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## DETERMINANTS OF AGRICULTURAL FARM PARTICIPATION IN REGIONAL ECONOMIC SYSTEMS\*

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**Abstract.** With a growing population, epidemiological hazards, climate risks, no clear prospects for obtaining safe energy and increasing environmental pollution, food production systems need to develop in a sustainable manner, i.e. with no adverse impact on the environment or sanitary conditions and with sparing use of energy, while securing quantitative and qualitative demand for food, which is steadily increasing. In stimulating agricultural farm development, various theories of enterprises, including the consumerist and neoclassical theories, need to be taken into account. However, cooperative theories, transaction cost theories and agency theories, which favour joint action between entities (synergistic effect), should be increasingly important in this respect. To identify major determinants of agricultural farm participation in regional economic systems. The Pearson correlation coefficient was applied to determine the relationships between selected features of agricultural farms, the agri-food sector and regional economic parameters which affect the participation of farms in regional economic systems. Data for the analysis were obtained from Statistics Poland in Warsaw, Poland. The way to enhance the synergistic effect arising from strategic cooperation in food chains is primarily to increase the participation of farms in regional economic systems. Agricultural farms virtually do not compete directly with other farms for a position in the food market, but they do compete for a position in processing companies' supply systems. The ability of farms to sell raw materials is determined by the market efficiency of the food sector enterprises. The added value of the study will result, *inter alia*, from the identification of relationships between the variability of endogenous factors that characterise farms and the major exogenous factors affecting the participation of farms in regional economic systems.

**Keywords:** regional economic systems; cooperation; agricultural farm

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## 1. Introduction

With a growing population, epidemiological hazards and climate risks, no clear prospects for obtaining safe energy and increasing environmental pollution, food production systems need to develop in a sustainable manner, i.e. with no adverse impact on the environment and sanitary conditions and with sparing use of energy, while securing quantitative and qualitative demand for food, which is steadily increasing. In this context, the aim should be to create a more efficient economic system that incorporates both the production and distribution of food. The basic role in this system is served by agricultural farms, which provide raw material resources for food processing. It is their structure and productivity that determine the quantities of agricultural raw materials in individual regions.

A scientific analysis of factors affecting the development of farms should take into account various economic theories of enterprises, *inter alia* the consumerist and neoclassical theories. However, cooperative theories, transaction cost theories and agency theories, which favour joint action between entities (synergistic effect), should be increasingly important in this respect. The way to enhance the synergistic effect arising from strategic cooperation in food chains is primarily to increase the participation of agricultural farms, particularly in regional economic systems.

The purpose of the study was to identify major determinants of the participation of agricultural farms in regional economic systems. The added value of the study results, *inter alia*, from the identification of relationships between the variability of endogenous factors that characterise farms and the major exogenous factors likely to increase the participation of farms in regional economic systems.

The basic methodological assumption was to apply the Pearson correlation coefficient to determine the relationships between selected features of agricultural farms, the agri-food sector and regional economic parameters which affect the participation of farms in regional economic systems. The data included in studies by Statistics Poland were analysed for individual voivodeships in Poland.

The literature review paid particular attention to the possibilities for wider implementation in agricultural farms of economic theories referring to the cooperation and transaction costs and to the agency theory. In addition to the subject and object of the study, the research methodology includes the research hypothesis assuming that the potential of agricultural farms is insufficient to significantly expand the participation of farms in regional economic systems. In order for integration processes to be able to be implemented, greater participation of the business and institutional environment is primarily required. The study results characterising endo- and exogenous factors that have an effect on the increase in farms' participation in regional economic systems are presented in tabular form and described synthetically, with particular emphasis on the most important correlations between variables. The discussion addressed the critical reference to the study results and referred to studies conducted by other authors in the field of the theory of economics and food economy. The conclusions refer to the purpose of the study and correspond to the obtained data which show, *inter alia*, the significant effect of the business and institutional environment on the expansion of the participation of farms in regional systems.

