INSTITUTE OF AGRICULTURAL AND FOOD ECONOMICS
NATIONAL RESEARCH INSTITUTE

Polish agricultural holdings in the first years of membership – efficiency and competitiveness

Wojciech Józwiak

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THE ECONOMIC AND SOCIAL CONDITIONS OF THE DEVELOPMENT OF THE POLISH FOOD ECONOMY FOLLOWING POLAND`S ACCESSION TO THE EUROPEAN UNION

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Prof. Wojciech Józwiak

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This report is a part of the research topic
The Polish agriculture farms in the first years of EU membership
in the following tasks:

The analysis of economic results of the Polish agriculture
The economic condition and activity of various groups of the Polish farms
The adjustment processes in large agricultural holdings

The report depicts changes that occurred in Polish agriculture after the year 2004 with a special focus on efficiency, development capability and competitiveness of different types of agricultural farms.

Translated by
Dariusz Sielski

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Joanna Gozdera

Technical editor
Leszek Ślipski

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Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej
– Państwowy Instytut Badawczy
00-950 Warszawa, ul. Świętokrzyska 20, skr. poczt. nr 984
tel.: (22) 50 54 444
faks: (22) 50 54 636
e-mail: dw@ierigz.waw.pl
http://www.ierigz.waw.pl

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INTRODUCTION

This report focuses on four issues. Firstly, it discusses the efficiency[1] of Polish agriculture between 2004 and 2008 in comparison with relevant indicators recorded in previous years as well as with those observed in other European Union Member States and in Russian, Belarusian and Ukrainian agriculture. As regards the latter group of countries, the examination was aimed to formulate an opinion on the period when they would import Polish agri-food products. Secondly, the report raises the question of development prospects of various groups of Polish agricultural holdings in 2005–2007, and thirdly, it describes the competitiveness of farms held by natural persons (the analysis mostly covers the years 2004–2006) as compared to agricultural holdings in selected other EU Member States. Finally, it examines the efficiency of particular groups of Poland's largest farms in 2004–2008. Such holdings are analysed separately as they differ from those held by natural persons in methods for labour remuneration, the calculation of related costs (social security, taxation on salaries and wages), etc.

The analyses were based on the results of monitoring under the Polish FADN and the Community FADN, empirical data (collected in large Polish farms through steered interviews and questionnaires), statistics of Eurostat, GUS and statistical offices of Russia, Ukraine and Belarus, as well as on relevant Polish and foreign literature. The substantive correctness of the analyses of agricultural holdings in Poland and in other EU Member States was ensured by using largely the same methods for collecting and processing numerical data.

The analyses conducted allow to draw conclusions regarding future developments, primarily in the medium term.

[1] As a matter of fact, the emphasis is not on efficiency as such, but on its specific form, namely the productivity of Polish agriculture, since it was primarily measured by the ratio of the production value to inputs of all material production factors used, mainly expressed in physical units rather than in monetary terms.

I. POLISH AGRICULTURE AS COMPARED TO AGRICULTURAL PERFORMANCE IN OTHER EUROPEAN COUNTRIES

The efficiency of Polish agriculture[2]

The analysis covering the first years after Poland's accession to the European Union indicates a positive influence of the Common Agricultural Policy (CAP) on the level of agricultural income in Poland. The value of production of the Polish agricultural sector[3] at constant prices was 25.6% higher in the four-year period 2005–2008 than in the four-year period 2000–2003, which was accounted for by a price rise in ca. 71% and by an increased volume of output in 29%. The production of poultry and industrial crops gained in importance, the production of potatoes and pigs showed a decline, whereas intermediate consumption went up by 3.9%. Consequently, as much as approx. 86% of the growth in the production volume was determined by shifts in the production structure and a mere 14% of this increase was due to greater intensity.

The difference between the value of production of the agricultural sector and the value of intermediate consumption is referred to as gross value added. At current prices, it augmented from PLN 19,016 million in the four-year period 2000–2003 to PLN 23,100 million in the four-year period 2005–2008, i.e. by 21.5%.

