CONFERENCE PAPER

DOI: 10.5836/ijam/2016-05-25

Impact of the 2014-2020 CAP reform on the economic performance of Polish farms

EDWARD MAJEWSKI[1], ADAM WĄS[1,*] and STEFANIA CZEKAJ[1]

ABSTRACT

This paper deals with potential impacts of the recent CAP reform on crop production structure and economic results of Polish farms in the perspective of the year 2020. The focus of the assessment was on the 'greening' component, which is the key element of the reformed policy. The assessment was made with the use of static farm optimization model. Model results show that the reformed CAP on average will have a positive impact on farm incomes. A decrease in farm income can be seen, however, in certain types of farms that require major adaptations in order to fulfil the greening criteria, mainly establishing 5% of the Ecological Focus Area. Some changes in the cropping structure may be expected because of greening, mainly slight reduction of the share of cereals and a greater area of legume crops.

1. Introduction

Since its establishment, the Common Agricultural Policy (CAP) has undergone successive reforms. One of the most important changes in the history of the CAP was de-coupling (EC 2011a) that shifted support from product to producer by assigning a payment to the area of agricultural land in order to eliminate distortions in international trade in agricultural commodities. The most recent CAP reform, shaping agricultural policy of the EU for the period 2014-2020 introduced the 'greening' concept which, although not expressly stated, was legitimization of financial support for agriculture and response to public expectations within the EU.

In the original proposal of the European Commission of November 2011(EC 2011b) the 'greening' requirements for all farms with more than 3 hectares of arable area (AA) were presented:

- minimum three crops in rotation (one crop maximum 70% share, 5% minimum share of the AA);
- maintaining at least 95% of permanent grassland,
- designating 7% of AA for ecological focus areas (EFA).

Considering those criteria 88% of Polish commercial farms[2] met the crop diversification criterion. Majority, 74% of farms had adequately diversified crops structure, but without the required EFA.

In the final version of the reformed policy the original 'greening' proposal was significantly modified (EU Parliament 2013). Farms having less than 10 ha of AA and all ecological farms have been exempted from the 'greening'. For farms below 30 ha only 2 crops were required (max. share of 75%). Farms below 15 ha of arable land have been released from establishing EFA. The minimum EFA for larger farms has been set as 5% of AA. Additionally a set of practices equivalent to EFA has been introduced. For example, in Poland 1 ha of nitrogen fixing crops substitutes 0,7 ha of EFA. Taking into account final regulation 57% of Polish farms will be exempted form new obligations, 23% fulfil the criteria, in 18% some EFA deficits could be observed and 2% do not meet crop diversification criterion.

The 'greening' concept has been criticized by numerous authors (Pe'er, 2014). They point out that the majority of EU farmers work on farms smaller than 10 hectares, so they will be exempt from the greening. Therefore 'greening' will not have a positive impact on the environment or biodiversity protection, which were original objectives of this concept. Ciaian *et al.* (2013) state that 'greening' will cause an increase in costs, thus reducing farm incomes. The authors point out that in fact the impact of the CAP 'greening' can vary greatly due to the existing diversity in the structure of production, specialization, geographical location and technology of production in agricultural holdings. Some researchers predict that the 'greening' will result in increases of prices of agricultural commodities. This would compensate additional costs of adaptation to the new requirements (DEFRA 2013).

The objective of this paper is to assess impacts of the recent CAP reform on crop production structure and economic results of Polish farms in the perspective of the year 2020.

2. Research Methodology

In order to determine the impact of the final form of the CAP 'greening' the baseline scenario and two scenarios for reformed agricultural policy have been developed.

*Corresponding author. Adam Was, Warsaw University of Life Sciences, Warsaw 166th, Nowoursynowka Street, Poland. adam_was@sggw.pl

[1]Warsaw University of Life Sciences SGGW.

[2] Based on Farm Accountancy Data Network (FADN) criteria for year 2009, Standard Gross Margin higher than 2400 EUR/farm/year

To assess production and economic impacts of their potential implementation non-linear optimization model was applied. The results obtained by the modelled farms were aggregated in order to determine the impact of the agricultural policy scenarios on economic results obtained in the different types of farms and FADN regions.