## 2. Literature Review

An analysis of the economy at the mesoeconomic level considerably expands the research, analytical and application capabilities of economic sciences. The macroeconomic approach is, in certain circumstances, too general to solve problems relating to specific components of the economy, i.e. individual sectors or voivodeships, while the microeconomic approach most often focuses exclusively on the problems of managerial economics. The mesoeconomic (*inter alia*, regional) approach allows economic problems to be analysed and solved in more detail

(Bal-Domańska et al., 2020, pp. 785–810; Kijek & Matras-Bolibok, 2020, pp. 295–313; Marks-Bielska et al., 2020a, pp. 323–333; Marks-Bielska et al., 2020b, pp. 463–487; Miłek & Nowak, 2015, pp. 115–135).

Various researchers have previously proved that consideration of the determinants of the participation of farms in regional economic systems was possible because the most important - from the perspective of an economic system - components can be assigned to the regional (territorial) system, *inter alia* the system coordination mechanism, the means of production related to a particular territory and region, the entities being targeted by the regulation instruments used by the control system and the mechanism for affecting economic operators and their economic activity (Bartova & Fandel, 2020, pp. 489–509; Candemir & Duvaléix, 2021, pp. 1–27; Turina et al., 2016, pp. 353–371).

The changing situation in the field of food economy and the growing determination of agricultural farms to participate more in various types of economic systems favouring the improvement of their economic efficiency encourage the expansion of relations with suppliers and customers as well as with other actors in the agribusiness environment. These measures should be aimed at minimising transaction costs (Candemir & Duvaléix, 2021, pp. 1–27; Czyzewski & Majchrzak, 2017, pp. 93–102; Firlej et al., 2017, pp. 502–509).

Agricultural farms, when striving to expand their business relations and for greater integration, both at a horizontal (with other farms with a similar or complementary production profile) and a vertical level (with other links in the food chain), most frequently become entities that are more and more complementary in relation to the market, thus gaining a better strategic position. More relationships necessitate entering into more transactions. In this context, it is still very important to reduce the costs of searching for suppliers and customers, information, negotiation, decisions, and the execution of transactions (Bartova & Fandel, 2020, pp. 489–509; Firlej et al., 2018, pp. 28–33). Noga et al., 2020, pp. 52–65; Parzonko & Borawski, 2020, pp. 168–174).

Many previous scientific studies referred, *inter alia*, to the agency theory which is an institutional counter-proposal to the transaction cost theory. Agricultural farms (particularly those with significant economic potential) with extended integration relationships can become a market hub for contracts. The relevance of this theory in relation to agricultural farms will be growing as the virtualisation and the scale of these entities' operations increase (Candemir & Duvaléix, 2021, pp. 1–27; Noga et al., 2020, pp. 52–65).

The economic integration of farms is explicitly linked to the cooperative enterprise theory, according to which the expected factor is the maximisation of profit together with business partners. This theory holds that an enterprise's position results from the participation in cooperatives, and the economy takes two basic forms, i.e. the market economy and the network economy. The involvement of agricultural farms in systems based, among others, on cooperation, may take various forms (e.g. agricultural producer groups, economic clusters) (Bartova & Fandel, 2020, pp. 489–509; Candemir & Duvaléix, 2021, pp. 1–27).

### 3. Research Methodology

The subject of the study was the determinants of the participation of agricultural farms in regional economic systems. They are both endogenous (are initiated and determined by the potential and organisation of particular farms) and exogenous (arising from the situation in their market and institutional environment) in nature.

This study focused on agricultural farms and selected regional economy parameters (by voivodeship) in Poland. A detailed analysis was carried out on selected components of the characteristics of farms, their production and organisational activity and selected components of the characteristics of the regional economy with particular emphasis on the agri-food sector, arranged in order by voivodeship. The data were collected from the resources of Statistics Poland, primarily the Local Data Bank and cover the years 2018–2019.

The relationship between selected features of agricultural farms, the agri-food sector, and regional economic parameters in individual voivodeships was examined using the Pearson correlation coefficient. The relationships between the variability of endogenous factors that characterise farms and the major exogenous factors likely to affect an increase in the participation of farms in regional economic systems were identified. The standard assumptions of statistical analysis of the variability of features and the significance of study results were maintained.