The rise in transfers directly influencing agricultural income was an immediate effect of the inclusion of Polish farmers in the Common Agricultural Policy. Such transfers, in the form of direct payments, increase the value of agricultural production or are recorded in the income account, depending on the link with agricultural products. In the years immediately preceding EU accession, payments increasing the value of agricultural production concerned support for wheat and rye producers. Upon the inclusion of Polish farmers in the CAP, this group of instruments comprised supplementary payments and payments to tobacco, hop and sugar beet producers. Periodically, recipients of such payments also included producers of certain fruit and vegetables withdrawn from the market. On average, in 2005–2008 the total annual amount of such payments was PLN 4,000 million, i.e. approx. 17% of gross value added at producer prices (Table 1). For comparison, in the years preceding EU accession product subsidies of PLN 416 million only accounted for a mere 2% of gross

[2] This section was prepared on the basis of: Z. Floriańczyk, *Polskie rolnictwo w pierwszych latach akcesji do UE w świetle rachunków ekonomicznych dla rolnictwa*, IERiGŻ-PIB, typescript, 20 November 2009.

[3] The value of production of the agricultural sector consists of the value of the following: agricultural output, services supplied and secondary activities, e.g. home processing of milk for human consumption.

value added. The growing role of direct payments on production in generating agricultural income in Poland stemmed from the implementation of the EU system of direct income support under the EU agricultural policy.

Following EU accession, the rise in costs related to the consumption of fixed assets in agricultural production was relative. In the pre-accession period such costs represented ca. 26% of gross value added at producer prices, whereas after Poland's joining the EU this proportion decreased to approx. 23%. Thus, there was a relative fall in the share of depreciation in the income account for agriculture. As a result of increased product subsidies and relatively lower depreciation, after EU accession net value added constituted nearly 95% of gross value added at producer prices, whereas it only accounted for 75% prior to accession. Similarly, there was a relatively decline in the compensation of employees and in the value of other taxes on agricultural production (e.g. land tax and tax on vehicles). A moderate rise in the value of such items at current prices stemmed from inflation, i.e. it reflected the increase in unit prices of these cost components.

Table I.1

Value added and income in Polish agriculture at current prices in 2000–2003 and in 2005–2008

Specification	2000–2003		2005–2008	
	PLN million	GVA PP=100	PLN million	GVA PP=100
1. Gross value added at producer prices (GVA PP)	**19,016**	**100.0**	**23,100**	**100.0**
2. Subsidies less taxes on products	416	2.2	4,000	17.3
3. Gross value added at basic prices (1+2)	**19,433**	**102.2**	**27,100**	**117.3**
4. Depreciation	4,987	26.2	5,365	23.2
5. Net value added (3-4)	**14,445**	**76.0**	**21,736**	**94.1**
6. Compensation of employees	2,982	15.7	3,364	14.6
7. Other taxes on production	1,360	7.2	1,418	6.1
8. Other subsidies	447	2.3	7,307	31.6
9. Operating surplus (5-6-7+8)	**10,549**	**55.5**	**24,261**	**105.0**
10.Rents	329	1.7	416	1.8
11.Balance on interest paid and received	-824	4.3	-1,028	4.4
12.Agricultural entrepreneurial income (9-10+11)	**9,397**	**49.4**	**22,817**	**98.8**

Source: Rachunki ekonomiczne dla rolnictwa (RER) *("Economic Accounts for Agriculture"), www.rer.ierigz.waw.pl*

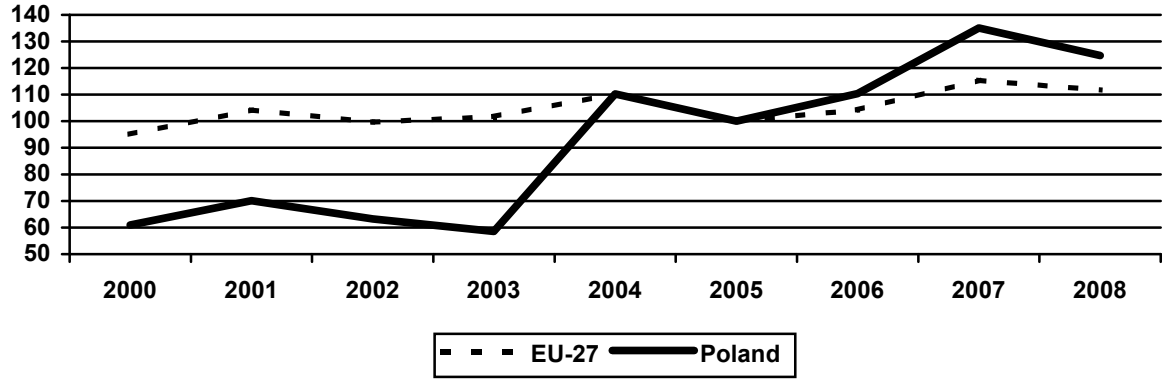
Among the components of the income account, there was a particularly sharp rise in the value of other subsidies on production. In the pre-accession period, they only included subsidies to biological progress in crop and animal production as well as to liming. The share of this item in gross value added at producer prices went up from ca. 2% prior to accession to over 30% in the first years of membership. It resulted from the inclusion of Polish agriculture in

