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AGRICULTURE IN THE SOUTHWEST FUNCTIONAL AREA OF WIELKOPOLSKIE VOIVODESHIP

Abstract. Agriculture is among the major economic sectors of the Wielkopolskie voivodeship. Compared to the rest of the country, the region offers average natural conditions for agricultural and livestock production which do not differ much from what may be encountered elsewhere in Poland. However, the sophistication, intensity and organization of agricultural production are at a higher level. The Southwest Functional Area, as identified in this study, definitely stands out against the rest of the voivodeship. To assess the impact of EU integration processes on agricultural development, a survey was carried out of selected farms who illustrate the progress in the field.

Keywords: agriculture development, Southwest Functional Area of Wielkopolskie voivodeship, intensive agriculture, agricultural production

INTRODUCTION

The history of agriculture spans over more than ten thousand years. Agricultural products were one of the first commodities to be exchanged. Some of them, such as cattle, cereals or skins, were used as currency in the primitive economies. The dynamic development of humanity is the driver of changes in agricultural systems, resulting in a redefinition of functions and roles of agriculture in the economy (Zegar, 2004; Gudowski and Piasecki, 2007; Klepacki, 2008) and in the agribusiness (Tomczak, 2004).

The 19th century is believed to be a breakthrough for agricultural development. At that time, technical progress and industrial development led to the intensification of agricultural production. As a consequence,

agricultural productivity increased and the share of agricultural workers in the total working population declined (Pinstrup-Andersen, 2002; Bański, 2007). Ever since, the share of food expenditure in the population's total spending and the contribution of agriculture to GDP have been observed to decrease, too. Despite its smaller economic importance, agriculture continues to play a major role in the functioning of each country. It attracts interest from the ruling political parties and is a matter of strategic importance to all economies around the world. Human food needs cannot be addressed with other goods, and the national agricultural production is the foundation for the country's food security. The importance of food security was one of the basic economic drivers of European integration processes; the solutions implemented under the Common Agricultural Policy

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gave an unprecedented momentum to the European agriculture. At the same time, in most Central and Eastern European countries (including Poland), the structural change and development processes were much slower because of the adopted political solutions. Nevertheless, some regions clearly developed at a higher pace. While Poland's accession to the European Union accelerated the development processes throughout the country, regions at higher development levels seized the opportunity to develop even faster. The purpose of this paper is to assess the situation of agriculture in the context of implementing the CAP instruments in the region believed to have the most developed agricultural sector, as reflected in the regional delimitation of the Southwest Functional Area of Highly Developed Agriculture.

METHODOLOGY

The source materials are the results of a survey carried out in October 2018 in the Southwest Functional Area of the Wielkopolskie voivodeship composed of 19 municipalities located in the following districts: Gostyń, Krotoszyn, Rawicz and Leszno. The surveyed population consisted of 35 farmers of various gender, age, education, period of farming activity and place of residence. The survey questionnaire administered to the respondents consisted of 24 questions regarding such matters as the availability of tractors and machinery; main lines of production; livestock production volume; impact of Poland's accession to the European Union on the volume and value of agricultural production and on planned and implemented investments. The survey allowed to collect a set of information which cannot be fully presented due to size limitations of this paper. Therefore, only the selected results are discussed to focus on issues related to the purpose of this paper. Because the functional area has only recently been delimited, the results are the first stage of planned research and a starting point for further analyses. The study included an analysis of the two-dimensional distribution of observations of the set of units based on two features (X and Y) which consists of a vector of distribution pairs defined as $[x_j y_j] = [x_1 y_1; x_2 y_2; \dots; x_{n-1} y_{n-1}; x_n y_n]$; individual data is presented in intervals of k groups for variable X and l groups for variable Y . The existence of a relationship between the distributions of features was verified with a null hypothesis that the distributions of two features in the population are independent (H_0 : X and Y are independent features).

Hypothesis H_0 was verified using the χ^2 test which consists in comparing the observed and expected incidence rates under the assumption that no relationship exists between the variables.