The research hypothesis assumed that the endogenous potential of agricultural farms was insufficient to significantly expand the participation of farms in regional economic systems. For integration processes to be able to be implemented, significant participation of the business and institutional environment is primarily required. In regions with low potential in the business environment, a gap in integration processes often occurs.

The value of the study results, *inter alia*, from the mesoeconomic approach to endogenous and exogenous factors likely to increase the participation of farms in regional economic systems. The diagnostic variables used in the study could be a source of discussion and criticism and their range primarily results from the availability of comparable data at the regional level, which could also be a source of important information for the scientific problem under consideration.

#### 4. Results

The participation of farms in regional economic systems was determined by two groups of factors:

- endogenous factors – initiated and determined by the potential and organisation of particular farms,
- exogenous factors – arising from the situation in their market and institutional environment.

When analysing the endogenous factors, the focus was put on the most significant components of agricultural farm potential as well as production and organisational activity which are presented (by voivodeship) in Table 1.

Particular attention should be paid to the following findings:

- the highest number of farms per 1,000 ha of agricultural land was found in Małopolskie, Podkarpackie, and Świętokrzyskie Voivodeships (the lowest number was in Zachodniopomorskie, Warmińsko-Mazurskie and Pomorskie Voivodeships),
- the highest number of farms with an area of 50.0 ha and more per 1,000 ha of agricultural land was located in Zachodniopomorskie, Lubuskie, and Dolnośląskie Voivodeships (the lowest number was in Małopolskie, Świętokrzyskie and Łódzkie),
- the highest proportion of farms specialising in specific agricultural production was found in Dolnośląskie, Podlaskie and Lubuskie Voivodeships (the lowest proportion was in Podkarpackie, Świętokrzyskie, and Małopolskie),
- the highest proportion of farms with an economic size class (in thousand EUR) of more than 15,000 was found in Kujawsko-Pomorskie, Warmińsko-Mazurskie and Wielkopolskie Voivodeships (the smallest proportion was in Podkarpackie, Małopolskie and Śląskie),
- permanently employed persons on individual farms (with the equivalent of full-time employment taken into account) were most numerous in Mazowieckie, Wielkopolskie and Kujawsko-Pomorskie (the least numerous were in Małopolskie, Podkarpackie and Świętokrzyskie),
- the highest number of agricultural tractors with a power of 100 kW and above per 1,000 ha of agricultural land was found in Opolskie, Kujawsko-Pomorskie, and Dolnośląskie Voivodeships (the smallest number was in Świętokrzyskie, Podkarpackie and Mazowieckie),

- the proportion of farms with a manager holding an academic degree was the highest in Zachodniopomorskie, Lubuskie and Warmińsko-Mazurskie Voivodeships (the lowest proportion was in Małopolskie, Podkarpackie and Wielkopolskie),
- the highest number of producer group members per 10,000 ha of agricultural land was noted for Wielkopolskie, Opolskie, and Małopolskie Voivodeships (the lowest number was in Świętokrzyskie, Podlaskie and Zachodniopomorskie).

**Table 1.** Selected components of the characteristics of agricultural farms and their production and organisational activity