direct payments on agricultural land (single area payment), support for farming in less-favoured areas, the implementation of support schemes for semi-subsistence farms, agri-environmental schemes and animal welfare measures as well as from the introduction of refunds of excise duty paid on mineral oil used as motor fuel in agricultural production. Such support totalled PLN 7,300 million between 2005 and 2008.

Due to the rise in production subsidies to the level exceeding the compensation of employees and other taxes on production, in 2005–2008 the income of production factors in Polish agriculture was higher than gross value added at producer prices, whereas in the pre-accession period the remuneration of the factors used in agricultural production only accounted for approx. half of gross value added. In the period in question, there was also an increase in rents on land and in the negative balance on bank interest, but growth in these cost items had no significant impact on the economic performance.

Thus, the annual average value of agricultural entrepreneurial income (in the case of agricultural enterprises this income refers to profit), in nominal terms, jumped from PLN 9,397,000 in 2000–2003 to PLN 22,817,000 in 2005–2008, up by ca. 143% on the pre-accession period. It represented the rise in the remuneration of own labour as well as of tangible and financial assets of Polish farmers in comparison with 2000–2003.

Figure I.1. Fluctuations in real income of production factors in the agricultural sector per full-time worker (ratio A) in Poland and on average in the European Union in 2000–2008 (ratio A in 2005=100)



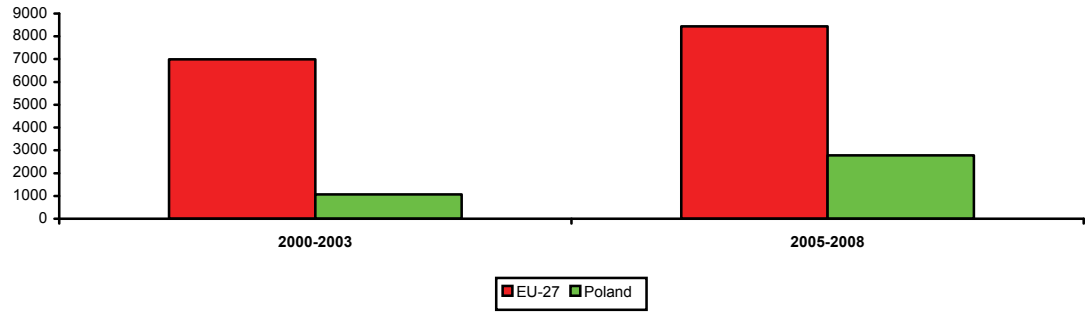
Source: RER, www.rer.ierigz.waw.pl, http://epp.eurostat.ec.europa.eu/.

The improved income in the agricultural sector resulted in an increase in the profitability indicator (ratio A), reflecting the real income of factors of production per full-time worker engaged in agricultural production. In 2000–2003 this ratio for Polish agriculture followed a similar pattern (Figure I.1) to that observed in agriculture of all EU Member States (EU-27), but in the first

year after accession there was a rapid growth, as a consequence of the implementation of direct support instruments and price convergence. In subsequent years, ratio A changed at the EU-27 average or greater rate.

The higher average growth rates of profitability ratios in Polish agriculture in comparison with those noted in other EU Member States proved to be insufficient to considerably narrow the gap in the remuneration of labour and capital between Polish and EU agriculture. Although the annual average value of this ratio in Polish agriculture increased from approx. EUR 1,000 in 2000–2003 to EUR 2,800 (by approx. 64%) in 2005–2008, the average profitability ratio for the EU-27 rose from ca. EUR 7,000 to approx. EUR 8,000 respectively (Figure I.2).