This study also used the factor analysis to classify and reduce the number of variables (to group the variables) in order to search for structures that explain the variation of many variables (27 factors were proposed that drive the development of farms after Poland's accession to the European Union). The number of groups (principal components) was selected in line with the Kaiser's criterion, and thus only the factors with eigenvalues greater than 1 were retained. The varimax rotation of the initial space of variables (factors that drive the development of farms) was carried out, with the criterion being to maximize variance (variation) of the new factor while minimizing variance around the new variable (Podręcznik..., 2010). Therefore, the structures were described as artificial dimensions (factors) which are strongly correlated with the variables analyzed while being independent from one another. Varimax calculations allowed to specify the number of new factors with variables having factor loadings greater than 0.65.

SOUTHWEST FUNCTIONAL AREA

Regional development theories focus on analyzing the development processes at regional level (Secomski, 1987) and indicate the unequal distribution of opportunities for gradual economic growth across regions while also explaining the underlying mechanisms responsible for disparities in economic development across countries (Czerny, 2005). The regional development concept, initially developed by J.H. von Thünen in 1826, is underpinned by location theories which, according to Grzelak (1989), essentially address the differences in regional development levels. All of them trace the patterns of and reasons behind regional disparities. However, each theory identifies different underlying causes and considers different forecasting conclusions, resulting in different development strategies being proposed to regional policymakers. Wilkin (2006) believes that "the ability to access extensive aid schemes for the agriculture and rural areas, financed by the Union, has provided a great new and unprecedented opportunity to considerably improve the condition of the Polish agriculture and of the entire food sector." Regional differences across Polish agricultural and rural areas have been discussed in the literature (including

Esperacia et al., 2000; Halamska, 2001; Czubak and Waloch, 2004; Lee et al., 2004; Krasowicz, 2009; Sikorska et al., 2009; Poczta and Bartkowiak, 2012; Kalinowski, 2015). Numerous studies suggest that the development of agriculture and rural areas varies across regions (Nermend, 2006; Sikorska et al., 2009; Poczta and Bartkowiak, 2012). The regions differ from one another not only by natural conditions but also by economic, socio-cultural, production and infrastructural aspects. Both the type of instruments and the form of state intervention in the agriculture and rural areas should be adjusted to regional particularities. Regional differences across agricultural and rural areas may require different levels and structures of public intervention.

Agriculture and processing are among the major economic sectors of the Wielkopolskie voivodeship (Poczta and Kołodziejczak, 2004). Compared to the rest of the country, Wielkopolskie voivodeship offers average, moderately favorable conditions for crop and livestock production. Nevertheless, some regions may be identified which demonstrate outstanding production intensity and professional skills. What matters in this case are not only the natural conditions but also the sophistication of agricultural practices, quality of human capital, higher production intensity and farm structure (Firlej, 2003; Majchrzak and Wysocki, 2007). These characteristics are identified when delimiting the areas in order to develop the best political solutions and intervention mechanisms.

Local governments at voivodeship level may identify and geographically delimit functional areas of regional importance. One of the areas planned to be established in the Wielkopolskie voivodeship is the Southwest Functional Area of Highly Developed Agriculture (SWFA) composed of 19 municipalities located in the following districts (Plan Zagospodarowania..., 2017): Gostyń (7), Krotoszyn (6), Rawicz (5) and Leszno (1):

- 13 urban-rural municipalities: Bojanowo, Borek Wlkp., Gostyń, Jutrosin, Kobylin, Koźmin Wlkp., Krobia, Krotoszyn, Miejska Górka, Pogorzela, Poniec, Rawicz, Zduny,
- 5 rural municipalities: Krzemieniewo, Pakosław, Pępowo, Piaski, Rozdrażew,
- 1 urban municipality: Sulmierzyce.

The SWFA was delimited as an integrated area characterized by intensive farming. The delimitation was based on selected criteria, primarily including:

- the share of agricultural land in total area of the municipality,
- valuation index for the agricultural production space,
- winter wheat yields per hectare of agricultural land,
- average size of an individual farm,
- livestock density per 100 ha of agricultural land,
- implementation of Measure 121 under the 2007–2013 RDP,
- mineral fertilizer consumption per ha of agricultural land.