The Farm-Opty optimization model with non-linear cost function using the Positive Mathematical Programming method (Howitt R.E. 1995) was used. The model is based on the assumption that farmers maximize farm income, as it is shown in the following equation:

$$\underset{x_i \geq 0}{DR} = \mathrm{p}^T(\mathrm{x} \bullet \mathrm{y}) + \mathrm{s}^T\mathrm{x} + fs - fc - \mathrm{d}^{\mathrm{T}}\mathrm{x} - \mathrm{x}^{\mathrm{T}}\mathrm{Qx}$$

provided that $Ax \leqslant B$

where:

DR – agricultural income,
p – products prices,
y – yield and productivity,
x – levels of production activities,
s – payments for production activities,
fc – relatively fixed costs,
fs – value of the payments,
A – resource utilization coefficients,
B – available resources,
d^Tx-x^TQx *– non-linear element determined in the model calibration.*

This model builds on the classical linear optimization problem used in farm models (Was, 2005). Introduction of PMP limited number of data required and solve over-simplification of LP models solutions. In order to verify the requirement of crop diversification in each type of farm Shannon-Weiner's index was used (Shannon, 1948).

Scenarios considered

A. Base_2012 and Baseline_2020

The scenarios assume a continuation of the current CAP. The BASE_2012 scenario was used only to calibrate the models, whilst baseline is a point of reference for other scenarios. The BASELINE_2020 scenario assumes that the existing in 2014 CAP mechanisms will remain unchanged.

B. Green_2020

In this scenario the requirements arising from the CAP 'greening' are implemented, entitling farmers to direct payments amounting EUR 184 per hectare.

Additional, newly introduced payments (MARD 2014) are also modelled:

- for young farmers - 62 EUR/ha for first 50 hectares.
- for farmers owning 3.01-30 hectares receive additional 41 EUR/ha.
- related to production:
  - for cattle for farmers having at least 3 bovine animals aged up to 24 months up to the 30th one - 70 EUR/head,
  - for cows – like the above,
  - for sheep and goats 25 and 15 EUR/head respectively,
  - for soft fruit – to strawberries and raspberries – up to 250 EUR/ha.
  - for protein crops –grown as the main crop up to 326 EUR/ha (digressive from 75 ha).

C. No_Green_2020

The scenario implies giving up 30% of direct payments, by farms non-adapted to greening requirements (EUR 74/ha). Farms exempted from 'greening' and fulfilling all the requirements would receive direct payments, and other support equal to those assumed in the GREEN_2020 scenario.

Both Green Scenarios assume that inclusion of the 'greening' component will result in decrease in funding of agri-environmental activities under the 2nd pillar, from EUR 2.304 billion provided for in RDP 2007-2013 to EUR 1.060 billion provided for in RDP 2014-2020. Thus the existing agri-environmental payments will be reduced also by 46% per average farm which will be the subject of modelling. LFA[3] payments were assumed in all the scenarios under consideration at the level used to date.

3. Research Sample

Polish FADN[4] was the main source of data. The 2012 data were used to develop a typology and prepare parameters for farm models. The data set consists of 10,909 research objects (individual farms). The entire population of farms was divided into production types according to Community typology of agricultural holdings of 2009. The population of the FADN (farms represented by the FADN sample) includes 735.5 thousand farms, which accounts for 50% of all farms in Poland. The farms covered by the FADN system produce about 90% of the total value of output in the agricultural sector, and have 81% share in the total agricultural area in Poland.

Typology of farms

The farms for modelling were identified based on the following three criteria:

- area of agricultural land,
- production type (field crops, cattle, pig, mixed, other),
- degree of adaptation to the 'greening' requirements.

According to the key criterion - degree of adaptation to the 'greening' requirements the following farm types were distinguished:

- Exempted from 'greening' – <10 ha AA and organic,
- 'Green' – meeting all requirements,
- No diversification – failing to meet the crop diversification requirement,
- No EFA – having insufficient EFA
- No EFA and diversification – failing to meet both above requirements.

The results obtained after application of these criteria are shown both as a whole (for the entire FADN population), and taking into account the individual FADN regions (Figure 1).

The structure of farms belonging to the FADN population, determined based on the adopted typology is shown in Table 1.

[3] Less Favoured Areas

[4] Farm Accountancy Data Network – the EU system of gathering accountancy data from the sample of farms in EU; http://ec.europa.eu/agriculture/rica/

Figure 1: FADN regions

The majority of Polish farms fulfil the crop diversification criteria. Non-compliance with the 'greening' requirements applies to 20% of the farms from the population represented by FADN, with insufficient EFA being the major reason. The percentage of non-adapted farms is different among regions. The greatest numbers of non-adapted farms are to be found in the regions characterized by the largest average area of farms. In areas where farms are relatively small, there is the largest proportion of farms exempt from the 'greening' requirements. The least adapted to the 'greening' are farms specialized in field crops and pig farms.

