PRACE NAUKOWE UNIWERSYTETU EKONOMICZNEGO WE WROCŁAWIU
RESEARCH PAPERS OF WROCLAW UNIVERSITY OF ECONOMICS AND BUSINESS

2019, vol. 63, nr 10

ISSN 1899-3192
e-ISSN 2392-0041

Katarzyna Smędzik-Ambroży
Poznań University of Economics and Business
e-mail: katarzyna.smedzik-ambrozy@ue.poznan.pl
ORCID: 0000-0001-5228-2263

Marta Guth
Poznań University of Economics and Business
e-mail: marta.guth@ue.poznan.pl
ORCID: 0000-0001-9332-1193

COMMON AGRICULTURAL POLICY VERSUS ECONOMIC AND ENVIRONMENTAL SUSTAINABILITY OF AGRICULTURAL FARMS IN POLAND*

WSPÓLNA POLITYKA ROLNA A ZRÓWNOWAŻENIE EKONOMICZNE I ŚRODOWISKOWE GOSPODARSTW ROLNYCH W POLSCE

DOI: 10.15611/pn.2019.10.07
JEL Classification: E6, E02, Q01

Summary: The purpose of the article was to determine the impact of Common Agricultural Policy (CAP) instruments on the economic and environmental sustainability of farms in Poland in 2004-2014. For this purpose, a panel analysis was used based on farm accountancy data network. It has been shown that agri-environmental subsidies are an instrument that had a positive impact on the economic and environmental sustainability of farms in Poland. In addition, it has been proven that replacing subsidies for agricultural production with single area payments does not favor the increase in the sustainability of agriculture in Poland. In connection with this, agri-environmental subsidies are the most beneficial instrument in the pursuit of increasing the sustainability of agriculture in Poland. From this point of view their importance should be strengthened because they contribute to the implementation of the postulate of increasing the sustainability of the EU agriculture, which is the strategic goal of the European Union.

Keywords: agriculture in Poland, CAP, sustainable development, subsidies.

* The project was funded with the means of the National Science Centre allocated on the basis of the decision number DEC-2012/07/D/HS4/01601.

Streszczenie: Celem artykułu było określenie wpływu instrumentów wspólnej polityki rolnej UE (WPR) na zrównoważenie ekonomiczne i środowiskowe gospodarstw rolnych w Polsce. Zastosowano analizę panelową, bazując na danych rachunkowych gospodarstw rolnych FADN. Wykazano, że instrumentem, który korzystnie wpływa na zrównoważenie zarówno ekonomiczne, jak i środowiskowe gospodarstw rolnych w Polsce, są dopłaty rolno-środowiskowe. Poza tym dowiedziono, że zastępowanie dopłat do produkcji rolnej jednolitymi płatnościami obszarowymi nie wpływa korzystnie na wzrost zrównoważenia rolnictwa w Polsce. W związku z tym dopłaty rolno-środowiskowe stanowią instrument o największym korzystnym znaczeniu w dążeniu do zwiekszenia zrównoważenia rolnictwa w Polsce. Z tego punktu widzenia ich znaczenie należy wzmocnić, przyczyniają się bowiem do realizacji postulatu zwiększania zrównoważenia rolnictwa w UE, który jest celem strategicznym tego ugrupowania.

Słowa kluczowe: rolnictwa w Polsce, WPR, zrównoważony rozwój, subsydia.

1. Introduction

Business entities as well as people adapt their activities to policy by using all the benefits of it [Rodríguez-Morillaa, Díaz-Salazarba, Cardenetec 2007]. The above statement may show the possibility of using policy as a stimulator of sustainable development [Gołębiewska, Pajewski 2015]. This is also the objective of the EU's common agricultural policy, which ultimately is devoted to lead to the sustainable development of the agricultural sector in Europe. For example, according to J. Wilkin: "sustainable development can only be achieved through an appropriate combination of public policy (national and EU) with regulated market mechanisms" [Wilkin 2011]. In turn, according to J.S. Zegar: "The European Agriculture Model (EMR) sets the direction for the development of EU agriculture through CAP solutions such as the principle of cross-compliance, greening, animal welfare, Rural Development Program (RDP) including agri-environmental program" [Zegar 2014; Smędzik-Ambroży 2018; Dudu, Kristkova 2017]. Sustainable development is a concept that assumes a close relationship between economic growth and the natural environment. The definition of sustainable development covers a number of areas and emphasizes the idea of sustainability of environmental protection, economic and social development within the limits of available global natural resources [Bartelmus 1999]. Already in 1997, sustainable development became a fundamental challenge for the EU and was included in the Amsterdam Treaty as the overarching goal of EU policy [Smędzik-Ambroży 2018, s. 55].

