The importance and determinants of cooperation between fruit farms and the institutional environment

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Abstract

The development of farms requires support from the institutional environment of agriculture. Institutions help introduce innovations and adapt their functioning to the requirements of the European Union. The aim of the research was to determine the factors affecting the cooperation of orchard farms with the institutional environment and the economic effects of this cooperation. The article's novelty answers two questions: what factors on the farm affect cooperation with the institutional environment, and whether such cooperation affects the economic results of orchard farms? The study covered 45 farms from the Małopolska and Pogórze Region in Poland, specializing in cultivating fruit trees and shrubs, which in 2018 kept accounts under the Farm Accountancy Data Network (FADN). The descriptive method, chi-square test, and Spearman's rank correlation coefficient were used in the data analysis. An original relationship index was used to assess fruit producers' cooperation with agricultural organizations. A backward stepwise multiple regression model was used to identify the factors influencing its level. The research showed a statistically significant relationship between the relationship index with the organization and utilized agriculture area, total workload, the value of subsidies to operating activities, direct costs, and the farmer's age. The regression model shows that the value of subsidies to operating activities explains 28.09% of the variability of the relationship index (R_i). Based on the analysis, it can be concluded that the cooperation of fruit producers with the institutional environment positively impacts orchard farms' economic and financial results.

Keywords: organisations, relationship index, orchard farms, agricultural income

JEL classification: Q12, D02, D24

1. Introduction

The institutional system of agriculture is created by agricultural agencies, agricultural advisory centers, and agricultural organisations, as well as regulations concerning the organization of agricultural markets, producer groups, and rural cooperatives. The listed organisations and standards are part of the institutional system that surrounds agriculture and with which farms maintain more or less permanent relations. The main task of such institutions is to improve the bargaining position of agriculture in relation to other agribusiness links (Grzelak, 2003). The institutional system of agriculture is also created by market (commercial) institutions, such as banks, insurance companies, or agricultural exchanges, which are important for the proper functioning of agriculture. These institutions, through transactions and cooperation with farmers, contribute to more partnership relations between farms and the market environment. Foreign experience shows that the presence of institutions improves the economic situation of business entities, but this applies primarily to economically stronger enterprises in the market players (Fahlbeck, 2004).

Poland's accession to the European Union had a major impact on institutional development, requiring the adaptation of national legal and organizational standards to EU systems (Kołodziejczyk & Wasielwski, 2005). It also forced significant changes in the relations of farmers with financial and advisory institutions and with entities that are part of the institutional system of the Common Agricultural Policy, in particular with the Agency for Restructuring and Modernization of Agriculture and the Agricultural Market Agency (Czudec & Kata, 2007).

Institutions, both formal and informal, are the source of economic dynamism, and the ordered institutional sphere of the economy has a positive impact on, among others, the efficiency of agricultural production and stimulates the activity of entities living in rural areas. A special task falls to institutions in the sustainable development of agriculture (Elobeid, 2012). According to Cheng and others (Cheng, Kwabena, Sun, Zhuang & Foroudi, 2020), the interaction between the organization and the institutional environment leads to organizational change or innovation. The proper construction of the institutional system in the agricultural sector should lead to the effective use of agricultural space while observing the principles of environmental protection.

Improving the institutional environment in which the economy functions can be achieved by adding new institutions to the existing ones, replacing ineffective institutions with more effective ones, experimenting with institution building, and allowing institutions to compete with each other on a regional, national, and supranational scale (Wilkin, 2003). Orcharding is a special segment of agriculture. Its planned development must be based on long-term assumptions, including a stable agricultural policy (Galanopoulos, Nilsson, Wajnblom & Surry, 2009). The durability of crops combined with the environmental requirements of this production line makes fruit production very susceptible to changes in the environment, both man-made and natural. In recent years, such elements as professional knowledge, support from the instruments of the Common Agricultural Policy, and international policy have become important development factors (Zalesko, 2008).