In addition to a highly developed agriculture sector, the region also boasts an outstanding agri-food industry. Both of these basic agribusiness aggregates (food industry and agriculture) are interrelated through complex socioeconomic links. Mutual impacts and feedbacks, which include the flow of raw and other materials, the circulation of payments (in the opposite direction) and the exchange of information, become increasingly determinant for the regions' ability to develop a strong competitive edge. Because of market pressures and internal initiatives, mutual relationships often become formal arrangements. Poland's accession to EU structures and the resulting extent of aid delivered under agricultural policy mechanisms (and other structural funds) provided an opportunity to accelerate and deepen the agricultural transformation (Tomaszewski, 2015).

According to Poczta et al. (2017), the Southwest Functional Area is characterized by a higher production intensity and sounder relationships between productive inputs which result in higher land productivity (38% more than the average for Wielkopolska and 90% more than in Poland). In 2010, the SWFA extended over 165,792 ha of agricultural land (9.43% of agricultural land in Wielkopolska). Arable land accounts for nearly 90% of agricultural land, compared to 76% in Poland and 85% in Wielkopolska. In 2010, the average size of a farm in the SWFA was 15.55 ha of agricultural land. In 2015, cereal yields in the study area were 48.7 dt/ha, i.e. 30% more than in Wielkopolska and 38% more than in Poland. In the SWFA, high levels of agricultural development are reflected by the economic performance of the agricultural sector. For instance, the profitability of agricultural production in the SWFA is nearly twice as high as the corresponding figures for Wielkopolska and Poland. Although the study area has a highly developed agriculture sector, it still demonstrates above-average performance as regards growth rate of crop

yields, growth in the average size of farms and numbers of main livestock species. These trends are driven by the sophistication of local agricultural practices which enable higher crop yields than elsewhere in the country. Agricultural sophistication is also reflected by a sounder cropping pattern: while cereals play a minor role, industrial crops (such as rape, vegetables or sugar beet) are of much greater importance (Poczta et al., 2017). In the study area, over 34,000 people are farm workers, accounting for nearly 10% and nearly 1% of the total workforce in Wielkopolska and in Poland, respectively. Note also that the SWFA manages its agricultural labor on a sounder footing: in 2010, there were nearly 21,000 full-time employees, representing 11% and 1% of FTEs in Wielkopolska and in Poland, respectively. All of the factors analyzed make the Southwest Functional Area an important agricultural player both at voivodeship and countrywide level. This role has an impact on, and coincides with, the development level of the local agri-food industry. The literature study suggests that the SWFA has not yet been subject to dedicated research. Because the region has the most developed agriculture sector in Wielkopolska which may also be considered to be the best in the country (this will also be subject to verification), the processes taking place locally could become a basis for creating a development path to be pursued by other regions.

RESULTS OF THE STUDY

The surveyed group was composed of 35 farmers, including 27 men (77%). People aged 31–50 accounted for more than half of the total number of respondents (19 people); 13 interviewees were aged above 51 while 3 people were up to 30 years old. Two thirds of the group surveyed declared to have a secondary education. Other farmers covered by this survey had a tertiary (10 people) or primary (2 people) education. In the group of respondents, 55% (19 people) had a non-agricultural education background whereas 45% (16 people) graduated from an agricultural school.

The farms surveyed were relatively larger than what may be observed in the voivodeship. However, the distribution of the study sample reflected the disparities characteristic of the southern part of Wielkopolska: 12 farms were larger than 25 hectares, 12 other farmers declared to own 15 to 25 hectares of farmland, and 11 farms were smaller than 15 hectares. The survey suggests that the

small increase in the average area of farm in the region concerned is caused by lack of land supply. The holdings surveyed were mainly (21 farms) engaged in mixed (crop and livestock) production; 8 farms were engaged in crop production only; while 6 other specialized in livestock production. As regards availability of machinery and equipment (an important aspect in the assessment of investments), more than two thirds of farms surveyed owned 2 agricultural tractors; 9 respondents declared to have more than 3 tractors; and only 4 farms owned 1 tractor. More than half of farmers surveyed (19) do not have a harvester; 14 respondents own 1 harvester; and two interviewees declared to have 2 harvesters. The average value of tractors and harvesters is ca. PLN 160,000 and PLN 35,000, respectively.

