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AGRICULTURAL HOLDINGS RECORDING LOSSES – CHARACTERISTICS AND DETERMINANTS[1]

Key words: agricultural holdings, income, loss, CAP, Poland

ABSTRACT. The aim of the article is to recognise the characteristics of farms with loss of agricultural income, as well as to determine factors shaping income in this type of units. In the article, unpublished individual data of farms continuously keeping agricultural accounts in the FADN system in the period 2004-2019 were used. It was found that the productivity of intermediate consumption has a significant influence on the formation of the income situation. In the group of larger loss-making farms, the impact of asset value was statistically insignificant. This means that it is relatively poorly managed. The same is true of debt, whose low efficiency of use translates into failed investments (or overinvestment). In the context of the conducted analyses it can be concluded that there is a group of farms which to some extent adapted to the existing support system, and the considerable assets, provide safety for their functioning also in the context of the possibility to obtain credits.

INTRODUCTION

The development of agricultural holdings is a complex process resulting from the resources of production factors, management and external conditions. The identification of success factors for agricultural holdings favouring the improvement of the income situation is relatively well recognised, although this issue still remains a challenge in practical terms (support instruments). However, analyses in the case of situations when agricultural holdings suffer income losses are not frequent. It results from the difficulty of access to this type of unit. In this article, such an attempt has been made. The question may be asked why it is useful? Well, it allows for a better recognition of development mechanisms of agricultural holdings from the perspective of the ad absurdum approach.

Not only the success factors are important but also recognise the difficulties and the reduction of risks associated with threats. Hence, the main aim of the article is to recognise the characteristics of farms with loss of agricultural income, as well as to determine factors shaping income in this type of unit.

LITERATURE REVIEW

There are many types of researches relating to agricultural income. The most common one focuses on the impact of the common agricultural policy (CAP) instruments on income [Hansen, Teuber 2010, Enjolras et al. 2012, Severini, Tantari 2013, Schmid et al. 2006]. They point out the importance of support, and regulation of markets for the formation of agricultural incomes. The high dependence of the economic situation of agricultural producers on public support makes farm incomes in the EU countries sensitive to changes in budget expenditure [Matthews 2016]. The cited author emphasises that in EU countries, in the period 2004-2013, direct payments accounted for about 47% of income of agricultural producers' from farming, other public transfers 15%, and the remaining 38% was related to market factors.

In turn, in published studies [Czyżewski, Matuszczak 2004, Woś 2000] often indicate that the weak income position of farmers results from the fact that there is a transfer of income from agriculture to its environment. Consequently, the market environment takes over the economic surplus produced by farmers. On the other hand, Bazyli Czyżewski [2017] emphasizes that farmers have fallen into the so-called market treadmill, which is based on the fact that an increase in food production above the demand offered on the market leads to a decrease in the prices of articles produced by farmers. Thus it leads to a decrease in their income below the average level for farms outside agriculture. To defend against these negative phenomena, farmers increased production through technological changes, which again caused overproduction and a fall in prices. Hence, despite the increase in farming intensity and productivity in agriculture, this did not translate into higher income [Zegar 2012]. On the other hand, from a macroeconomic perspective, Jayson Beckman and David Schimmelpfening [2015], based on the US experience, stress that agricultural income is determined by the GDP, technological changes, exchange rates, interest rates, price relations as well as agricultural land prices. This means that the mechanism of agricultural income formation is complex.

Miranda Meuwissen et al. [2011] examining the issue of risk management in shaping income stability in the EU countries found that an important issue is, among others, counteracting the problems of information asymmetry and rising transaction costs. On the other hand, Samuele Trestini et al. [2017] using the Italian farm experience as an example,

find that units specialising in fruit and vegetable production and livestock production are the most exposed to severe income losses. For this reason, they are more inclined to insurance. Interesting research was conducted by Irena Augustyńska-Grzymek and Joanna Pawłowska-Tyszko [2015] in a group of economically weak farms in the Wielkopolska and Silesia regions in Poland. They show that smaller farms (2-8ESU) diversified their income from non-agricultural sources also as a consequence of low or losses in agricultural income. On the other hand, according to some studies [Gustafsoni et al. 1990], accounting methods may overestimate farm depreciation, which may lead to an underestimation of income as well as equity values. In addition, the issue of losses is also raised when studying the impact of plant or animal diseases on income [Raizman et al. 2009].