For many years, Poland has been one of the largest fruit producers in Europe and in the world (Wróblewska, Pawlak & Kwiatkowska, 2013). According to data from the Central Statistical Office, the area of orchards in Poland in 2020 was 355.7 thousand ha, and the number of farms engaged in orchard production accounted for 155.9 thousand. The area of fruit trees in orchards covered 233.0 thousand ha, and their cultivation took 97.4 thousand ha of farms. The average area of an orchard farm with the cultivation of fruit trees increased from 1.54 ha in 2010 to 2.39 ha in 2020. On the other hand, the area of fruit bush cultivation on farms amounted to approx. 98.8 thousand hectares, which accounted for 27.8% of the total area of orchards. Fruit bushes in orchards were cultivated by 60.2 thousand farms. The average area of an orchard farm with fruit bushes increased from 1.00 ha in 2010 to 1.64 ha in 2020 (Powszechny Spis Rolny, 2020). The presented data show that the area under fruit trees in orchards is decreasing, and the area under fruit bushes is increasing. In addition, there are significant changes in the area structure of farms, which consist mainly in increasing orchard cultivation on farms with a large area of agricultural land maintained in good agricultural condition.

The review of the literature shows that the problem of cooperation of orchard farms with the institutional environment has not been fully recognized. The conducted research fills this research gap. The aim of the research was to determine the factors affecting the cooperation of orchard farms with the institutional environment and to determine the economic effects of this cooperation.

2. Literature review

In the literature, an institution is defined in three ways. The first of them identifies an institution with an "establishment" of a public nature, which deals with a specific range of matters. The second approach to institutions refers to a set of legal or moral norms related to the organization of a specific area of life. The third definition, on the other hand, recognizes an institution as an organization functioning on the basis of norms (Drabik, Kubiak-Sokół & Sobol 2021). Arndt defined institutions as "sets of conditions and rules for transactions and other interactions" and where culture is often considered as an informal structure of a wider social setting (Arndt, 1981).

In general, the institutional environment supporting Polish agriculture is highly developed and consists of several dozen institutions operating at various levels (from national, through regional to local) and supporting various spheres of agricultural activity. In the literature on the subject, there are many classifications of institutions and organisations that create the agribusiness environment (Kołodziejczyk, 2012). Kożuch (2011) divided institutions into three categories: norms, markets, and organisations. Wilkin included, among them: rules of social life, regulators of human behaviour, binding patterns of conduct, and the so-called action codes. In this classification, there were also often less visible social structures and formal or informal codes of conduct, including, for example, entrepreneurs, consumers, identical population groups, and social order (Wilkin, 2016).

Regardless of terminological and definitional differences, in the literature on the subject, there is a division of institutions into three types, which are, at the same time, substitutive and complementary to each other. These are (Staniek, 2017):

- formal institutions (law, property rights, contracts, transaction costs, regulations),
- informal institutions (social norms, cultural patterns, customs, trust, networks, ability to solve common problems),
- organisations (enterprises, markets, networks, state).

Due to the legal form, organisations operating in the agricultural environment can be divided into public, private, and non-governmental. Public organisations can gather information and have extensive knowledge about specific problems in rural areas and effectively influence people's behaviour. Private organisations are formed due to associating (formally or informally) groups of people undertaking joint activities. Due to the scope of action, the most significant importance in the development of rural areas in Poland is played by cooperatives. On the other hand, non-governmental organisations create the infrastructure of civil society. They operate based on mutual trust and support human activity (Kołodziejczyk & Wasilewski, 2005).

The emergence of institutions, their changes, and interdependencies result from the independent needs of business entities, as well as from decisions made by the institutional policy of the state (Staniek, 2017). According to Maroda and Wilkin (2002), institutions are the foundation on which the functioning of the state, economy, and society is based, and the quality of institutions has a large impact on the efficiency and effectiveness of their functioning. Legal norms and organisations (e.g., agencies, foundations) are also becoming more and more important.