When assessing the development of farms, with particular focus on the importance and impacts of the accession to the EU on agricultural transformation, the scale of investments was also examined. Investments were made by nearly all of the farms surveyed (except just one). Six of them purchased land in addition to tractors, machinery and equipment whereas one farm purchased land only (did not make any equipment-related investments). Obviously, the extent of investments strongly depended on the farm's size. The coefficient of correlation between the area of agricultural land and the total amount of investments was 0.84. The farms invested large amounts of money. In absolute terms, the average expenditure incurred in 2004–2017 was ca. PLN 780,000 (more than PLN 24,000 per hectare of agricultural land). The sources of financing are an important aspect of investment implementation. As a major component, they include funds disbursed under the Common Agricultural Policy for the financing or co-financing of investments. In view of the above, the farms were grouped by whether they relied solely on their own funds or were supported by EU funds (which include both direct payments and funds available under the second pillar) or reimbursable funds (loans and lease contracts). The two-dimensional distribution of features covered by this study is shown in Figure 1.

The study proves that CAP funds in the form of direct payments and funds available under the second pillar stimulate farm investments. The amounts invested were higher for farms who included CAP funds in their financing mix.

In addition to assessing the impact of agricultural policy funds on the amount of investments, the respondents

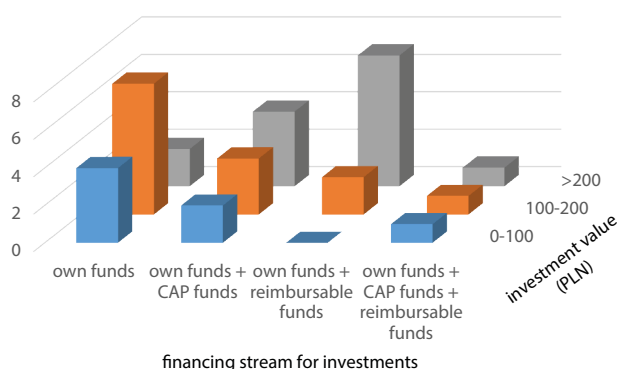


Fig. 1. Two-dimensional distribution of farms by sources of financing and total investment value (PLN)
 Statistical significance was tested; the result of the Pearson's χ^2 test (with 6 degrees of freedom and at a p -value of 0.15433) indicates a significant relationship between the sources of financing and the amount of investment.
 Source: own elaboration based on the results of statistical significance tested (data sourced from a survey, $n = 35$).

ments and the EU investment support programs as the best drivers of development. These opinions, too, show the importance of EU integration in stimulating the development of farms. The legal environment, including amendments to legislation, was found to be the least relevant factor. The factor analysis was used to group the development factors. The research resulted in separating two clearly distinct factors (Table 1). The first one may be defined as market developments related to European integration. According to the farmers, the internal market has expanded; there are better export opportunities; the prices have followed a favorable trend; and both vertical (cultivation contracts) and horizontal (producer groups, informal relationships) integration structures have been reinforced. It appears that in the region which is home to economically strong holdings, the economic integration of Poland with the EU not only resulted in the emergence of market failures related to the competition in the single market, but also created some oppor-

Table 1. Results of grouping the factors behind the development of farms after Poland's accession to the European Union ($n = 35$)