2. The importance of agriculture for sustainable development

The importance of agriculture for the sustainable development of rural areas is key [Góral, Rembisz 2017]. Defining sustainable agriculture takes place through the prism of three basic orders: environmental, economic and social [Majewski 2008;

Stępień, Smędzik-Ambroży, Guth 2017; Stępień, Guth, Smędzik-Ambroży 2018]. In defining the first of them, the importance of implementing agricultural production that would not threaten, but even enable the natural environment to be preserved, is emphasized. The most important issue here is the agricultural sector's ability to provide public goods, such as protecting the rural landscape or ensuring the welfare of plants and animals [Adamowicz 2015; Czyżewski, Czyżewski 2015; Gołębiewska 2012; Hulse 2007]. In turn, economically sustainable agriculture aims to generate agricultural income ensuring a fair standard of living for the farmer and his family, enabling the development of the farm [Zegar 2005; Czyżewski, Smędzik-Ambroży 2017]. In contrast, social indicators refer to such issues as: the use of agricultural labor resources, the contribution of agriculture to maintaining and developing the economic and social viability of rural areas, the share of employed in agriculture in the total labor, working in agriculture per 100 ha, unemployment rate, labor productivity [Matuszczak 2013]. Indicators of the level of social sustainability indicate difficulties in maintaining the separation of environmental and economic orders from the social order. One could even say that environmental and economic sustainability affect the social dimension of farm sustainability, in the way that the higher the level of economic and environmental sustainability of a farm, the higher its sustainability in social order.

Therefore, the main purpose of the research is to determine the impact of individual instruments of the common agricultural policy on the economic and environmental sustainability of farms in Poland in 2004-2014. Determining the extent to which individual CAP instruments have influenced the economic sustainability of Polish agriculture in the long term (2004-2014) and determining the direction of these changes is the added value of research.

The criteria for determining the impact of individual farms on the quality of natural capital include:

- share of cereals in the crop structure,
- number of crop groups,
- index of arable land coverage with vegetation during the winter,
- livestock density in large units (LU) per ha of utilized agricultural land (UAA),
- soil organic matter management.

The greater the number of these criteria farms meets, the more environmentally sustainable it is [Zegar 2014a; Wrzaszcz 2012b, Majewski 2008; Kuś, Kopiński 2011]. In the terms of economic order, agricultural income is used as a synthetic measure of farm sustainability. At least the parity ratio of agricultural income per one employee to the average wage per one person in the national economy is desirable [Wrzaszcz 2012a; Matuszczak, Smędzik-Ambroży 2013]. This is a microeconomic approach, in which the sustainability of agriculture is determined on the basis of data on farms in Poland. This approach was used in the article.

3. Material and methods of the research

The analysis was carried out based on standard financial and accounting data from representative FAND farms from individual voivodships in Poland in 2004-2014 (they represented, depending on the year, from 725 570 to 738 170 Polish farms [EUFADN 2019]. That is about 50% all farms in Poland. The analysis covered the years 2004-2014 due to the need to include the entire CAP financial perspectives in the study. Only this approach can first determine the impact of the CAP on the sustainability of agriculture in the long term. Secondly, it eliminates the risk of not showing the impact of a given CAP instrument on the sustainable development of agriculture, due to the omission in the analysis of the years in which farmers received financial support from this instrument. It is also not a rule that in each year of a given financial perspective, financial support under a given CAP instrument is paid to farmers [ARMA 2019]. Therefore, the analysis covered the CAP financial perspectives 2004-2006 and 2007-2013. The research scope was extended by one year because the funds from the Rural Development Program (RDP) 2007-2013 were also paid to farmers in 2014. This year, according to the report of the Agency for Restructuring and Modernization of Agriculture (ARMA), the amount of financial transfers for farmers under all instruments RDP support for 2007-2013 amounted to as much as PLN 9.7 billion [ARMA 2019]. Because the research used the financial and accounting data of representative farms, these transfers were visible in them. At the same time, there was no threat of overlapping CAP funds paid under both the RDP 2007-2013 financial perspective and 2014-2020 because in 2014 only the value of liabilities from the new RDP financial perspective (PLN 0.7 billion) was specified in the ARMA budget [ARMA 2019]. In 2014, no funds were paid to farmers from this time perspective. It is also worth adding here that the research did not take into account subsequent years due to the unfinished nature of the CAP 2014-2020 financial perspective at the time of preparing the study.