The increasingly complex and dynamically developing institutional environment causes the results of farm activity to depend largely on its impact. The institutions support and stimulate transformations in farms, help introduce innovative solutions, and adapt them to the requirements set by the European Union. The role of institutions increases with the development of agriculture. Especially after Poland's integration with the EU, the institutional environment of agriculture has great opportunities to support rural radicals and shape the direction of their economic activity (Kawa & Grzybek, 2009). According to Siekierski (Siekierski, 2005), institutions and organisations are a permanent element of changes in Polish agriculture and rural areas. The needs of farmers in terms of support from the institutional environment are also changing, especially regarding the processes of transformation and modernization of farms. They are primarily the result of changes and conditions for the functioning of agriculture due to the impact of the CAP and the related opportunities to obtain EU funds to finance farms. Most of the EU programs supporting transformation in agriculture favour farms that are economically stronger and more closely linked to the institutional environment (Kata, 2008).

Organisations in the agricultural environment provide farmers with knowledge about the use of new fruit varieties and their production technologies, opportunities to sell fruit, participate in the transfer of funds from the EU budget for the purchase of new equipment for production and storage, and carry out campaigns promoting increased fruit consumption on the domestic and foreign market. Farmers' relations with these organisations may be conducive to making specific decisions regarding changes in farming, stimulating the processes of change in the structure and methods of operation (Rysz & Szymańska, 2023).

In the process of development of rural areas, and thus of agriculture, the most important role is played by public organisations, i.e., government and local government administration, which have the ability to collect information as well as have extensive knowledge about specific problems in rural areas, as well as effectively influencing people's behaviour (Kołodziejczyk & Wasilewski, 2005). Institutions are essential for the functioning of the agricultural market. They influence his transformations. They create the framework and mechanisms that regulate people's behaviour. They shape interpersonal relations in the management process. With regard to the market (including the agricultural market), institutions make it more understandable, transparent, and predictable (Zalesko, 2006). For sustainable development, institutions, especially at local levels, are important for mobilising resources and regulating their use to maintain a long-term base for productive activity (Uphoff, 1992).

The role of business environment institutions in developing rural entrepreneurship, the assessment of cooperation between rural enterprises and business environment institutions, and the degree of usefulness of the services they offer were the subject of research by Bański (2015). His analyses show that the knowledge of entrepreneurs from rural areas about the activities of business environment institutions and the services they offer is insufficient. Among the most frequently mentioned barriers hindering cooperation with business environment institutions were lack of information on services offered by such institutions, insufficient experience in cooperation and lack of financial resources.

Research by Szymańska, Rysz and Utnik-Banaś (2023) shows that public organizations such as the Agency for Restructuring and Modernization of Agriculture, Agricultural Advisory Centers, banks, and KRUS, which provide their services free of charge, are more important for the proper functioning of farms. Fruit producers most often benefit from consulting, training, the opportunity to obtain information about EU programs, or assistance in completing documentation for EU programs.

According to Jakubowicz (2007), all institutions, including those working for the development of agriculture and, thus, the development of farms, face the following challenges: making an objective assessment of the past, complying with the law, defining clear directions of action, access to funds, improvement of management and implementation of European Union programmers. The improvement of the institutional environment in which the economy functions can be achieved by launching new institutions to existing ones, replacing ineffective institutions with more effective ones, experimenting with the creation of institutions, and enabling institutions to compete with each other on a regional, national and supranational scale (Wilkin, 2003).

Institutions have to perform many important functions that are of fundamental importance for the development of farms. Therefore, it is necessary to create a system of institutional environment for agriculture that will effectively use its possibilities of supporting and creating farm activity and will contribute to shaping their structure in line with the needs of farmers. It is necessary to strongly promote the institutional environment system and disseminate information about its activities, including, above all, specific benefits for farmers.

3. Materials and Methods

The basic area of research covered the FADN Region 800 in Poland - Małopolska and Pogórze, which includes four voivodeships: Małopolskie, Podkarpackie, Świętokrzyskie, and Śląskie. The mentioned region is distinguished by:

- the largest agrarian fragmentation in the country, which contributes to the development of orchard production in this area,
- the small scale of production on farms,
- the high percentage of people living in rural areas in the total number of inhabitants,
- the high share of people earning their living from work in agriculture,
- the high level of unemployment, especially in the Podkarpackie and Świętokrzyskie voivodeships,
- underdevelopment of rural infrastructure,
- border location (eastern and southern border of Poland),
- the high share of legally protected areas in the total area of Małopolska and Pogórze.

