation between the farmer-institutions relationship intensity rate and the examined factors as determined by the statistics of the significance tests $\chi^2$ and contingency coefficients *C* values

Tabela 2. Statystyki testu $\chi^2$ oraz wartości współczynników kontyngencji C opisujące stopień powiązania między aktywnością rolników w kontaktach z instytucjami a badanymi zmiennymi

| The examined factors | Significance tests $\chi^2$ statistics | Pearson's contingency coefficient *C* | Statistical significance of the relation |
|---|---|---|---|
| Farmer's age | 18.3 | 0.18 | ** |
| Farmer's completed education | 34.3 | 0.23 | ** |
| Farmer's experience in managing the holding | 6.9 | 0.11 | – |
| Farmer's gender | 11.0 | 0.15 | ** |
| Farm full-time employment | 32.7 | 0.24 | ** |
| Full-time employment per 100 ha of arable land | 60.0 | 0.31 | ** |
| The size of arable land in the holding | 143.8 | 0.46 | ** |
| Economic strength of the holding, in ESU | 151.0 | 0.48 | ** |
| Total volume of agricultural sales in 2006 per holding | 159.4 | 0.49 | ** |
| Total volume of agricultural sales in 2006 per 1 ha of arable land | 65.0 | 0.33 | ** |
| Total value of the EU financial support in 2002–2006 per holding | 135.0 | 0.45 | ** |
| Total value of the EU financial support in 2002–2006 per 1 ha of arable land | 125.8 | 0.44 | ** |
| Share of farm income in total family income in 2002–2006 | 86.8 | 0.37 | ** |
| Change in the number of production activities in farm in 2002–2006 | 23.4 | 0.20 | ** |
| Change in labour resources in farm in 2002–2006 | 4.50 | 0.09 | – |
| Change in land resources in farm in 2002–2006 | 62.4 | 0.34 | ** |
| Change in livestock building resources in farm in 2002–2006 | 29.7 | 0.24 | ** |
| Change in agricultural machinery resources in farm in 2002–2006 | 84.1 | 0.39 | ** |
| Change in livestock unit numbers in farm in 2002–2006 | 38.8 | 0.26 | ** |

Notes: ** significance for probability value $p = 0.01$
Uwaga: ** istotność przy prawdopodobieństwie $p = 0{,}01$

Source: Calculated on the basis of own research.
Źródło: Obliczenia na podstawie badań własnych.

The next factor which may affect the intensity of relationships between farmers and institutions was the level and type of education attained by holding owner or owners. Seven types of education were distinguished, i.e. primary, agricultural and non-agricultural vocational, agricultural and non-agricultural secondary and agricultural and non-agricultural higher education. The analysis findings generally prove that growth of intensity of relationships is accompanied by increase in the level of farmer's education, particularly agricultural education. The results of the $\chi^2$ test suggest a statistically high dependency of the variable within the relationship; however, the dependency itself was

higher compared to the former and its value determined by the Pearson's contingency coefficient *C* equalled 0.23.

As for the dependency between the farmer-institutions relationship intensity rate and farmer's farm management experience (length of time), the findings prove lack of any statistically significant correlation.

The holding owners were both men and women, yet the research proved that male farmers tended to be more active in relationships with institutions. The relationship also proved statistically highly significant: the Pearson's contingency coefficient *C* valued 0.15.

Another important labour-related factor is manpower resource base in farm. At first the farmer-institutions relationship intensity rate and the size of the manpower resource base was analysed. The relationship between the above factors turned out statistically highly significant and the Pearson's contingency coefficient *C* was 0.23. The correlation may not only result from the need to effectively use the farm workforce but also from the fact that larger manpower resources are found in larger (with regard to area) holdings; the effective use of the farm land is of crucial importance in these holdings and they showed high intensity rate of their relationships with the institutional environment. The value of the Spearman's rank correlation coefficient which defined the degree of dependency between the manpower resource base and the holding area size was positive and statistically highly significant and came to 0.37 approximately.

When it comes to examining the relationship between the farmer-institutions intensity rate and labour resource per unit of arable land it turns out to be inverse. This basically means that the less manpower resources per 100ha of arable land, the higher the intensity of farmer-institutions relationships was evidenced and the correlation was statistically highly significant as the Pearson's contingency coefficient *C* was 0.31. Naturally, one can conclude that concentration of labour resource per unit of land is lower in larger – with regard to area – holdings, which is confirmed by the value of the Spearman's rank correlation coefficient, i.e. –0.71, simultaneously indicating statistically high significance of the relationship.

Another production input, apart from labour, is land. The relationship between the arable land size and the farmer-institutions intensity rate is statistically highly significant and the Pearson's contingency coefficient *C* evidenced relatively high value of 0.46.

The ESU rate was used to denote economic strength of holding. The farmer-institutions intensity rate proved linked to each other in a statistically highly significant manner as the Pearson's contingency coefficient *C* was relatively high, i.e. 0.47. This fact reveals a considerable need for close relations between institutions and farmers managing high-volume production potential holdings. Undoubtedly, such interaction is beneficial for the holding as it gains access to extra funding and may lead to higher efficiency of the production process.