There is also a stream of research on bankruptcy or liquidation of farms [Musiał 2009, Grzegorzewska 2016, Dinterman et al. 2018]. It is indicated, among others, that the liquidation of farms is related to the characteristics of farm managers (advanced age, lack of successors, poor health) [Dudek 2010]. Meanwhile, in the case of bankruptcy, endogenous factors are important, especially farm management [Boratyńska 2010]. On the other hand, Robert Dinterman et al. [2018], based on the experience of farms in the USA, point to the important role of macroeconomic factors (interest rates and unemployment rate) and farmland value as predictors of farm bankruptcy.

RESEARCH METHODOLOGY

In the article, unpublished individual data of farms continuously keeping agricultural accounts in the FADN system in the period 2004-2019 were used. In total, the group consisted of 2,299 farms of individuals. These units are characterised by a relatively more favourable economic situation in comparison with the units in the FADN observation field, as well as with average farms in Poland. Therefore, these units are not representative for agricultural holdings in Poland, and they represent holdings more strongly linked to the market. On the other hand, it does not hinder the recognition of the analysed relations in various sections taking into consideration the dynamics of the researched phenomena and, first of all, the continuity of the conducted results within the framework of FADN agricultural accounting.

From the surveyed group of agricultural holdings, there were distinguished those which in the analysed period (2004-2019) with loss of income at least three times. This results from the fact that in the case of losses occurring once or twice it can be assumed that they were incidental. On the other hand, when at least three out of sixteen years it occurred then it indicates poor management of resources as well as less sustainable development of these units. There were a total of 92 such units and this group was further divided into

two groups based on economic size (ES6)[2]. The first for smaller units (ES1-ES3) is 70 farms and the second for larger units (ES4-ES6) is 22 farms. This division was the result of separating the units according to their endowment with production resources, as well as different production and economic characteristics, or the importance of agricultural income in the total income of the farmers' family. The aim was to take into account of the impact of this element (economic size) on the assessment of the income situation. The assessment of the situation of agricultural holdings with poor equipment in production resources is different from that of those with better equipment. Moreover, it can be assumed that in the case of smaller farms, issues of tax optimisation as part of a parallel non-agricultural activity or self-supply of food are also involved. As a result, three groups of agricultural holdings were obtained: the first (comparative), which included units that recorded a loss in income up to two times in the analysed period. The second group – smaller farms in terms of economic size (ES1-ES3) with at least three years in which there were losses, and the third – larger farms in terms of economic size (ES4-ES6) in which there were losses in income. A division into production types of farms (TF8) was also used in the analyses, TF1 – farms specialising in field crops, TF5 – in milk production, TF6 – sepcialising in other grazing livestock, TF7 – in granivores (pigs, poultry), TF8 - farms without specialisation.

The panel analysis was used to evaluate factors shaping income in three separate groups of agricultural holdings. It resulted from the recognition of the importance (similarities and differences) of the selected factors (variables) in shaping the income situation in the three analysed panels. The aim was to use the same set of variables in each of the models, which made it possible to compare their influence on income. The dependent variable in the models is agricultural income (SE420). It represents a payment for the farm's own factors of production and takes into account the subsidies received by the farm. The choice of explanatory variables was dictated by substantive considerations, data availability, as well as statistical significance [Ryś-Jurek 2009, Vătavu et al. 2015, EC 2018]. The models used asset value (SE436), acreage of agricultural land (SE025), debt (SE485), the share of fixed assets in total assets (SE441/SE436), intermediate consumption productivity (value of agricultural production to value of intermediate consumption ((SE135 + SE206)/SE275)). The first two variables refer to the number of resources used by the farm, which translates into agricultural income. Debt, on the other hand, represents a source of financing for investments and the generation of future income through this. The share of fixed assets in the total value of assets reflects the structure of assets, which is relevant to the income

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[2]   Economic size class is defined as the sum of the standard value of agricultural output, the so-called standard output (SO – the average monetary value of the agricultural output at the farm gate price of each agricultural product crop or livestock in a given region), and is expressed in thousands of EUR. The analyses used the delimitation of six classes of economic sizes: very small farms ES1 (EUR 2-8 thousand SO), small ES2 (EUR 8-25 thousand SO), medium ES3 (EUR 25-50 thousand SO) medium-large ES4 (EUR 50-100 thousand SO), large ES5 (EUR 100-500 thousand SO) and very large ES6 (over EUR 500 thousand SO).

situation. The productivity of intermediate consumption indicates approximately the efficiency of production processes in agricultural holdings.