Fruit production in this area contributes to its sustainable development. In 2021, in the region of Małopolska and Pogórze, orchards occupied a total of 65.2 thousand ha, which accounted for 18.9% of the area of orchards in the country. 816.3 thousand of them were collected, which accounted for 18.2% of the total harvest in Poland. Similar relationships were observed in the field of berry fruit harvest. The harvest of this type of fruit in the Małopolska and Pogórze Region amounted to a total of 63.9 thousand tonnes and accounted for 11.3% of the total berry fruit crop in the country (Bank Danych Lokalnych 2023).

The research covered all farms from the Małopolska and Pogórze Region, specializing in cultivating fruit trees and shrubs (without vines and olives), which in 2018 kept accounts under the FADN. Four farm owners did not agree to complete the questionnaire during the research. In this situation, the research covered 45 farms. When completing the questionnaires, the employees of the Agricultural Advisory Centres were assisted. The research was carried out in the summer of 2019, and the data obtained concerned 2018. The collected data was formally and substantively verified and then entered into the MS Excel spreadsheet.

The method of building this indicator and its level was described in detail in another study by the authors on the cooperation of fruit farms with the institutional environment toward sustainable development (Szymańska, Rysz & Utnik-Banaś, 2023). Taking into account the intensity of cooperation with orchard farms and organizations, all surveyed farms were divided into three groups: the first group with weak contacts with organisations ($R_i <= 0.14$), the second group with medium contacts ($0.15 <= R_i < 0.23$, the third one with intensive contacts with organisations ($R_i >= 0.23$) Each group consisted of 15 farms, because according to the requirements of the FADN, it is not possible to publish data for groups with fewer farms. In such groups of farms, an analysis of resources, investment level, and economic and financial results was carried out.

The descriptive method and statistical tests were used in the data analysis. The chi-square test was used to assess the distribution of the relationship index with organisations, which showed that the relationship index was inconsistent with the normal distribution (Mynarski, 2003). In this situation, Spearman's rank correlation coefficient was used to assess the relationship between the indicator of relations between orchard farms and the institutional environment and selected characteristics of the surveyed farms.

In order to identify the factors influencing the level of the relationship with the environment indicator (R_i) a multiple regression model was used (Stanisz, 2006). The model's variables were selected based on substantive criteria and data availability. On this basis, factors influencing the level of the indicator of relations with organisations in the surveyed orchard farms were identified.

In assessing of the relationship between the value of the relationship between farms and organisations and the economic and financial results of orchard farms, the Spearman's rank correlation coefficient was used, because the distribution of economic measures and indicators (agricultural income, return on assets, and return on equity) did not follow a normal distribution.

4. Results and discussion

The surveyed farms were divided into three equal groups based on the value of the relationship between orchard farms and organisations (R_i) of the institutional environment. The data contained in Table 1 show that the smallest UAA (8.24 ha) occurred in the farms of the first group and the largest 11.93 ha in the third group, which means that farms with a higher relationship index had a larger UAA. Moreover, farms from the third group had, on average, almost 2-3 times larger total UAA in comparison to the average for the region.

The structure of UAA was dominated by orchards, which on average, in the group with the lowest indicator of relations with organisations, accounted for 80.2% of the farm area. In the group with the highest relationship index, their share was lower by 6.6 percentage points. All surveyed farms additionally leased UAA, on average from 0.67 ha in the first group to 1.39 ha in the third group.

In the surveyed farms, owned and hired labour inputs were higher in groups with a higher relationship index with the institutional environment. All farms were dominated by the farmer's and his family's labour input, and hired labour was only a minor supplement to it. The share of own work in total labour input was the highest in the group with the lowest value of the relationship with organisations indicator (76,7%). This situation could be the result of less frequent contact of orchard owners with employment agencies to look for employees to pick fruit in season. In the other two groups, the share of own work was lower and amounted to 62.5% in the second group and 67.8% in the third group, respectively. In these two groups, a significant share comprised hired workers.