Panel analysis was used to determine the direction and strength of the impact of individual CAP instruments on the economic and environmental sustainability of these farms. In relation to the models used to assess the impact of individual CAP instruments on the economic sustainability of agricultural holdings, the ratio of farm income in relation to the average gross remuneration in a given voivodship was adopted as the dependent variable. In the case of models used to assess the impact of individual CAP instruments on the environmental sustainability of farms, the dependent variable was the arithmetic average value determining the fulfillment number of criteria of environmental sustainability for production by the analyzed farm. The criteria for determining the sustainability of the analyzed farms in environmental order were:

- share of cereals in the crop structure,
- number of crop groups,
- livestock density in large units (LU) per ha of UAA.

In the group of the above criteria, there were no criteria related to the management of soil organic matter and soil coverage by vegetation during the winter, because basing on the FADN data that was used in the article, it is impossible to obtain information on this topic. Therefore, three criteria of farm environmental sustainability were used in the research. The first two of them are stimulants of farm sustainability in environmental order. In turn, livestock density in large units (LU) per ha of UAA is a destimulant of farm sustainability in environmental order. According to the assumptions presented above, the higher the value of independent variables in both models, the higher the level of economic and environmental sustainability of the analyzed farms.

The independent variables, both in the case of the model determining the impact of CAP instruments in 2004-2014 on farm sustainability in economic and environmental order, were the values of funds from individual CAP instruments per 100 ha of UAA of a given farm. Therefore, these were the values of: production subsidies [PS], single area payments [SAP], other subsidies for rural development [OSRD], agri-environmental subsidies [AES], subsidies for investment [IS], less favoured areas payments [LFA]. The estimated models for sustainability in economic and environmental order were thus:

$$Y = b_0 + b_1 PSt + b_2 SAPt + b_3 OSRDt + b_4 AESt + b_5 ISt + b_6 LFAt.$$

The collinearity of variables was assessed on the basis of variances of inflation (VIF). Since none of the variables exceeded the critical value VIF = 10 [Kufel 2011, p. 65], inference was made based on estimated models. The Doornik-Hansen (1994) chi^2 test was used to assess the compatibility of the residue distribution with the normal distribution. Stepwise respect was made backwards until all the independent variables left behind in the model were significant. The problem of heteroskedasticity caused the resignation from the estimation by classical panel methods for fixed and random effects and carrying out the weighted least squares estimation. Due to small samples to eliminate the problem of heteroskedasticity, the so-called robust errors could not have been used (for more, see e.g. [Stawiński 2017; Maddala 2013]). The number of observations was 176, which resulted from the number of voivodships (16) and the time range of analyzes (11 years).

Statistically significant parameters of the function of the independent variables allowed to conclude on the impact of a given CAP instrument on the economic and environmental sustainability of representative FADN farms in 2004-2014.

4. Research results

The results of the analysis showed the beneficial effect of subsidies for agricultural production on the economic sustainability of FADN farms in 2004-2014. However, the impact of these payments on the environmental sustainability of agriculture in Poland has not been determined. In terms of particular CAP instruments, an adverse

impact of the value of single area payments per 100 ha of UAA of agricultural holdings on the environmental sustainability of FADN agricultural holdings in 2004--2014 was indicated. In turn, in the examined period, the impact of these values on the economic sustainability of farms in Poland was not statistically significant. This contradicts the view that replacing production subsidies with these payments reduces the adverse impact of agricultural production on the natural environment of rural areas. This is due to the adverse impact of single area payments per 100 ha of UAA on the environmental sustainability of farms in Poland, and at the same time the lack of this impact on the environmental order of sustainability in the case of subsidies for agricultural production per 100 ha of UAA (see Table 1).