In the next stage of the panel analyses, variables expressed in nominal values were deflated to make them more realistic. The explanatory variables in the models were verified using the variance of inflation factor (VIF) test for collinearity. Values exceeding 10 indicate the presence of a collinearity problem. In all models included in the study, the values of the VIF test did not exceed 5, which means that this problem did not occur in the analysed models [Haan 2002].

Econometric models were estimated using panel data, assuming that the dependent variable is influenced, in addition to the explanatory variables, by non-measurable, time-constant and object-specific factors called group effects [Wooldridge 2002]. In this case, since individual effects are often present, fixed (which we can assign to specific objects) or random panel models are used. The advantage of panel data is that we can control for heterogeneity in the model by considering heterogeneity as either fixed or random effects. This solves the endogeneity problem.

To select an appropriate estimation method, the heteroskedasticity of the random component was assessed. For this purpose, the Breusch-Pagan (Br.-Pag.) [Breusch, Pagan 1980] and the Hausman test were applied. The Wald test was also applied to assess the heteroskedasticity of the random component. The Beck-Katz standard error correction procedure was used, as it allows to reduce of problems related to the autocorrelation of the random component.

RESULTS AND DISCUSSION

During the study period (2004-2019), the share of surveyed farms that recorded income losses fluctuate from 2% in 2006 to 5.2% in 2015. This variability was mainly due to the conditions of profitability of agricultural production, especially the price relations of products sold to purchased by agricultural producers. We can also notice cyclical changes in the share of farms recorded losses, which may indicate the conjunctural connotations of these phenomena. In total, the percentage of holdings with losses was not high. However, it should be noted that the analysed group is formed by economically stronger and better managed units. The latter is also associated with the necessity of current production and economic records, systematic cooperation with the staff of agricultural advisors (conducting and monitoring data collection) and relatively long period. Hence, the awareness of the impact of keeping an economic account on farm performance is higher. Therefore, it can be assumed that in the whole population of agricultural holdings in Poland, the share of such holdings is definitely higher. Often such units operate in conditions of narrow reproduction, decapitalisation of assets [Grzelak 2014].

Separated groups of farms differ significantly in terms of economic and production characteristics (Table1). Attention is drawn to the low income of smaller farms with losses. They are so low that they do not provide a parity level, hence the importance of non-agricultural income-generating activity increases in them [Augustyńska-Grzymek, Pawłowska-Tyszko 2015]. As the results of Tomasz Wojewodzic's [2017] research indicate, this type of farms often implement recessive strategies through divestment into agricultural activities. Thus, resources from the farm supply non-agricultural activities. Interestingly, that the value of assets of the larger loss-making farms is higher compared to the comparison group. This means low efficiency of its use in the former, which is also reflected in the lower level of the intermediate consumption productivity index. On the other hand, very high indebtedness in the group of larger loss-making agricultural holdings (group three) indicates that these units carry out risky activities in the financial sphere, which can also lead to overinvestment [Pawłowski et al. 2021]. Their functioning is secured by a relatively high value of assets and a significant level of subsidies that help them with liquidity. If the subsidies were excluded from calculation of income then the level of income in smaller and larger holdings with losses in income would be comparable.

Agricultural holdings in the third group farm operate on average in large areas (52 ha), the value of agricultural production and the number of employees is higher than in the other groups. They extensive use external factors of production (land rent, credits, hired workers) making their income more in line with the profit category. Consequently, charge of external factors of production is high, which increases operating costs. This is also reflected in the return on equity, which is not high compared to the comparison group.

In larger holdings with losses in income, the intensity of livestock production evaluated through the prism of stocking density (LU/ha) and environmental pressure is also higher (Table 1). These units are more strongly linked to the market, apply more capital-intensive production techniques, use external factors of production, and hence have a stronger environmental impact. On the other hand, a low environmental impact was recorded for smaller holdings with losses, which is related to the low intensity of agricultural production. It is worth noting that in this group, the share of farms specialising in field crops was the highest. There was also a relatively high share of farms specialising in granivores (pigs, poultry), and a low share of milk specialisation units (7.1%), compared to the comparative group. Moreover, while in the comparison group, as many as 35.4% of the farms were without specialisation, in the case of the larger farms with starters, only 22.2%. Such distribution indicates that the farms in the third group specialise to a greater extent in agricultural production and thus bear a relatively higher risk of agricultural activity.

In the case of age, no significant differences were found between the analysed groups of farms. The situation was similar in the case of education. These variables differentiate the analysed groups to a lesser extent from the perspective of the analysed issues, which does not mean that this influence exists in the case of some of the units.