As many as 229 farm types were ultimately designated to be modelled taking into account their geographical location, the criterion of production scale and production type, as well as their adaptation to the 'greening' requirements.

4. Results

The implementation of the 'greening' requirements in model farms has a noticeable impact on transformations in the cropping and crop production structure (Table 2).

Transformations in the crop structure result from the restrictions on the number and share of crops and the need to withdraw from production some arable land to create the required are of the EFA. However, the possibility of applying practices equivalent to EFA mitigates an impact of the CAP 'greening' on the crop structure. In the GREEN_2020 scenario the shares of all main crops are decreased, affecting mostly cereals, reduced by 2 percentage points.

The share of legumes is increased in the model solutions for both 'green' scenarios due to the introduction of an EFA equivalent which provides for recognizing 70% of the area on which legumes are cultivated as EFA. In the NO_GREEN_2020 scenario, although there is no need to establish EFA the increase in the area under legumes results from subsidies for its production. Relative changes in farm incomes presented in table 3 are average values for farm types modelled after aggregating model results.

The results of model solutions account for the combined impact of the three major innovations in the set of mechanisms provided for in the reformed CAP – 10% increase in the Polish direct payments envelope compared to the previous financial EU budgetary framework, 'greening' and additional payments for small and medium-sized farms, including subsidies for livestock production.

An average Polish farm would benefit under the GREEN_2020 scenario due to the implementation of the CAP reform by nearly 5% relative to the BASELINE_2020 scenario. Incorporating the 'greening' mechanism in the system of direct payments in Poland has a small impact on agricultural income, which is due mainly to the fact that a significant proportion of farms are exempt from the 'greening' requirements or satisfy them sufficiently. The farm income of farms which need adjustments is slightly decreased, on average inefficient those farms that have no sufficient EFA or do not meet both, the EFA and diversification criteria.

Model results show some differences across the various farm types. In geographical terms the undoubted beneficiaries of the reformed CAP are farmers from the regions of Mazovia and Podlasie, as well as those from

Table 1: Structure of farms represented in the FADN population [%]

	Exempted	'Green'	No EFA	No diversification	No EFA and diversification
Poland	57	23	18	1	1
By FADN region					
Pomerania and Masuria	44	27	26	1	2
Greater Poland and Silesia	42	25	29	1	3
Mazovia and Podlasie	58	24	16	1	1
Lesser Poland and Pogórze	80	14	6	0	0
By production type					
Field crops	36	30	30	1	3
Cattle	61	20	18	0	1
Pig	36	24	33	2	5
Mixed	59	23	16	1	1
Other	93	3	2	1	1
POLAND	57	23	18	1	1

Source: The authors' compilation based on FADN data.

Table 2: Changes in the crop structure in the model solutions within the ''greening'' scenarios

Item	BASELINE_2020		GREEN_2020		NO_GREEN_2020	
	Area [ha]	[%]	Area [ha]	[%]	Area [ha]	[%]
TOTAL						
Wheat	2.26	16.4	2.21	16.0	2.25	16.2
Other cereals	7.96	57.5	7.69	55.9	7.90	56.9
Cereals-total	10.23	73.9	9.89	71.9	10.15	73.1
Legumes	0.39	2.8	0.61	4.4	0.58	4.2
Rape	0.72	5.2	0.69	5.0	0.71	5.1
Other crops	2.14	15.5	2.04	14.8	2.13	15.4
EFA	0.37	2.7	0.52	3.8	0.31	2.2
Total	13.84	100	13.75	100	13.88	100

Source: The authors' compilation.

Lesser Poland and Pogórze, in which small farms dominate. The majority of farms in these regions are exempted from the greening restrictions and at the same time they benefit from the newly introduced additional payments, that are in favour of small farms.

Analysis of the impact of the reformed CAP on the various farm types leads to the conclusion that cattle and mixed farms benefit most from the new CAP. This is largely due to the high level of conforming to the 'greening' requirements and the introduction of subsidies for cattle production. In the other farm types, the reform of the CAP has nearly no influence on incomes.

Farm incomes of small farms up to 15 hectares of arable land will increase by about 8% in relation to the BASELINE_2020 scenario and large farms will be affected by the consequences of the reforms. Farm incomes in farm size clusters of 15-30 hectares and more than 30 hectares decrease by 1,2% and 5,7% respectively.