The lowest average value of fixed and current assets was characteristic of farms from the group with the highest relationship index with organisations. In the group with the lowest level of this indicator, the average values of assets were higher than in the third group,

but the differences were not large. The highest value of fixed and current assets occurred in the group with an average level of the relationship index with organisations.

Table 1. Resources of production factors in farms with different levels of relationship with organizations

Description	Relationship index with organisations (R_i)		
	up tu 0.14	0.15 – 0.23	above 0.23
Total Utilised Agricultural Area - UAA [ha]	8.24	10.96	11.93
Rented UAA [ha]	0.67	0.86	1.39
Orchards [ha]	6.61	9.00	10.36
Total labour input [AWU/ha]	1.72	2.37	2.86
Unpaid labour input [FWU/ha]	1.32	1.48	1.94
Paid labour input [AWU/ha]	0.39	0.89	0.92
Total fixed assets, including: [thous. PLN*/ha]	524,11	587,26	652,00
Land [thous. PLN/ha]	296,34	345,97	380,48
Buildings [thous. PLN/ha]	143,71	127,99	179,49
Machinery [thous. PLN/ha]	84,06	113,30	91,99
Total current assets [thous. PLN/ha]	80,96	91,23	91,29
Stock of agricultural products [thous. PLN/ha]	21,61	58,89	52,94

*Polish zloty [PLN] - the currency in force in Poland
Source: own study.

Farms with a higher relationship index with the environment were also characterised by a higher value of fixed assets. In the first group the value of fixed assets was PLN 524.11, and in the third group, it was PLN 652. The fixed asset's structure was dominated by the value of land, which was also the highest in the third group. The share of land value in the first group was 56.5%, and in the second and third group, it was over 58.0%. The share of buildings was the lowest in the second group and amounted to 21.8%, and in the first and third group, it was at the level of over 27.0%. In turn, the share of machinery, equipment, and means of transport in the first and third groups was at a similar level, and in the second group it was the highest and amounted to 19.3%.

The value of current assets was the lowest in the first group, which amounted to PLN 80.960. In the second and third group, the value of current assets was at a similar level and amounted to approximately PLN 91.20. In these two groups, the structure of current assets was dominated by inventories, the value of which amounted to PLN 58.89 in the second group and PLN 52.940 in the third group, respectively. The analysis shows that farms with different levels of ties with institutional environment organisations differ in land, labour, and capital resources.

The subject of the analysis was also the value of production in orchard farms with a varied relationship index with organisations (Table 2). The data show that the lowest value of all production categories occurred in the first group. Moreover, there was no livestock production in this group of farms. The highest production value per 1 ha of UAA was characteristic of farms with an average ratio of relations with organisations. In this group, the average value of animal production was the highest and amounted to PLN 239 per ha of UAA.

Table 2. Production in the surveyed farms according to the level of relations with organizations [thous. PLN]

Description	Relationship index with organisations (R_i)		
	up tu 0.14	0.15 – 0.23	above 0.23
Total output	10,883.98	13,801.50	12,748.67
Total crop production	10,686.99	13,429.23	12,145.34
Fruit	9,628.00	12,544.75	11,412.73
Total livestock production	0.00	239.00	27.48
Other output	196.99	133.27	575.85

Source: own study.

Various factors condition the fruit production value in each orchard farm. The decisive role is played by the resources of land, labour, and capital and the degree of their use. How the produced products will be managed depends to a large extent on the decision of the fruit grower. Produced fruit can be sold by the producer or intended for consumption on his own farm. The lowest value of fruit sales occurred in the group of farms with the highest relationship index with organisations and amounted to PLN 97,366.12. Higher sales value by PLN 46,011.26 was recorded in the second group with an medium relationship index with organisations.