Factor	Variable	Factor loadings		Average rating
		factor 1	factor 2	
Factor 1	Emergence of new markets	0.65	0.38	2.4
	Ability to export agricultural and processed agricultural products	0.63	0.27	2.5
	Favorable pricing of agricultural products sold	0.80	0.01	2.3
	Favorable pricing of raw materials for production	0.77	-0.15	2.4
	Ability to enter into cultivation contracts	0.76	0.12	2.7
	Financing for the establishment of agricultural producer groups	0.87	-0.14	2.8
	(Informal) integration with other farmers	0.72	-0.06	2.7
	Better, favorable conditions of sales contracts	0.64	-0.05	2.4
Factor 2	Ability to access EU investment support	0.17	0.64	1.9
	Other state aid	-0.11	0.75	2.7
	Ever-increasing availability of new technologies	-0.12	0.82	2.3
	Gaining new qualifications	0.14	0.74	2.7

were asked about their opinion on the factors that drive the development of farms in the context of Poland's accession to the European Union. Having considered all factors, farm managers indicated¹ the direct pay-

tunities which are effectively seized by these holdings. Therefore, strong economic structures make the agriculture sector more resilient to major economic shocks.

¹ The assessment was based on a discrete scale of 1 to 5, with 1 being the lowest score (a highly important development factor),

and 5 being the highest score (a completely irrelevant factor of development).

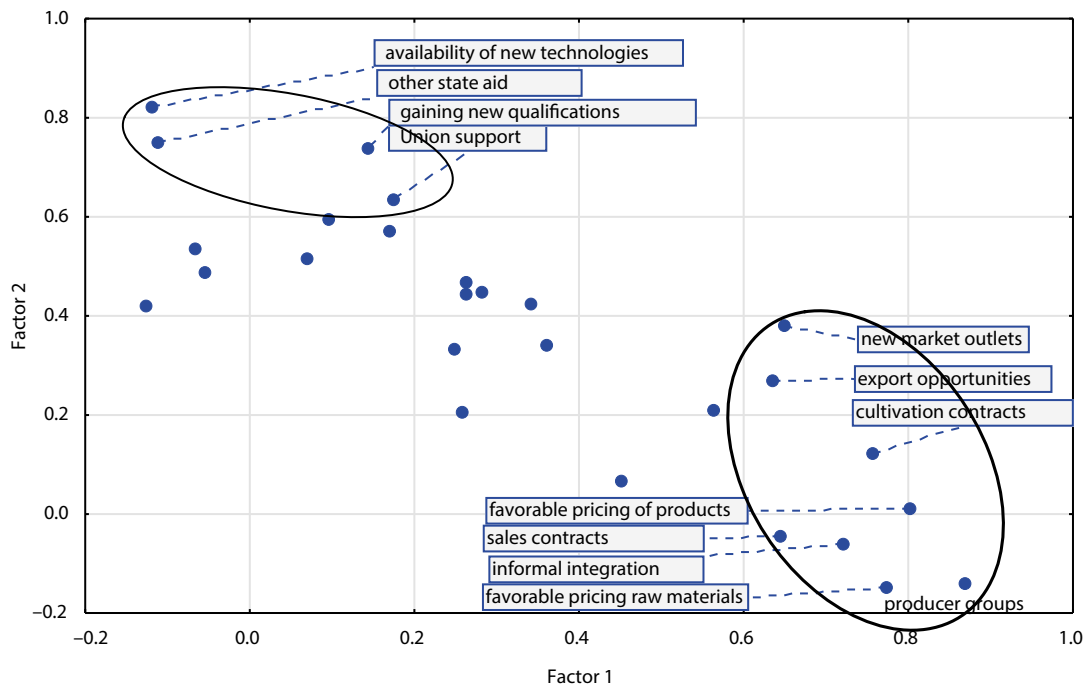


Fig. 2. Distribution of factors behind the development of farms after Poland's accession to the European Union
 Source: own elaboration based on survey data, $n = 35$.

The second group of factors are development opportunities related to the emergence of Union and national investment support and to the impact of such opportunities on the development of human capital. Managers of farms located in a region of intensive agriculture actively and effectively exploited the opportunities to implement investments co-financed with agricultural policy funds. Importantly, they also took advantage of the trainings and courses offered to help them acquire new knowledge and skills.

Data analysis also included checking the variation in opinions regarding impact of Poland's accession to the European Union on the change in farming conditions depending on the amount of investments in agricultural holdings (total investment expenditure in 2004–2017). As shown by statistical tests, a relationship exists between the ratings and the change in farm size (Fig. 3).