Table 1. Selected characteristics of farms continuously keeping agricultural accounts in the FADN system during the period 2004-2019, recording losses in comparison with other farms (n = 2,299) (averages for 2004-2019)

Specification	Comparative group of agricultural holding A*	Group of smaller farms with losses B**	Group of larger farms with losses C***
Number	2,207	70	22
Income [thousand PLN]	89.9	38.9	78.7
Assets [thousand PLN]	1,061.9	664.8	2,341.0
Debts [thousand PLN]	97.3	55.0	455.7
Total subsidies [thousand PLN]	43.0	27.2	67.7
Income – subsidies [thousand PLN]	47.0	11.6	11.0
Agricultural area [ha]	34.3	22.6	51.8
Number of employees [a]	2.15	1.86	3.27
Tota output value [thousand PLN]	234.6	124.9	461.3
Productivity [b]	1.72	1.6	1.6
Value of external factors [c] [thousand PLN]	11.5	7.1	51.0
Income/equity [%]	10.5	6.9	7.6
Stock density [LU/ha]	1.4	0.9	2.5
Environmental pressure indicator [thousand PLN] [d]	5.1	4.8	10.1
Age [lata]	45.7	44.8	45.5
Education [e]	3.7	3.9	4.1

* Agricultural holdings which have made no more than 2 losses or have been operating without losses during the period 2004-2019
** Agricultural holdings which have made 3 losses or more times during the period 2004-2019, and at the same time their average economic size was ES1-ES3
*** Agricultural holdings which have made 3 losses or more times during the period 2004-2019, and at the same time their average economic size was ES4-ES6
a) the number of employed expressed in AWU (1 AWU = 2,120 h)
b) productivity of intermediate consumption = (value of crop production + value of livestock production)/value of intermediate consumption
c) the sum of interest costs, rents and wages of paid employees
d) environmental pressure index = sum of costs of purchase of fertilizers, plant protection products, animal feed, energy per ha of UAA [Piekut, Machnacki 2011]
e) 1 – basic, 2 – basic non-agricultural, 3 – basic agricultural, ... 7 – higher agricultural

Source: own calculation base on of unpublished individual data of farms continuously keeping agricultural accounts in the FADN system in the years 2004-2019

Table 2. Panel models explaining the income development in farms continuously keeping agricultural accounts in the FADN system in the period 2004-2019 (Beck-Katz standard errors)

Specification	Group A	Group B	Group C
Number of observation	35,312	1,120	352
Dependent variable	Income		
Method of estimation	FE	FE	FE
const	85,574*** (7,625)	132,932*** (27,899)	74,017* (43,969)
assets	0.042*** (0.02) *0.43*	0.067*** (0.01) *0.48*	-0.002 (0.01)
agiculturalarea	724*** (51) *0.31*	563*** (133) *0.24*	1,579*** (221) *0.72*
debt	0.004 (0.005)	-0.08*** (0.02) *-0.16*	-0.007*** (0.024) *-0.3*
Share of fixed assets in total assets	-163,278*** (7,036) *-0.15*	-217,235*** (31,543) *-0.29*	-312,580*** (55,170) *-0.24*
Productivity of intermediate consumption [a]	35,730*** (973) *0.28*	27,016*** (2,157) *0.38*	121,085*** (11,284) *0.51*
Statistical test			
Test Breusch-Pagana	< 0.001	< 0.005	< 0.001
Test Hausmana	< 0.001	< 0.001	< 0.001
Test Walda	< 0.001	< 0.001	< 0.001
LSDV R-kwadrat	0.65	0.53	0.57
R^2 – within	0.50	0.48	0.52

Group A, B, C – see Table 1
* For p < 0.1, p < 0.05, *** for p < 0.01
a) Productivity of intermediate consumption = value of agricultural output/value of intermediate consumption standard errors in brackets, standardised regression coefficients in italics

Source: own calculation base on of unpublished individual data of farms continuously keeping agricultural accounts in the FADN system in the years 2004-2019

The analysis of panel models indicates that the value of assets was not important in shaping income in the group of larger households that recorded losses (Table 2). This confirms previous analyses regarding the fact that assets are used less effectively in them. Attention is drawn to the negative impact of debt on farms with losses. Debt was not used effectively in these farms in terms of income creation.