Voivodeship	Number of farms per 1,000 ha of agricultural land	Number of farms with an area of 50.0 ha or more per 1,000 ha of agricultural land	The proportion of farms that specialise in specific agricultural production (%)	The proportion of farms with the economy size class (in thousand EUR) of more than 15,000 EUR (%)	Permanently employed persons in individual farms - in thousand AWU (the equivalent of full-time employment)	Number of agricultural tractors with a power of 100 kW and more per 1,000 ha of agricultural land (units)	The proportion of farms whose manager holds an academic degree (%)	Number of producer group members per 10,000 ha of agricultural land*
Dolnośląskie	59.2	3.4	84.9	22.1	2.8	7.0	15.5	5.2
Kujawsko-Pomorskie	58.0	2.6	75.2	42.2	7.4	7.1	12.1	5.5
Lubelskie	104.5	1.7	74.6	17.0	3.8	4.1	14.8	4.1
Lubuskie	48.4	3.8	83.3	24.7	1.9	5.6	18.1	5.2
Łódzkie	112.4	1.1	76.1	21.9	5.8	3.6	12.8	4.7
Małopolskie	203.9	0.8	71.8	6.8	1.6	3.7	9.7	7.3
Mazowieckie	96.4	1.5	79.4	26.4	17.8	3.4	14.2	3.8
Opolskie	49.3	3.4	77.5	31.9	1.8	7.7	11.9	9.5
Podkarpackie	191.9	1.5	68.7	5.1	1.6	3.2	9.8	3.9
Podlaskie	61.5	2.0	84.8	32.2	4.6	4.0	15.0	1.0
Pomorskie	47.8	3.0	72.2	33.0	3.6	6.7	14.8	5.4
Śląskie	133.2	2.1	73.9	13.2	2.9	6.2	14.0	1.3
Świętokrzyskie	153.4	0.8	69.0	14.2	1.7	3.0	13.3	0.2
Warmińsko-Mazurskie	40.9	3.1	83.6	40.6	5.2	5.6	17.1	1.7
Wielkopolskie	64.9	2.4	74.1	36.5	15.3	6.2	11.7	16.1
Zachodniopomorskie	32.2	4.4	81.4	30.5	2.2	5.7	20.1	1.2

\* - excluding tobacco producers

Source: own research based on the data of Statistics Poland in Warsaw.

The potential of agricultural farms in the context of integration processes is very important, as it creates the added value generated in agricultural activities that are primarily determined by the scale of operations and the possibility of incurring material and financial expenditure with long return cycles. The potential of farms and the scale of operations are interdependent factors. The importance of the scale of production arises from the possibility of reducing unit costs under the influence of changing production volumes (in agriculture, it depends mainly on the area of agricultural land).

When referring to exogenous factors, the most important components of the regional economy, with particular emphasis on the agri-food sector, presented (arranged by voivodeship) in Table 2, should be taken into account. Particular attention should be paid to the following issues:

- the highest gross added value (current prices) was generated by Mazowieckie, Śląskie and Wielkopolskie Voivodeships (while the lowest was by Opolskie, Lubuskie and Podlaskie).

- the highest gross added value (current prices), generated by agriculture, forestry, hunting and fisheries was noted in Mazowieckie, Wielkopolskie, and Lubelskie Voivodeships (while the lowest was in Opolskie, Lubuskie and Podkarpackie),
- the highest number of food industry enterprises (more than nine employees) was found in Wielkopolskie, Mazowieckie and Śląskie (the lowest number was in Opolskie, Świętokrzyskie and Lubuskie),
- the highest value of average sales revenue per food industry enterprise (more than nine employees) was noted for Warmińsko-Mazurskie, Podlaskie and Mazowieckie Voivodeships (the lowest value was in Podkarpackie, Lubuskie and Zachodniopomorskie),
- the highest average employment rate per food industry enterprise (more than nine employees) was noted for Mazowieckie, Warmińsko-Mazurskie and Podlaskie Voivodeships (the lowest rate was in Lubuskie, Dolnośląskie and Zachodniopomorskie),
- the highest value of the procurement of agricultural products (current prices) per 1 ha of agricultural land was noted for Wielkopolskie, Mazowieckie and Podlaskie Voivodeships (the lowest value was in Podkarpackie, Małopolskie and Zachodniopomorskie).

**Table 2.** Selected components of the characteristics of the regional economy (by voivodeship), with particular reference to the agri-food sector.