It follows from the above that farmers engaged in the most important development activities (i.e. those who extend the area of agricultural land) see the changes in institutional environment in a better light. These farms were not only able to expand their acreage but also proved to be effective in applying for investment support under

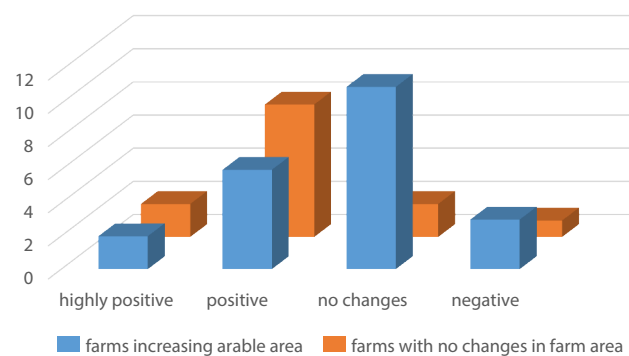


Fig. 3. Two-dimensional distribution*: change in farm size vs. impact of Poland's accession to the European Union on the change in equipment ($n = 35$)

*The statistical significance was confirmed with the Pearson's χ^2 test at $p = 0.0001$.

Source: own elaboration based on survey.

the second pillar of the CAP. For the most rapidly developing farms, the European integration created much more opportunities than threats and concerns. Although this research did not include comparing the farmers' opinions across the regions, it can reasonably be expected that the

development opportunities created for the agriculture sector through its inclusion in CAP mechanisms will result in an even faster, more dynamic development of regions which already are ahead in terms of development.

SUMMARY

The Southwest Functional Area is a region of a clearly agricultural nature, as reflected by the high share of agricultural land in total area. It also demonstrates higher levels of technical efficiency of production (e.g. cereal yields in the region are clearly higher than in Wielkopolska and Poland). Poland's accession to the European Union had a very positive impact on the region's development which is manifested by investment outcomes of the holdings surveyed and by the farmers' positive views on European integration. No one replied that Poland's accession to the European Union had a very negative impact on changes in access to machinery and equipment while only one interviewee found this impact to be negative. Farmers based in southern Wielkopolska effectively seized the opportunities created by CAP mechanisms. They accessed both direct payments and funds available under the second pillar to support their investments related to the purchase of tractors, machinery and agricultural equipment. The respondents are also willing to further develop their farms; they plan to invest both in farm modernization and in the construction or repair of livestock buildings. For the farmers, an important factor is the development of regional industry which provides them with an opportunity to find market outlets for raw materials. The positive processes taking place in the region with the most developed agriculture in Wielkopolska are both market changes (as regards pricing and the acceleration of integration processes) and the emergence of Union and national investment support schemes. The conclusion from this study is that the development opportunities created for the agriculture sector through its inclusion in CAP mechanisms are effectively exploited in the region of intensive agriculture located in Wielkopolska. Also, they provide momentum for an even faster and more dynamic development of the region which already is ahead in terms of development.

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ROLNICTWO NA POŁUDNIOWO-ZACHODNIM OBSZARZE FUNKcjONALNYM WOJEWÓDZTWA WIELKOPOLSKIEGO

Abstrakt. Jednym z ważniejszych działów gospodarczych województwa wielkopolskiego jest rolnictwo. Na tle całego kraju warunki przyrodnicze dla prowadzenia produkcji rolnej i zwierzęcej w tym regionie są przeciętne, nie odbiegając znacząco od sytuacji w całym kraju, to jednak kultura rolna, poziom intensywności i organizacji produkcji rolnej w Wielkopolsce jest wyższy. Na tle całego województwa szczególnie wyróżnia się wyodrębniony Południowo-Zachodni Obszar Funkcjonalny. W celu oceny wpływu integracji z UE na rozwój rolnictwa przeprowadzono badania ankietowe wśród wybranych gospodarstw rolnych, które potwierdzają zaawansowanie procesów rozwojowych.

Słowa kluczowe: rozwój rolnictwa, Południowo-Zachodni Obszar Funkcjonalny województwa wielkopolskiego, intensywne rolnictwo, produkcja rolnicza