Resigning from the 'green' portion of direct payment in the NO_GREEN_2020 scenario is not profitable for farmers. It is particularly disadvantageous for field crop farms and pig ones due to their relatively large average area and a high share of cereals.

Compared to the BASELINE_2020 scenario, the share of subsidies in farm income increases in all farm types under consideration, mainly due to the increased envelope of direct payment for Poland in the EU payments convergence process. The share of subsidies in income under GREEN_2020 scenario greater, compared to the BASELINE_2020, in all types of farms.

As expected, rejection of the adjustments and abandoning the 'green' portion of the payment under the NO_GREEN

Table 3: Changes in farm income and share of subsidies in farm income under considered scenarios

Farm types	Farm Income BASELINE_2020=100		Share of payments in Farm Income [%]		
	GREEN 2020	NO_GREEN 2020	BASELINE	GREEN 2020	NO_GREEN2020
Production type					
Field crops	100.6	94.8	44	46	41
Cattle	109.2	106.1	35	40	38
Pig	100.3	97.6	21	22	19
Mixed	106.6	102.2	51	55	52
Other	99.4	100.8	20	22	21
Farm area					
I<10 ha AA*	107.6	107.6	52	55	55
10 ha<II<15 ha AA	107.5	108.0	48	52	51
15 ha<III<30 ha AA	106.5	98.8	43	48	42
IV>30 ha AA	100.2	94.3	33	35	29
Adaptation to the ''greening'' requirements					
Exempted	107.0	107.0	55	57	57
Green	110.3	110.4	50	54	54
No EFA	95.0	97.4	33	36	28
No diversification	101.5	93.3	18	22	16
No EFA and diversification	97.8	92.1	31	34	25
Region					
Pomerania and Masuria	102.2	98.3	37	39	36
Greater Poland and Silesia	103.1	98.6	37	41	36
Mazovia and Podlasie	107.6	103.4	51	55	52
Lesser Poland and Pogórze	104.1	102.1	39	42	40
POLAND	104.6	100.7	42	46	42

* AA – arable area.

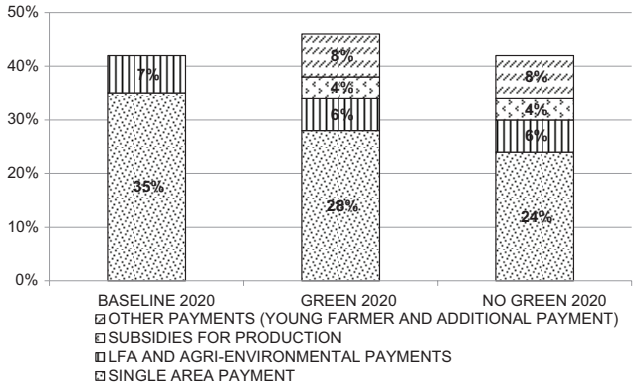

Figure 2: Share of subsidies in agricultural income
Source: The authors' compilation.

scenario results in a decreased share of subsidies in income. Rejection of adjustment to the 'greening' requirements results in a decrease in the share of subsidies below the level of 2012 mainly in field crop and cattle farms, as well as in the largest farms.

The reform of direct payments and the introduction of additional payments result not only in a change in the share of subsidies in income, but also in a change in the aid structure. Changes in the average share of the various types of payments in agricultural income are shown in Figure 2.

In the GREEN_2020 scenario reduction of the amounts of the Single Area Payment (SAPS), which is the basic component of the CAP financial support for farmers, does not result in a decrease in the average level of aid as the newly introduced subsidies for production offset the reduction. As a result, the average level of aid for farms under the GREEN 2020 scenario is higher than in the BASELINE_2020 scenario.

Reduction of the share of SAPs under the NO_GREEN_2020 scenario results from the introduction of sanctions on non-adapted farms. Limitation of funding for agri-environmental measures and the resulting decrease in agri-environmental payments by 46% has a relatively small impact on the aid structure due to a relatively low level of participation of farms in agri-environmental measures.

It should be noted that the presented structure of payments reflects changes taking place on the average farm, while the share of direct payments in income of larger farms (>30 ha) will be lower by approx. 10 pp. It needs to be emphasized that the presented results do not account for the largest, large-scale farms which are not subject to FADN observations. In the case of the aforementioned farms, the reformed CAP will have a negative impact on their financial performance, mainly due to the EFA requirement and modulation of direct payments.