Figure I.2. Agricultural income in Poland and in the EU per full-time worker in 2000–2003 and 2005–2008, in EUR



Source: RER, www.rer.ierigz.waw.pl, http://epp.eurostat.ec.europa.eu/.

Poland ranks among countries characterised by the lowest levels of the remuneration of production factors in agriculture. Only Romanian and Bulgarian agriculture noted lower profitability ratios. The structure of agricultural holdings in the two countries is dominated, as in Poland, by farms of a social character. At the same time, holdings characterised by the highest profitability ratios were found in Western European countries and in Estonia. They were distinguished by large-scale production which allows to make efficient use of modern production technologies and to minimise labour input. In this light, the increase in agricultural income in Poland depends on structural changes determining a more efficient utilisation of production factors in agriculture.

It should be emphasised that in 2000–2008 Polish agriculture experienced a gradual improvement in the use of means and factors of production. Those favourable processes were reflected in lower values of the following technological and production indicators: material intensity, energy intensity, capital intensity, land intensity and labour intensity of agriculture (Table I.2). As compared to the period immediately preceding EU accession, the sharpest fall, by an annual average rate of over 3%, was recorded in the case of land intensity

of production, measured by the ratio of utilised agricultural area to the volume of agricultural production. A similar decline, by an annual average rate of 2.9%, concerned labour input relative to the volume of agricultural production. At the same time, energy intensity and material intensity went down, on average, by 1% annually.

Table I.2

Technological and production indicators characterising changes in costs and inputs of means and factors of production in Polish agriculture in 2000–2003 and 2005–2008

Specification	2000–2003	2005–2008
	Annual average changes in %	
Material intensity of production	-0.8	-0.7
Energy intensity of production	-1.2	-1.7
Capital intensity of production	-2.2	-3.7
Land intensity of production	-3.1	-1.2
Labour intensity of production	-2.9	-1.0