In our research, we have not shown the impact of single area payments on the economic sustainability of Polish agriculture. In turn, in the studies by Stępień, Smędzik-Ambroży and Guth [2017], these authors stated that an increase in the single area payment by 1% in Polish farms leads to an increase in farm income per full-time employee from a family by 0,13%. The differences between the results of these studies and the results of other studies resulted from the fact of various

Table 1. Impact of individual CAP instruments on economic and environmental sustainability of representative FADN farms in 2004-2014 − results of panel model estimation*

Variable	Economic sustainability	Environmental sustainability
PS (production subsidies per 100 ha UAA)	0.000575*** (0.0002)	
SAP (single area payments per 100 ha UAA)		−1.73616exp(-6)** (8.6518exp(-7))
OSRD (other subsidies for rural development per 100 ha UAA)	−0.007597*** (0.0010)	3.88702exp(-5)*** ($5.9944^{exp(6)}$)
AES (agri-environmental subsidies per 100 ha UAA)	0.002910*** (0.0006)	1.33171exp(-5)*** (3.1438exp(-6))
IS (subsidies for invesment per 100 ha UAA)	−0.001513*** (0.0004)	
LFA (less favoured areas payments per 100 ha UAA)	−0.000943** (0.0004)	6.1409exp(-6)** (2.8220exp (-6))
Constant	122.060*** (5.8502)	1.3369 (0.0335)
F statistic	15.31722 $p < 0.00$	20.3799 $p < 0.00$
coefficient of determination R^2	0.32	0.33

* Standard errors of parameters are given in brackets, *** means significance at the level of $p < 0.01$; ** means significance at the level of $p < 0.05$; * indicates significance at $p < 0.10$; no value in the cell means that the variable was not significant.

Source: own calculations based on FADN data.

dependent variables adopted in the models. In the case of these surveys, it was the relation of farm income to the average gross salary in a given voivodship, and previous surveys Stępień, Smędzik-Ambroży and Guth were family farm income. In addition, Stępień, Smędzik-Ambroży and Guth in another article covering individual EU countries in 2005-2015 stated that: thanks to CAP subsidies, average farm incomes in individual EU countries were approaching the values of average incomes in national economies. Earlier this was confirmed by the results of the research of Baer-Nawrocka [2013] and Drygas [2010]. It had a positive impact on the economic sustainability of agriculture in the EU, which certainly also concerned Poland, although it was not shown in these studies.

A positive impact on both the economic and environmental sustainability of FADN farms in Poland in 2004-2014 was demonstrated in the case of agri--environmental payments. This confirms the positive impact of the activities financed from these programs on the natural capital of rural areas, as well as the economic situation of agriculture in Poland after 2004. In connection with this, it can be said that agri-environmental payments limit both the income disparity of agriculture in relation to other sectors of the national economy, and affect its environmental sustainability. From the point of view of the EU's aim of sustainable agriculture, this is an optimal state. A positive impact on the sustainability of agriculture in environmental order was also obtained in the case of the value of payments to LFA areas. In relation to the economic sustainability of farms in Poland in 2004-2014, the impact of these payments was negative. These dependencies are not surprising because the more LFA areas in a given geographical area, the less favorable conditions for agricultural production. At the same time, it implies a relatively worse economic results of the agricultural sector and translates into a less favorable economic situation of farmers from these regions compared to farms from other areas.

At this point, the results of the study Stępień, Smędzik-Ambroży and Guth [2017] should be recalled, in which it was noted that the smallest significance for explaining net income from a farm per one full-time member of the family had the subsidies to public goods which included: agri-environmental subsidies, less favoured area payments, for organic farms and for afforestation. In this study, we examined separately the impact of financial support from agri-environmental programs and LFA areas on the sustainable development of agriculture in Poland. Due to this procedure, we can say that the lowest significance of explaining net income from an agricultural holding per full-time employee from the family resulted from the positive impact of activities financed from agri-environmental programs and the adverse impact of payments to LFA areas on the economic situation of agriculture in Poland.