The data shows that in the structure of costs and financial burdens per 1 ha of UAA of the surveyed orchard farms, the average share of direct production costs accounted for about 1/4 of the total cost value (Table 3). However, the surveyed farms were diversified in terms of costs and financial burdens depending on the value of the relationship with the organization's indicator. Plant protection products accounted for the largest share (over

50.0%) of indirect costs. In the second group, their share was 58,5% of direct costs. The costs of mineral fertilizers occupied the next position in this structure. Their highest percentage (27.5%) occurred in the first group. In the second group, they accounted 20.8%, and in the third group, for 24.4% of all direct costs. The costs of seeds and seedlings had a small share in the cost structure, but their percentage was the most diverse in the surveyed groups of farms. Their share was the lowest in the second group, where it amounted to only 2.9%. In the third group it was over 6.5 times higher. In the second group, the costs of seeds and seedlings accounted for 5.9%. A similar situation concerned general farming costs. The data show that in the group with the highest relationship index with organisations, the average value of general farming costs was the lowest (PLN 1,719.42). In the group with the medium level, it was the highest (PLN 2,066.56).

Table 3. Operating costs of fruit farms in relation to the ratio of relations with organizations [thous. PLN]

Description	Relationship index with organisations (R_i)		
	up tu 0.14	0.15 – 0.23	above 0.23
Total inputs [thous. PLN]	83.34	131.80	84.50
Total direct costs	2,304.58	2,447.64	2,371.12
Seeds and plants	137.05	71.27	154.60
Fertilisers	634.48	508.27	577.73
Crop protection	1,290.69	1,430.56	1,214.81
Other direct costs	236.49	304.32	409.46
Total farming overheads	1,827.46	2,066.56	1,719.46

Source: own study.

The productivity and profitability of the surveyed fruit farms, depending on the size of the relationship with the organization's indicator, are presented in Table 4. The data shows the farms with a medium relationship index had the highest land productivity. In the group with the lowest relationship index, the land productivity was at the lowest (about PLN 10,000 per farm). Work efficiency, which may determine its competitiveness, is of great importance for the functioning of farms. The lowest value of labour productivity (67,801.21 PLN/FWU) was characteristic of farms with the lowest relationship index with organization, and the highest value occurred in the group with an medium relationship index links and amounted to PLN 102,686.88 per full-time employee on average.

Labour productivity in individual analysed groups of farms depended on the technical equipment of farms and the size of agricultural land (UAA) per employee. The analysis of capital productivity measured by the value of production per PLN 1,000 of the value of

fixed assets shows that its highest value occurred in farms from the third group and was almost 1.5 times lower in the first group.

Table 4. Productivity and profitability of orchard farms with different degree of relationship index

Description	Relationship index with organisations (R_i)		
	up to 0.14	0.15 – 0.23	above 0.23
Production per 1 ha of UAA [PLN/ha]	10,619.84	13,217.53	14,151.79
Production per 1 FWU [PLN/FWU]	67,801.21	102,686.88	78,559.05
Production per PLN 1,000 of fixed assets value [PLN]	180.03	254.51	257.90
Agricultural income [PLN]	31,615,50	47,810,70	53,400,00
Income per 1 ha of UAA [PLN]	3,003.40	4,467.00	4,529.24
Income per 1 FWU [PLN/FWU]	20,716.15	30,723.30	32,395.99
Income per PLN 1,000 of fixed assets value [PLN]	52.34	97.68	108.62
Return on assets ratio - ROA [%]	4.55	7.72	9.12
Return on equity ratio - ROE [%]	4.61	7.77	9.21

Source: own study.

The economic effects of orchard farms result from the quantity of fruit produced and intended for sale as well as the costs incurred. The basic economic category in farms is income. The value of family farm income in the surveyed farms was highly diversified. In the group of farms with the highest relationship index with institutional environment organisations, the farm income economic results was over 1.5 times higher than in the group with the lowest relationship index. It was probably related to the use of knowledge gained from agricultural advisors or employees of other organisations with which fruit producers cooperated. This, in turn, could have contributed to an increase in income and various types of investments in farms. Thanks to this, fruit growers could achieve a higher competitive position in the market.