One of the most measurable effects of production activities of a holding is sales volume of its production. There proves to be a high positive correlation between the farmer-institutions intensity rate and the value of agricultural production sales. This fact is verified by the statistically high correlation between the two variables for contingency coefficient *C* equalling 0.49, the highest value of all the examined so far.

As far as the size of agricultural production sales per unit of arable land is considered, one could conclude that that there is also high correlation between this variable and the farmer-institutions intensity rate, as evidenced by contingency coefficient *C* of 0.33. It is worth noting that higher sales volume per 1ha of arable land was observed by larger in size holdings. The relevant Spearman's rank correlation coefficient was in this case positive and statistically significant (app. 0.3).

Another relationship to be considered is the one between the farmer-institutions intensity rate and the size of financial support received from the EU funds. This correlation proves statistically highly significant–the contingency coefficient *C* had relatively high value of 0.45. The size of the EU financial support was also statistically highly significant and positively correlated to the area size of the holding, which is indicated by the value of the Spearman's rank correlation coefficient, i.e. slightly above 0.5.

Taking into account the amount of the EU financial support per unit of arable land in farm the findings of the research lead to the conclusion that the increase of the support is accompanied by growing intensity of relationships between farmers and institutions. The dependency was statistically highly significant as the contingency coefficient *C* showed one of the highest measured values, i.e. 0.44. Furthermore, it should also be noted that there is positive and statistically highly significant relationship between the amount of the EU financial support per unit of arable land and the farm area which is verified by the Spearman's rank correlation coefficient 0.37.

Not all members of the farmer's families work on the farm. Hence another analysed relationship was the one between the share of farm income in the total family income and the farmer-institutions relationship intensity rate. The results of the $\chi^2$ test demonstrated in this case high statistical significance of the relationship between the variables as the Pearson's contingency coefficient *C* was 0.37. This fact denotes that the more families relied on agricultural production for their income, the more these holdings were interested in maintaining closer relationships with institutions.

Agricultural holdings are often required to make decisions that result in modification of the production process. The main reason is the need to adjust the production profile to the existing market conditions and to make use of the available resources most efficiently. One of the methods boils down to change the number of economic activities in the holding. The research findings show that farmers who cooperate with institutions more actively tend to increase the number of economic activities more often – the relationship between this feature and the farmer-institutions intensity rate is statistically highly significant and the relevant Pearson's contingency coefficient *C* is 0.2. The increase in the number of economic activities in holding runs counter the process of specialization of production; however, taking into account the fact that the above occurrences are accompanied by the growth of farm area or/and capital resources, they increase security of farm income in highly volatile markets and prices for agricultural produce. Hence, farmer's cooperation with institutions enables them to take advantage of emerging market opportunities.

Modifications in holding organization do not apply to the production process exclusively but its surrounding conditions as well. The analysis of changes in farm labour resources does not allow to confirm statistically significant relationship with farmer-institutions intensity rate. The fact can mainly justified by relatively high inertia of farm labour resources.

Land is another fundamental production input. Increase in land resources was significantly more frequent among the farmers who cooperated with institutions more closely and this relationship was statistically highly significant as the Pearson's contingency coefficient *C* was 0.34. Moreover, it should be noted that in this case the number of holdings which decreased their land resources was so small, that statistics of the $\chi^2$ test was calculated on the basis of a 3×2 table as the holdings and those which did not change their land resource base had to be placed in one group.

A statistically high significant relationship between the farmer-institutions intensity rate and the increase in livestock building resources in farm was noted. The Pearson's contingency coefficient *C* which defined the relationship was 0.24. Like in the former case, statistical analysis was conducted in 3×2 table which was justified by occasional cases of decreasing number of buildings in farms. These cases were included into the group of holdings which did not change their building resource base.

A clear and statistically highly significant relationship occurred between the farmer-institutions intensity rate and the increase in agricultural machinery base in farm: in this case the Pearson's contingency coefficient *C* was 0.24. For actually a very small number of holdings saw a decrease in their agricultural machinery base, the holdings were included into the group of holdings which declared no changes in this respect: statistics of the $\chi^2$ test were calculated like in the former two cases, in a 3×2 table.

Statistically highly significant relationship was observed between the farmer-institutions intensity rate and the size of livestock population. The value of the Pearson's contingency coefficient *C* defining this relationship was 0.24.

## CONCLUSIONS

Statistical analysis of the research findings allows to conclude that the intensity of relationships between farmers and institutions is most highly related to the following features: agricultural production sales per unit of arable land, economic strength of agricultural holding (in ESU), holding area size and the EU financial support per farm and per 1 ha of arable land.

In the light of the findings it is justified to note that the largest–in terms of area and economically strongest holdings were the biggest recipients of the EU support funding: the farmers in charge of them established relatively the closest relationships with agricultural support institutions and they proved most resourceful at efficient management of the existing production inputs.