Adverse impact on the economic sustainability of farms in Poland in 2004-2014 was also obtained in the case of the value of other payments for rural development per 100 UAA and subsidies for investments in agricultural farms per 100 of UAA. It can be assumed that the results of the analyzes revealed the phenomenon of financ-

ing investments from external capital, which reduces the income of the farm, and thus the level of its sustainability in the economic order, to the debt repayment. After paying off the debt, investments have a positive impact on the profitability of agricultural activities. On this basis, it should be said that in the years 2004-2014 the analyzed farms were at the stage of financing investments and paying off loans, which reduced their profitability and economic sustainability. This is evidenced by the negative parameters of the impact of the value of subsidies for investment per 100 ha on economic sustainability in the economic sustainability model (see Table 1).

5. Conclusions

The article showed that CAP instruments contributed to the sustainable development of agriculture in Poland after 2004 in both environmental and economic order. Therefore, they influenced the economic situation of agriculture in relation to other sectors as well as the natural capital of rural areas. In 2004-2014, the strength and direction of the impact of these instruments on the economic and environmental sustainability of farms in Poland differed. This is evidenced by the experience of FADN farms in Poland. In the analyzed period, agri-environmental subsidies had a positive effect on the economic and environmental sustainability of Polish farms, which is why the importance of this CAP instrument in striving for sustainable development of agriculture in Poland is the greatest. It has also been proven that replacing subsidies for agricultural production with single area payments does not increase the sustainability of farms in Poland, and even decrease their environmental sustainability. The lack impact of the single area payments (SAP) on the economic situation of agriculture in Poland is interesting, because contradicts the general view that these payments have a significant impact on the sustainable development of agricultural sector. This view is also contradicted by the negative impact of single area payment to environmental sustainability of farms in Poland, which was shown in research. It was also shown that FADN farms from Poland financed investments with foreign capital in 2004-2014.

Bibliography

Adamowicz M., 2015, *Wspólna Polityka Rolna wobec rodzinnych gospodarstw rolnych stanowiących podstawę europejskiego modelu rolnictwa*, [in:] A. Chlebicka (ed.), *Ekonomiczne mechanizmy wspierania i ochrony rolnictwa rodzinnego w Polsce i innych państwach Unii Europejskiej*, MRiRW, FAPA, Warszawa.

ARMA, 2019, https://www.arimr.gov.pl/fileadmin/pliki/zdjecia_strony/223/Sprawozdanie_ARiMR__2014.pdf (25.07.2019).

Baer-Nawrocka A., 2013, *Wpływ wspólnej polityki rolnej na efekty dochodowe w rolnictwie nowych krajów członkowskich*, Scientific Yearbooks of SGGW in Warsaw: European Policies, Finance and Marketing, vol. 9(58), no. 36.

Bartelmus P., 1999, *Greening the national accounts − approach and policy use*, DESA, Discussion Paper, no. 3.

Czyżewski A., Czyżewski B., 2015, *Ziemia i jej renty w nowym paradygmacie rozwoju rolnictwa*, [in:] A. Czyżewski, B. Klepacki (eds.), *Problemy rozwoju rolnictwa i gospodarki żywnościowej w pierwszej dekadzie członkostwa Polski w Unii Europejskiej*, PWE, Warszawa.

Czyżewski B., Smędzik-Ambroży K., 2017, *The regional structure of the CAP subsidies and the factor productivity in agriculture in the EU 28*, Agricultural Economics – Czech 63, p. 149-163. DOI: 3001.0012.2937.

Drygas M., 2010, *Wpływ dopłat bezpośrednich w ramach Wspólnej Polityki Rolnej 2004-2006 i 2007--2013 na przekształcanie obszarów wiejskich w województwie pomorskim*, IRWiR PAN, Warszawa.

Dudu H., Kristkova, S.Z., 2017, *Impact of CAP Pillar II Payments on Agricultural Productivity*, JRC106591, Publications Office of the European Union, Luxembourg, DOI:10.2760/802100.

EUFADN, 2019, https://ec.europa.eu/agriculture/rica/database/report_en.cfm?dwh=SO, (15.06.2019).

Gołębiewska B., 2012, *Ekonomiczne i środowiskowe cele produkcji rolniczej w gospodarstwach o zróżnicowanych powiązaniach z otoczeniem*, Scientific Yearbooks of SERiA, vol. XIV, no. 5.