5. Conclusions

Model calculations demonstrate that the final CAP 'greening' will not result in significant adverse changes in the productivity of land and economic performance of farms. Relaxation of the requirements by the European Commission in the final version of the reform means that 'greening' does not significantly affect farm incomes.

A more significant decrease in agricultural income can be seen, however, in certain types of farms (those characterized mainly by monoculture on good soils and those to which the EFA requirement applies). However, in certain types of farms (e.g. cattle ones, fully adapted ones) an increase in income by 2020 can even be noted due to a minor impact of the restrictions being introduced and the increasing level of aid under the newly introduced additional payments.

The introduction of additional payments for farms up to 30 hectares and payments to certain production types (cattle, sheep, goats, soft fruit) increases farm incomes of the smallest farms and on average reduces negative impacts of greening restrictions. The inclusion of leguminous crops and catch crops as EFA equivalents resulted in a further decrease in the percentage of Polish farms which require adjustments to the 'greened' CAP to 20%. By far the largest group of farms classified as non-adapted ones have insufficient EFA. In almost all types of non-adapted farms, the introduction of changes leading to compliance with the 'greening' requirements is for farmers a more favourable alternative than abandoning 30% of the direct payment rate.

In conclusion, the CAP 'greening' will not have a significant impact on the volume of production and incomes in the agricultural sector in Poland. Adverse effects of the regulations may occur in a small number of non-adapted farms. At the same time, it should be noted that, given a high percentage of farms exempt from the 'greening' requirement, or those already adapted, the reform will not contribute to the achievement of environmental effects.

About the authors

Adam Was (Ph.D.) is an Assistant professor at the Faculty of Economic Sciences of the Warsaw University of Life Sciences (SGGW), agricultural economist. His main research areas are as follows: modelling impacts of agricultural policy changes on the farming sector and the environment, structural changes in agriculture. He was involved in delimitation of Less Favoured Areas in Poland, at present he is doing a research on biogas production in livestock farms.

Edward Majewski is a Full Professor at the Faculty of Economic Sciences of the Warsaw University of Life Sciences (SGGW), agricultural economist. His research interest are related mainly to Sustainable Agriculture and assessing impacts of agricultural policy changes on farm incomes and environmental performance of farms. He was introducing to Poland the concept of Integrated Farming System, promoting environmentally friendly farming practices.

Stefania Czekaj is a Ph.D. student at the Faculty of Economic Sciences of the Warsaw University of Life Sciences (SGGW). Apart from her involvement in the study on impacts of the CAP greening, she is expected to work on her PhD dissertation focused on the issue of succession in farming sector.

Acknowledgements

This article was presented as a peer-reviewed paper at the 20th International Farm Management Congress, Quebec, Canada, July 2015 and is reproduced by kind permission of the International Farm Management Association.

REFERENCES

Ciaian, P., Kancs, A., Swinnen, J. (2014). The Impact of the 2013 Reform of the Common Agricultural Policy on Land Capitalization in the EU, EAAE 2014 Congress 'Agri-Food and Rural Innovations for Healthier Societies'; Ljubljana, Slovenia.

DEFRA, (2013). Implementation of CAP reform in England, Evidence Paper DEFRA, 2013: https://www.gov.uk/government/publications?keywords=&publication_filter_option=consultations&topics%5B%5D=all&departments

EC, (2011a). Agricultural Policy Perspectives Briefs, Brief n° 1 rev January 2011; European Commission.

EC, (2011b). European Commission, Proposal for a 'Regulation of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy'; October 2011.

European Parliament, (2013). Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013.

Howitt, R.E. (1995). Positive Mathematical Programming, AJAE., 77(2), 1995, pp. 329-342.

MARD, (2014). Draft direct payment scheme in 2015-2020, MARD, Warsaw, August 2014.

Pe'er, G., Dicks, L.V., Visconti, P., Arlettaz, R., Báldi, A., Benton, T.G., Collins, S., Dieterich , M., Gregory, R.D., Hartig, F., Henle, K. Hobson, P.R., Kleijn, D., Neumann, R. K., Robijns, T., Schmidt, J., Shwartz, A., Sutherland, W.J., Turbé, A., Wulf, F. and Scott, A.V. 2014; EU agricultural reform fails on biodiversity. Science 344; p.1090-1092; DOI: 10.1126/science.1253425.

Shannon, C.E. (1948). A mathematical theory of communication. The Bell System Technical Journal; 27, p.379–423 and pp.623–656.

Was, A. (2005). Model optymalizacyjny rolnictwa (na przykładzie gminy Kobylnica); WULS; Warsaw 2005.