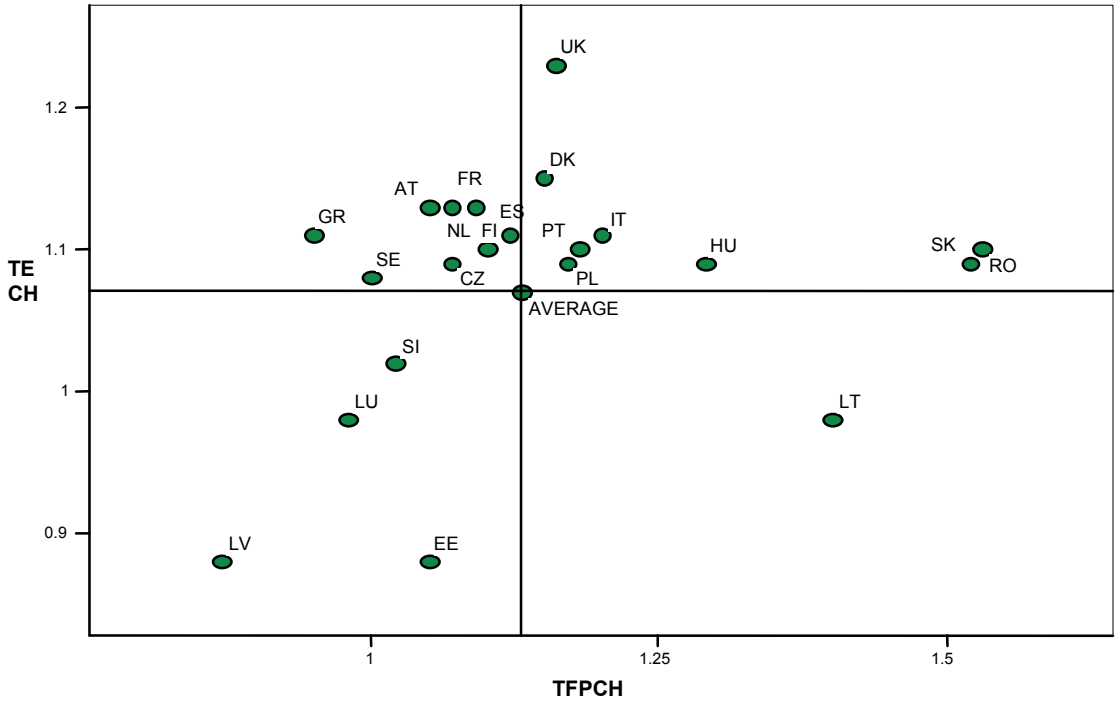
Source: RER, www.rer.ierigz.waw.pl

In the period 2005–2008 there was a particularly rapid drop (by an annual average of 3.7%) in the capital intensity of production, as a result of more efficient utilisation of the production base in Polish agriculture and an increase in the volume of production. However, this process cannot be unambiguously assessed as a favourable development as a continued downward trend of the production base would have an adverse effect on agricultural output in the long term. At the same time, a faster decline in the energy intensity of production should be seen as unquestionably positive, even though this process is likely to have been caused, to a certain extent, by an upsurge in fuel prices. There was a slowdown in the decrease in inputs of other means and factors of production relative to the volume of production, which reflects a deceleration in processes of productivity improvement in agriculture.

The thesis of a negative impact of direct payments on farming efficiency is not a new one, it was formulated on the basis of empirical data collected from French agricultural holdings[4]. In fact, agricultural producers treat payments as premiums on prices obtained from the sale of finished products, therefore the marginal productivity of inputs is lower than in a situation without subsidies.

[4] As put forward, among others, by L. Latruffe in her doctoral dissertation. She is a researcher at INRA, Economics Unit of Rennes, France.

Figure I.3. Total factor productivity change (TFPCH) and technological change (TECH) in agriculture of selected European Union Member States in 1999–2006



TECH – Technological Change
TFPCH – Total Factor Productivity Change
Source: Z. Floriańczyk, "Polskie rolnictwo w pierwszych latach akcesji do UE w świetle rachunków ekonomicznych dla rolnictwa", IERiGŻ-PIB, typescript, 20 November 2009.

The analysis prepared on the basis of the Malmquist productivity indices pointed to a moderate improvement in productivity change in Polish agriculture in comparison with other European Union Member States. This improvement in productivity was only slightly above the average for EU Member States in question (Figure I.3). The most rapid increase in total factor productivity was observed in Romanian and Slovakian agriculture, owing to more efficient utilisation of the production base, as in Poland.

Agricultural productivity change driven by technological change primarily concerned Western European countries. In this respect, Polish agriculture was only marginally above the average for the analysed countries, and the majority of the new EU Member States experienced a similar scale of agricultural productivity change through technological change. The comparison of the two groups of countries suggests that the improvement in the productivity of agricultural production as a result of technological progress is inevitable in the new EU Member States. The actual pace of this process depends on structural changes allowing to fully exploit of various forms of progress.

* * *

To recapitulate, Poland's accession to the European Union brought about a marked increase in agricultural income in Poland. It stemmed from the introduction of the EU direct payment scheme, a significantly faster rise in prices for agricultural products than in those for agricultural inputs in the first year of membership as well as from a moderate improvement in the productivity of means and factors of production. In this light, the favourable impact of (the Polish version) of the common agricultural policy on the economic performance of the agricultural sector should be assessed with caution as it was mainly based on unstable prices for agricultural products and direct transfers.

Such transfers cannot be perceived as the main stimulant of change, due to their limited effectiveness in promoting agricultural development. As a matter of fact, they distort market processes and, most probably, hamper the improvement in production efficiency. Specifically, they impede the concentration of agricultural land, which constrains structural changes, very desirable in Polish agriculture.

Other types of transfers, not directly linked to products, belong to the group of instruments with a moderate distorting effect on market forces. At the same time, they stimulate or compensate for the production of socially desirable non-market goods and services (the protection of biodiversity, the preservation of landscape, etc.). Therefore, in the future such instruments will be more widely applied in support for the agricultural sector.