Voivodeship	Gross added value (current prices) – total (in million PLN)	Gross added value (current prices) – generated by agriculture, forestry, hunting, and fisheries (in million PLN)	Number of food industry enterprises, more than nine employees	The average value of sales revenue per 1 food industry enterprise with more than 9 employees (in million PLN)	Average employment rate per 1 food industry enterprise with more than 9 employees	The value of procurement of agricultural products by voivodeship (current prices) per 1 ha of agricultural land (PLN)
Dolnośląskie	153822	2123	86	61.0	86.3	2571
Kujawsko-Pomorskie	81681	3066	149	100.5	124.5	4744
Lubelskie	69580	3863	138	84.6	134.1	2996
Lubuskie	40401	1183	58	47.1	85.4	3125
Łódzkie	111176	3491	181	135.5	124.0	4542
Małopolskie	151211	1963	171	89.7	148.1	1948
Mazowieckie	418378	11119	320	198.3	258.0	6454
Opolskie	37957	1068	38	115.6	113.7	3889
Podkarpackie	72723	1219	77	46.0	102.7	1673
Podlaskie	41027	2810	76	200.8	189.1	5064
Pomorskie	109400	2333	134	106.0	150.9	4859
Śląskie	228103	1660	239	80.0	118.7	3942
Świętokrzyskie	43499	1859	55	58.7	116.4	3321
Warmińsko-Mazurskie	47737	2724	65	207.5	253.0	4540
Wielkopolskie	182276	6567	329	143.5	135.0	7171
Zachodniopomorskie	68512	1877	103	54.6	95.3	2559

Source: own research based on the data of Statistics Poland in Warsaw.

The economic activity of the entities related to agriculture was correlated with the general condition of the economy of the voivodeships under consideration, which is indicated by the high coefficient of coordination ( $r = 0.790$ ) between the gross added value (current prices) generated by agriculture, forestry, hunting and fisheries, and the gross added value generated in total by the economy of voivodeships (Table 3). It should also be mentioned that there was a significant relationship between the gross added value (current prices) generated by



agriculture, forestry, hunting and fisheries and the number of agricultural producer group members in individual voivodeships ( $r = 0.544$ ).

**Table 3.** The relationship between selected features of agricultural farms, the agri-food sector and regional economic parameters in individual voivodeships

Feature X in individual voivodeships	Feature Y in individual voivodeships	Pearson correlation coefficient between features X and Y (r)
Gross added value (current prices) – generated by agriculture, forestry, hunting, and fisheries (in million PLN)	Gross added value (current prices) – generated by the entire economy (in million PLN)	0.790
Gross added value (current prices) – generated by agriculture, forestry, hunting, and fisheries (in million PLN)	Number of agricultural producer group members	0.544
Number of farms with an area of more than 50 ha of agricultural land	Number of agricultural producer group members	0.533
The proportion of farms with the economy size class in thousand EUR - more than 15,000 EUR (%)	The proportion of farms that specialise in specific production	0.505
The proportion of farms with the economy size class in thousand EUR - more than 100,000 EUR (%)	The proportion of farms that specialise in specific production	0.588
The proportion of farms with the economy size class in thousand EUR - more than 500,000 EUR (%)	The proportion of farms that specialise in specific production	0.617
Permanently employed persons in individual farms - in thousand AWU (an equivalent of full-time employment)	Number of agricultural producer group members	0.701
The value of the procurement of agricultural products (current prices) in million PLN	Number of agricultural producer group members	0.737
The value of the procurement of agricultural products (current prices) per 1 ha of agricultural land, in PLN	Number of agricultural producer group members	0.611
The value of the procurement of agricultural products (current prices) in million PLN	The value of the food industry (more than 9 employees) sales revenue, in million PLN	0.918
The value of the procurement of agricultural products (current prices) per 1 ha of agricultural land, in PLN	The value of the food industry (more than 9 employees) sales revenue per 1 enterprise (in million PLN)	0.738
The value of the procurement of animal products (current prices) per 1 ha of agricultural land, in PLN	The value of the food industry (more than 9 employees) sales revenue per 1 enterprise (in million PLN)	0.809
The value of the procurement of agricultural products (current prices) per 1 ha of agricultural land, in PLN	Gross added value (current prices) – generated by agriculture, forestry, hunting, and fisheries (in million PLN)	0.715
Number of food industry enterprises (more than 9 employees)	Number of agricultural producer group members	0.664
Number of food industry enterprises (more than 9 employees)	Gross added value (current prices) – generated by agriculture, forestry, hunting, and fisheries (in million PLN)	0.775
The employment rate in the food industry (more than 9 employees)	Gross added value (current prices) – generated by agriculture, forestry, hunting, and fisheries per 1 ha of agricultural land (PLN)	0.812

Source: own calculations.