The impact of a higher share of fixed assets in the value of assets was negative. This results from the fact that the increase in this asset stiffens production processes, which hinders more flexible adjustments of agricultural holdings to market conditions. Current assets directly generating production effects are an important element of the economic basis of farms' operation. They allow to directly translate into the volume of production, income, and then through investments into the accumulation of assets. Research by Aldona Skarżyńska et al. [2013] conducted in agricultural holdings in Poland and Lithuania, shows that a higher share of fixed assets in the first mentioned country resulted in a significantly lower capital efficiency (more than 2 times). In both smaller and larger farms with losses, the importance of this factor was stronger than in the comparison group. It resulted from a lower efficiency of production processes. The great significance for income formation among the explanatory variables was recorded for the productivity of intermediate consumption. This variable focuses on the efficiency of the production apparatus of agricultural holdings, including management, and the introduction of innovations.

The high value of assets in holdings in the third group allows the implementation of more risky activities in the financial sphere, while this did not bring the expected income effects. The latter was sustained by direct payments. They allow liquidity and agricultural producers are willing to take more risks compared to the situation without direct payments [Matthews 2013]. In the context of agency theory, it can be seen that the actions of agents (farm managers) are not in line with the expectations of the principal (state, EU). A contradiction of objectives emerges, which generates costs (losses). Taking advantage of the political rent in this case (obtaining subsidies) is not connected with the improvement of efficiency, or it is difficult to expect an increase in pro-environmental standards in these situations due to insufficient income. A wealth effect may be revealed in these cases [Grzelak 2022]. As Jason Henderson [2013] points out, as long as farm assets remain high and interest rates remain low, farmers' investments in real estate, especially land purchases, can remain high even with lower incomes. Berkeley Hill [2000], on the other hand, stresses that farm assets are important not only for income generation but also for providing security.

SUMMARY

Farms with losses are distinguished by their economic and production characteristics in comparison with other units. However, this group is not homogeneous. On the one hand, there are farms with lower economic size, and less equipped with production factors. Agricultural activity in them, as indicated by the results of other study [Kambo 2021], constitutes an additional source of income and is often realised most probably due to preferences resulting from access to social security or the tax system. The recorded losses result mainly from the small scale of activity. On the other hand, there is a group of economically strong agricultural holdings which losses. These are units that farm large areas and make extensive use of external factors of production. As a result, their activity is carried out in conditions of considerable risk. At the same time, a relatively high level of subsidies is conducive to maintaining financial liquidity. In the case of these farms, losses resulted mainly from high costs of external factors (debt), and as can be indirectly deduced from the conducted research, from the inadequate management.

It was found that the productivity of intermediate consumption has a significant influence on the formation of the income situation. In the group of larger loss-making farms, the impact of asset value was statistically insignificant. This means that it is relatively poorly managed. The same is true of debt, whose low efficiency of use translates into failed investments (or overinvestment).

In the context of the conducted analyses it can be concluded that there is a group of farms that to some extent adapted to the existing support system, and the assets, which are considerable in comparison with the comparative group, provide safety for their functioning also in the context of the possibility to obtain credits. The undesirable adjustment of these farms mainly lies in seeking the benefits of political rents while reducing market incentives in their operation. This weakens the efficiency and allocative function of the market, as well as the effectiveness of the use of subsidies. The research results indicate that there should be even greater degressive of support of farms and liberalization in the agricultural land market. The point is that the support should not contribute to specific adjustment behaviour of farms directed towards excessive risk or inefficient use of resources.

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GOSPODARSTWA ROLNE ODNOTOWUJĄCE STRATY – CHARAKTERYSTYKA I DETERMINANTY

Słowa kluczowe: gospodarstwa rolne, dochód, strata, WPR, Polska

ABSTRAKT

Głównym celem artykułu jest rozpoznanie cech gospodarstw odnotowujących straty w dochodach rolniczych oraz określenie czynników kształtujących dochody w tego typu jednostkach. W artykule wykorzystano niepublikowane dane indywidualne gospodarstw rolnych prowadzących nieprzerwanie rachunkowość rolną w systemie FADN w okresie 2004-2019. Stwierdzono, że znaczny wpływ na kształtowanie się sytuacji dochodowej wywiera produktywność zużycia pośredniego. W grupie gospodarstw większych, odnotowujących straty, wpływ wartości majątku był statystycznie nieistotny. Oznacza to, że jest on względnie słabo zarządzany. To samo dotyczy zadłużenia, którego niska efektywność wykorzystania przekłada się na nietrafione inwestycje (lub przeinwestowanie). W kontekście przeprowadzonych analiz można stwierdzić, że istnieje grupa gospodarstw, która w jakimś zakresie dostosowała się do systemu wsparcia, a znaczny majątek stanowi zabezpieczenie dla ich funkcjonowania także w kontekście możliwości pozyskania kredytów.

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