The profitability of the production factors of the surveyed orchard farms varied depending on the value of the relationship index with the organizations. The profitability of land in the analysed groups of farms ranged from 3,003 PLN (first group) up to 4,529 PLN (third group). The lowest profitability of work was found in the group of farms with the lowest relationship index with the institutional environment and the highest in the group with the highest level of relationship index with organisations. The difference in

work profitability between these groups was more than 1.5 times. In the case of property profitability, the largest differences occurred between the first and third groups of farms. The income per PLN, 1,000 of the value of fixed assets in the third group, was PLN 56.28 higher than in the first group.

In the analysed groups of farms, the value of the return on assets ratio remained at a positive level, which means that the assets of orchard farms brought profits. The lowest value was achieved by farms from the first group. In the second group, the return on assets ratio was more than 1.7 ratios higher, and in the third group 2.0 times. A similar situation occurred in the case of the return on equity ratio.

To identify the factors influencing the relationship index (R_i) level, the Spearman correlation coefficient and the backward stepwise multiple regression model were used. The analyses consider endogenous factors dependent on the farmer, i.e., resources, inputs, and selected characteristics of fruit producers. When selecting the explanatory variables for the model, the possibility of their substantive justification was considered. The set of potential explanatory variables included:
x1 - UAA [ha],
x2 - total workload [AWU],
x3 - the value of subsidies to operating activities [PLN],
x4 - the value of fixed assets [PLN],
x5 - the value of general farming costs [PLN],
x6 - the value of direct costs [PLN],
x7 - age of the farmer,
x8 - farmer's education.

In the first stage, the distribution of variables was tested with the chi-square test. Due to the lack of normal distribution of variables, Spearman's rank coefficient was used to determine the relationship in the next stage. The strength and direction of the relationship between the variables are presented in Table 5.

Table 5. Spearman correlation coefficient for variables proposed for the model

	R_i	x1	x2	x3	x4	x5	x6	x7	x8
R_i	1.000	0.437	0.396	0.412	0.263	0.162	0.295	-0.410	-0.128
x1	0.437*	1.000	0.453	0.873	0.585	0.383	0.515	-0.347	0.140
x2	0.396*	0.453*	1.000	0.409	0.663	0.566	0.583	-0.189	-0.098
x3	0.412*	0.873*	0.409*	1.000	0.511	0.268	0.240	-0.264	0.063
x4	0.263	0.585*	0.663*	0.511*	1.000	0.588	0.557	-0.225	0.031
x5	0.162	0.383*	0.566*	0.268	0.588*	1.000	0.548	-0.185	0.033

x6	0.295*	0.515*	0.583*	0.240	0.557*	0.548	1.000	-0.261	0.016
x7	0.091	0.087	0.071	-0.027	-0.014	0.007	0.059	1.000	0.146
x8	-0.066	0.036	0.099	0.075	0.240	0.165	0.012	0.146	1.000

Explanation: * value for $p<0.05$
Source: own study.

Then, using the stepwise multiple regression model, the factors influencing the level of the relationship index. Considering the small research sample, three variables with the highest Spearman's rank correlation index were adopted for further analyses:

x1 - UAA [ha],
x2 - total workload [AWU],
x3 - the value of subsidies to operating activities [PLN],

The assessments of structural parameters in the regression model, the values of standard errors of assessments, and the p-value of the probability are presented in Table 6. The model shows that the value of operating subsidies has a statistically significant impact on the relationship index. The increase in the value of operating subsidies contributes to the increase in the value of the relationship index. The multivariate coefficient of determination for the presented model was 0.2809, indicating that it explains 28.09% of the dependency relationship index (R_i) variability with the standard estimation error of 0.078. The random component (residual vector) has a normal distribution for $p=5\%$, so the model can be used for forecasting. A low level of the determination index means that the model explains the variability of the relationship index to a small extent but allows for understanding the dependencies.

Table 6. The results of the regression analysis for the relationship index (R_i)

Variables	N=45 (all orchard farms)		
	b	s(b)	p
Const.	0.1312	0.0216	0.0000
x3 - the value of subsidies to operating activities [PLN]	0.0001	0.0000	0.0002

Explanation: b-parameter, s(b)- the standard error of the parameter, p – p-value
Source: own study.