What was very important in the context of the adaptation of farms to the specificity of buyers of agricultural products was the scale of their operations. In this regard, the following correlations were found:

- between the proportion of farms with an economic size class (in thousand EUR) of more than 15,000 EUR and the proportion of farms that specialise in specific agricultural production ( $r = 0.505$ ),
- between the proportion of farms with an economic size class (in thousand EUR) of more than 100,000 EUR and the proportion of farms that specialise in specific agricultural production ( $r = 0.588$ ),

- between the proportion of farms with an economic size class (in thousand EUR) of more than 500,000 EUR (%) and the proportion of farms that specialise in specific agricultural production ( $r = 0.617$ ).

There was also a correlation between the number of farms with a greater area (more than 50 ha of agricultural land) in a particular voivodeship and the number of agricultural producer group members ( $r = 0.533$ ).

Farm owners have specific qualifications, organisational skills and motivation to act. With a greater scale of operations, they often pursue the policy of employee hiring, motivation, and development. In the voivodeships where the highest number of permanently employed persons were hired in individual farms, there was a greater tendency to associate in producer groups ( $r = 0.701$ ).

Greater agricultural productivity encouraged a greater tendency towards the integration of agricultural farms. There was a correlation between the value of procurement of agricultural products (current prices) in particular voivodeships and the number of agricultural producer group members ( $r = 0.737$ ) and a slightly lower correlation between the value of procurement of agricultural products (current prices) per 1 ha of agricultural land and the number of agricultural producer group members ( $r = 0.611$ ).

The gross added value (current prices) generated by agriculture, forestry, hunting and fisheries was determined by the productivity of agricultural farms in individual voivodeships. The coefficient of correlation between the value of procurement of agricultural products (current prices) per 1 ha of agricultural land in individual voivodeships and the gross added value (current prices) generated by agriculture, forestry, hunting and fisheries amounted to 0.715.

The condition of the food industry in individual voivodeships of Poland was very important in the context of the integration of farms within regional economic systems. There was a strong correlation between the value of the procurement of agricultural products (current prices) in particular voivodeships and the value of the food industry (more than nine employees) sales revenue ( $r = 0.918$ ), and a correlation between the value of the procurement of agricultural products (current prices) per 1 ha of agricultural land and the value of the food industry (more than nine employees) sales revenue per 1 enterprise ( $r = 0.738$ ). The correlation was even higher between the value of procurement of animal products (current prices) per 1 ha of agricultural land and the value of food industry (more than nine employees) sales revenue per 1 enterprise ( $r = 0.809$ ).

It is important to emphasise the relationship between the number of agricultural producer group members and the number of food industry enterprises (more than nine employees) in individual voivodeships ( $r = 0.664$ ), and the relationship between the gross added value (current prices) generated by agriculture, forestry, hunting and fisheries and the number of food industry enterprises (more than nine employees) ( $r = 0.775$ ). What was also correlated was the employment in the food industry (more than nine employees) in individual voivodeships and the gross added value (current prices) generated by agriculture, forestry, hunting and fisheries per 1 ha of agricultural land ( $r = 0.812$ ).

## **5. Discussion**

The validity of mesoeconomic research also in relation to agribusiness has already been confirmed in a variety of scientific studies (Bal-Domańska et al., 2020, pp. 785-810; Candemir & Duvaleix, 2021, pp. 1-27; Czyżewski & Majchrzak, 2017, pp. 93-102; Firlej et al., 2017, pp. 502-509; Turina et al., 2016, pp. 353-371). Firlej et al. (2017, pp. 502-509) further stress that the agri-business is the largest production sector in the European Union with regard to both the value of turnover and the generation of added value as well as the employment rate. The benefits of the participation of farms in regional economic systems have been recognised by many researchers in other European countries (Bartova & Fandel, 2020, pp. 489-509; Candemir & Duvaleix, 2021, pp. 1-27; Turina et



al., 2016, pp. 353-371). Additionally, Noga et al. (2020, pp. 52-65) point out that co-productivity can have wide application in value chains.