Gołębiewska B., Pajewski T. (2015). *Odpowiedzialność rolników za stan środowiska naturalnego*, Scientific Yearbooks of SERiA, vol. XVII, no. 2.

Góral J., Rembisz W., 2017, *Produkcja w rolnictwie w kontekście ochrony środowiska*, Wieś i Rolnictwo, vol. 104, no. 1.

Hulse J.H., 2007, *Sustainable Development at Risk: Ignoring the Past*, Cambridge University Press India Pvt. Ltd., Kundli.

Kufel T., 2011, *Ekonometria. Rozwiązywanie problemów z wykorzystaniem programu GRETL*, PWN, Warszawa.

Kuś J., Kopiński J., 2011, *Gospodarowanie glebową materią organiczną w kontekście zmian zachodzących w polskim rolnictwie*, [in:] J.S. Zegar (ed.), *Z badań nad rolnictwem społecznie zrównoważonym*, no. 11, IERiGŻ, Warszawa.

Maddala G.S., 2013 *Ekonometria*, PWN, Warszawa.

Majewski E., 2008, *Trwały rozwój i trwałe rolnictwo – teoria i praktyka gospodarstw rolniczych*, SGGW, Warszawa.

Matuszczak A., 2013, *Wskaźniki zrównoważonego rozwoju rolnictwa: przesłanki teoretyczne i propozycja pomiaru w regionach UE*, Wieś i Rolnictwo, no. 1(158).

Matuszczak A., Smędzik-Ambroży K., 2013, *Próba ocen współzależności pomiędzy zrównoważeniem środowiskowym a wynikami ekonomicznymi gospodarstw rolnych na przykładzie regionu Wielkopolska i Śląsk*, [in:] J.S. Zegar (ed.), *Z badań nad rolnictwem społecznie zrównoważonym*, no. 19. IERiGŻ, Warszawa.

Rodríguez-Morillaa C., Díaz-Salazarb G.L., Cardenetec A.M., 2007, *Economic and environmental efficiency using a social accounting matrix*, Ecological Economics, no. 60.

Smędzik-Ambroży K., 2018, *Zasoby a zrównoważony rozwój rolnictwa w Polsce po akcesji do Unii Europejskiej*, PWN, Warszawa.

Stawiński P., 2017, *Asymptotyka i statystyczne podstawy regresji,* coin.wne.uw.edu.pl/pstrawinski/notatki/asymptotyka.pdf (10.12.2017).

Stępień S., Guth M., Smędzik-Ambroży K., 2018, *Rola Wspólnej Polityki Rolnej w kreowaniu dochodów gospodarstw rolnych w Unii Europejskiej w kontekście zrównoważenia ekonomiczno-społecznego*, Scientific Yearbooks of SGGW, Problems of World Agriculture, vol. 18, no. 3.

Stępień S., Smędzik-Ambroży K., Guth M., 2017, *Oddziaływanie Wspólnej Polityki Rolnej na zrównoważenie ekonomiczno-społeczne gospodarstw rolnych na przykładzie Polski*, Wieś i Rolnictwo, no. 4 (177).

Wilkin J., 2011, *Wielofunkcyjność wsi i rolnictwa a rozwój zrównoważony*, Wieś i Rolnictwo, no. 4 (153).

Wrzaszcz W., 2012a, *Czynniki kształtujące zrównoważenie gospodarstw rolnych*, Journal of Agribusiness and Rural Development, no. 2(24).

Wrzaszcz W., 2012b, *Poziom zrównoważenia indywidualnych gospodarstw rolnych w Polsce*, IERiGŻ, Warszawa.

Zegar J.S, 2014a, *Z badań nad rolnictwem społecznie zrównoważonym (27). Alternatywne formy rolnictwa w strategii rozwoju sektora rolno-żywnościowego i obszarów wiejskich (Synteza)*, IERiG, Warszawa.

Zegar J.S., 2014b, *Zrównoważony rozwój rolnictwa w świetle paradygmatu konkurencyjności*, IERiGZ, Warszawa.

Zegar J.S., 2005, *Koncepcja badań nad rolnictwem społecznie zrównoważonym*, no. 11, IERiGZ, Warszawa.