The relationship between the variables can be written as the following equation (1).

$$Ri = 0.1312 + 0.0001x_3 \quad (1)$$

The demonstrated relationship between the variables seems rational because obtaining financial support is the primary reason for cooperation between agricultural producers and organizations in the institutional environment. Receiving such support motivates fruit growers to cooperate with the institutional environment.

Subsequently, the agricultural income, return on assets, and return on equity were used to assess the economic results of orchard farms (Table 7). The choice of agricultural income resulted from the fact that it is the fundamental economic category on farms. In turn, examining profitability is particularly important in horticulture because the production technologies used on fruit farms are much more capital-intensive than typical agricultural production. Therefore, developing a horticultural farm requires expensive investments, which translates into a significant increase in assets and sources of financing.

Table 7. Economic and financial results depending on the value of the relationship index - results of the analysis using the Spearman rank correlation coefficient

Variables	Relationship Index (R_i)	Agricultural income [PLN]	Return On Assets (ROA)	Return On Equity (ROE)
Relationship Index (R_i)	1.000	0.390	0.321	0.322
Agricultural income [PLN]	0.390*	1.000	0.901	0.908
Return On Assets (ROA)	0.321*	0.901*	1.000	0.998
Return On Equity (ROE)	0.322*	0.908*	0.998*	1.000

The symbol * denotes a statistically significant relationship at the significance level 0.05
Source: own study.

The Spearman's rank correlation indices justify the conclusion that the amount of agricultural income and the indicators of return on assets and equity depend on the degree of cooperation of the farm with the institutional environment. However, the level of these indicators indicates a low relationship with a significance level of $p<0.05$. This was probably due to the low relations between fruit producers and agricultural organisations. Contacts of fruit growers with the institutional environment were sporadic and concerned only selected organisations, which is indicated by the low level of the relationship index. In addition, the surveyed group of orchard farms was small, which significantly limits the inference.

5. Conclusions

The research shows that fruit producers in Poland do not take advantage of the opportunity to cooperate with the institutional environment. The developed relationship index, taking into account the number, form, and frequency of contacts between fruit producers growers and agricultural environment organisations and the form of assistance, confirmed the limited relationships of farmers with various organisations.

Farms with a larger UAA larger workforce, and higher value of fixed assets more often cooperate with the institutional environment. In addition, farms with a higher relationship index with agricultural support organisations.

The completed research showed that farms cooperating with the institutional environment achieved higher profitability of land, labour, and fixed assets. They were also characterized by higher returns on equity and assets. In addition, these farms recorded a higher cost-effectiveness index. The obtained results indicate the need to develop relations between fruit producers and the institutional environment.

Spearman's rank correlation analysis showed a statistically significant relationship between the relationship index with the organization and utilised agriculture area, total workload, the value of subsidies to operating activities, and direct costs. The multiple regression model confirmed the positive impact of subsidies to operating activities on the value of the relationship index with the institutional environment. This situation was probably because fruit producers most often use the help of agricultural organizations to obtain financial support.

Based on the analysis, it can be concluded that the cooperation of fruit producers with the institutional environment positively impacts the economic and financial results of orchard farms. The research has confirmed the statistically significant relationship between the relationship index and the economic results of orchard farms, although this dependence was low. This was probably due to the small number of farms and the low level of cooperation between farms and organizations in the agricultural environment.

The research shows, therefore, that cooperation between fruit producers and organisations should be perfected and improved because it positively affects changes in orchard farms. Adapting the offer of individual organisations to the needs of fruit growers, disseminating information about their activities, and reducing bureaucracy as part of this cooperation may be helpful in this respect.

Further research should be focused on recognizing the scope and quality of cooperation between farms of various production directions and the institutional environment and on determining the effects of this cooperation. Research on evaluating the effectiveness of the network in providing the services needed (i.e., information, knowledge, financial resources) and in developing trust and coherence between agricultural producers and the institutional environment will be very useful.

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