Holdings managed by the farmers who established most intense relationships with institutions were observed to introduce a specific set of changes to organization of the production process including increasing the number of agricultural activities, expanding the resource base of farm machinery, farm area, livestock and its buildings.

The intensity of farmer-institutions relationships was rather only moderately linked to the farm income share in overall family income, manpower resource base and farmer's education: however, these factors additionally contributed to higher farm management performance.

The intensity of farmer-institutions relationships was least related to changes in labour resources in farms, the farmer's gender and the time they had run the holding.

Generally, the research findings justify a statement that the intensity level of farmer's relationships with institutions of the agricultural environment is a yardstick which can accurately and comprehensively indicate not only the holding's resources, its production organization methods but its economic performance as well.

The research proved the proposed hypothesis that the higher intensity of relationship (cooperation) between farmers and local institutions, the more benefits they, i.e. famers, derive from this cooperation with regard to the changes taking place in the holdings and taking advantage of the EU financial support. Hence, close farmer's cooperation with the institutional environment of agriculture stimulates the processes of structural changes and modernization of agricultural holdings. This, however, applies primarily to the larger in terms of area and economically stronger holdings, which may lead to high polarization of holdings in the fragmented agriculture of the south-east of Poland.

## REFERENCES

Czudec A., Kata R., Miś T., Zając D., 2008. Rola lokalnych instytucji w przekształceniach rolnictwa o rozdrobnionej strukturze gospodarstw, Wydawnictwo Uniwersytetu Rzeszowskiego, Rzeszów, pp. 15–17, 140–163.

Czudec A., 2009. Ekonomiczne uwarunkowania rozwoju wielofunkcyjnego rolnictwa, Wydawnictwo Uniwersytetu Rzeszowskiego, Rzeszów, pp. 151.

Czudec A., Zając D., 2010. Znaczenie programu rolnośrodowiskowego we wdrażaniu form wielofunkcyjnego rolnictwa, Roczniki Nauk Rolniczych, Seria G – Ekonomika rolnictwa, Tom 97, Zeszyt 3, PAN, WNR,LiW, KER, WNE SGGW, Warszawa, pp. 51–60.

Fahlbeck E., 2004. Borderlines for a Common Agricultural Policy of Multifunctional Agriculture, [in:] Role of Institutions in Rural Policies and Agricultural Markets, G. van Huylenbroeck, W. Verbeke, L. Lauwers, Amsterdam, pp. 323–334.

Jóźwiak J., Podgórski J., 1998. Statystyka od podstaw, PWE, Warszawa, pp. 358–362.

Kołodziejczyk D., Wasilewski A., 2005. Identyfikacja instytucji działających na obszarach wiejskich, IERiGŻ, Warszawa, pp. 7.

Miś T., 2009. Instytucjonalne uwarunkowania rozwoju rolnictwa rozdrobnionego, [in:] Możliwości i bariery rozwoju regionu, edited by A. Czudec, Wydawnictwo Uniwersytetu Rzeszowskiego, Rzeszów, pp. 85.

Sobczyk M., 1996. Statystyka, PWN, Warszawa, pp. 218–220.

Steczkowski J., Zeliaś A., 1997. Metody statystyczne w badaniach zjawisk jakościowych, AE w Krakowie, Kraków, pp. 185–195.

Stiglitz J.E., 1999. Knowledge for Development: Economic Science. Economic Policy and Economic Advice, The Word Bank, Washington.

## ZNACZENIE INTENSYWNOŚCI RELACJI ROLNIKÓW Z OTOCZENIEM INSTYTUCJONALNYM W PROCESIE ROZWOJU GOSPODARSTW ROLNYCH

**Streszczenie.** Celem artykułu jest ocena znaczenia stopnia intensywności relacji rolników z otoczeniem instytucjonalnym w procesie rozwoju gospodarstw rolnych. Materiał źródłowy stanowią wyniki badań ankietowych przeprowadzonych w 2007 roku wśród rolników,

właścicieli gospodarstw rolnych z regionu południowo-wschodniej Polski, tj. z trzech województw: świętokrzyskiego, małopolskiego i podkarpackiego.
Przeprowadzone badania wykazały, że intensywność kontaktów rolników z otoczeniem instytucjonalnym jest bezpośrednio związana z zasobami, organizacją procesu produkcji i wynikami produkcyjnymi gospodarstw rolnych. Intensywne kontakty rolników z instytucjami ułatwiają dokonywanie zmian w gospodarstwach rolnych, przy wykorzystaniu wsparcia finansowego z Unii Europejskiej. Dotyczy to jednak głównie jednostek większych obszarowo i silniejszych ekonomicznie, co może prowadzić do większej polaryzacji gospodarstw w rozdrobnionym rolnictwie południowo-wschodniej Polski.

**Słowa kluczowe:** rolnicy, otoczenie instytucjonalne rolnictwa, rozwój gospodarstw rolnych

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