Many researchers have stressed the importance of endogenous factors in the development of farms, e.g. the scale of production (Bartova & Fandel, 2020, pp. 489-509; Czyzewski & Majchrzak, 2017, pp. 93-102; Firlej et al., 2018, pp. 28-33) and labour resources (Parzonko & Borawski, 2020, pp. 168-174). This is mainly due to the high specificity of agribusiness as a sector of the economy (Firlej et al., 2017, pp. 502–509). The author believes that endogenous factors were slightly less important in the development of the participation of farms in regional economic systems.

The study results are more consistent with the views referring to a greater effect of exogenous factors on the integration of agricultural farm processes. The literature contains numerous scientific studies which indicate *inter alia* the relevance of the specificity (specialisation) of the economic potential of individual voivodeships as a factor of local development (Bal-Domańska et al., 2020, pp. 785-810; Miłek & Nowak, 2015, pp. 115-135). Marks-Bielska et al. (2020, pp. 323-333) additionally stress that not only is the socio-economic development determined by the economic base and the possibility of financial support but also by the factors that involve institutions and institutional effectiveness can be defined as sustained readiness for shaping, for example, economic partnerships. Swiadek (2015, pp. 47-60) additionally links the economic potential of a voivodeship primarily to the innovation potential (including to the organisational innovation). A component of innovation may include, among others, the way in which regional economic systems are integrated.

This study did not address certain issues noticeable in other literature items, e.g. the beneficial effect of financial support on the involvement of farms in integration activities (Bartova & Fandel, 2020, pp. 489-509; Baer-Nawrocka & Blocisz, 2018, pp. 55-60). Michalek et al. (2020, pp. 1389-1401) primarily emphasise the significance of EU funding for the development of agribusiness. Bartova & Fandel (2020, pp. 489-509) note that the discontinuation of funding for agricultural producer organisations may have resulted in a restriction of these entities' activity. Candemir & Duvaléix (2021, pp. 1-27) point out that agricultural cooperatives play a major role in the economic sustainability of farms and the adoption of environmentally-friendly practices.

## Conclusions

This study indicates the greater importance of factors arising from the situation in the market and institutional environment of farms in developing the participation of agricultural farms in regional economic systems (which confirms the assumed research hypothesis). What significantly determined the conditions for agriculture development was the food industry, with considerable potential for generating sales revenue, which intensified the procurement of agricultural products in individual voivodeships, and the general condition of the economy in the voivodeships. In the voivodeships with a low level of procurement of agricultural products, the activity of farms in regional economic systems (e.g. in the form of integration in producer groups) was increased.

The dependence of participation in regional economic systems on factors arising from the potential and organisation of individual farms was, in many cases, significant (but usually less correlated as compared to the above-mentioned exogenous factors). The agricultural potential of farms was, for example, very important in forming their production specialisation, which favoured both the vertical and horizontal integration in food chains. The concentration of larger farms (an area of more than 50 ha) in a particular territory and the participation of economically stronger farms favoured the involvement of these entities in regional economic systems.

The cooperation gap between agricultural farms can be significantly reduced by greater involvement in the integration processes of the food industry and the agri-business environment institutions, but also by greater involvement of science in the development of a constructive concept of an agri-food sector integration system. Voivodeships (particularly those with a significant agri-business potential) must not neglect the measures improving the condition of the business environment (e.g. in the field of the development of computerisation which facilitates the maintenance of relations between agricultural farms and processing operators and other entities supporting integration measures). It is also very important to inspire integration measures by institutions involved in the economic development of voivodeships.

The research limitations as regards the participation of farms in regional economic systems are attributed primarily to the limited availability of comparable data at the regional level, particularly those concerning the forms and the scale of cooperation between agricultural farms. The benefits of the participation of farms in regional economic systems encourage the continuation of research, particularly in the field of mechanisms of economic (regional) policy aimed at the creation and development of integration links in regional agri-business systems.

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