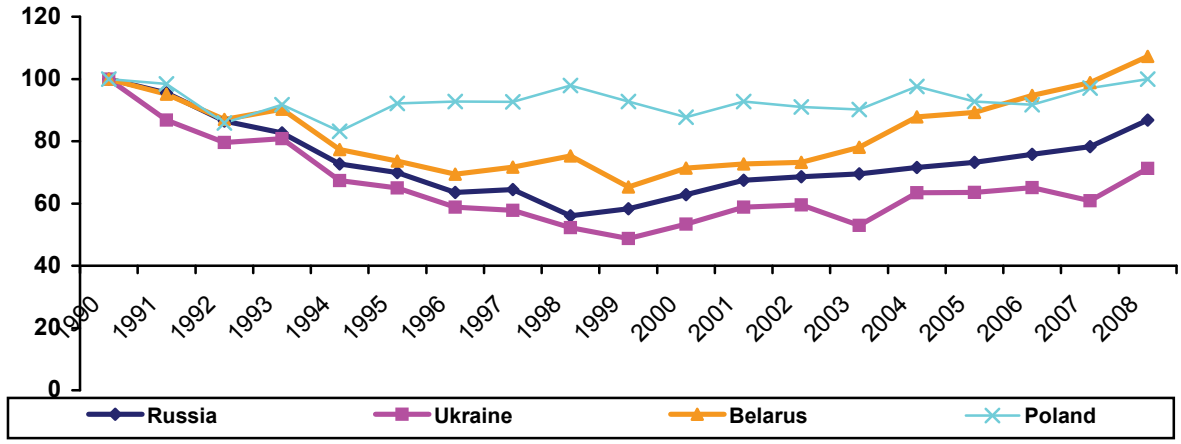
Changes in Russian, Ukrainian and Belarusian agriculture[5]

Until recently, agriculture in Russia, Ukraine and Belarus was recovering from the deep production and economic crisis observed in the 1990s. But the duration and the severity of this crisis differed between the three countries. In Russia the fall in agricultural output came to a halt in 1998, at 56% of the 1990 level, in Ukraine it stopped at 49% in 1999, whereas in Belarus it was basically curbed at 69% in 1996. After a period of such a collapse of agricultural production, all the countries in question experienced an increase, but despite government programmes aimed to improve the situation the growth rate was insufficient to meet the needs and considerably varied between countries. In 2000–2008 agricultural production rose by 38% in Russia, by 33% in Ukraine and by 50% in Belarus. As a result, the 1990 production level was only achieved

[5] Prepared on the basis of the text by W. Dzun and M. Tereszczuk, *Przemiany zachodzące w rolnictwie Rosji, Ukrainy i Białorusi*, IERiGŻ-PIB, typescript, Warsaw, January 2009.

and exceeded in Belarus (at 99% and 107% of the 1990 output in 2007 and 2008 respectively). Russia gradually reduced the distance to the 1990 production level (at 78% and 87% respectively). At the same time, in Ukraine agricultural output continued to be markedly below the 1990 level (at 61% and 71% of the 1990 production in 2007 and 2008 respectively). For comparison and assessment of the depth of the crisis in agriculture in the three countries, in Poland the fall in agricultural production basically stopped in 1994, at 83% of the 1990 output. Between 2000 and 2008 agricultural production went up by 14%, to the present level roughly the same as in 1990 (at 97.1% and 100% in 2007 and 2008 respectively).

Figure I.4. Dynamics of agricultural output in 1990–2008 (1990=100)



Source: Own study based on statistical yearbooks of Russia, Ukraine, Belarus and Poland.

In all the Eastern European countries in question, livestock production suffers from a particularly deep crisis. In comparison with 1990, in Russia this production dropped below 50% in the late 1990s, and in Ukraine it plummeted to 43% in 2000. Also in Belarus livestock production represented ca. 58% of the 1990 output in 2000[6]. In spite of measures aimed at production recovery, even in 2007 output in the countries in question remained significantly below the 1990 level (at 80% in Belarus, ca. 60% in Russia and below 50% in Ukraine). For comparison, in 1994 in Poland livestock production accounted for approx. 84% of the 1990 output. Subsequent years saw a continued growth in this production, and in 2007 it was over 10% above the 1990 level. Such a noteworthy

[6] In this case, such a plunge in output largely stemmed from a very high level of livestock production, realised by Belarus under the division of tasks in the former USSR on the basis of cereals, primarily supplied from Kazakhstan. In 1990 Belarus produced, in *per capita* terms, 116 kg of meat, 732 kg of milk and 359 eggs, whereas Ukraine, for instance, produced 84 kg, 472 kg and 314 respectively.

improvement in livestock production in Poland resulted from increased farming efficiency, particularly from a rise in livestock productivity.

Table I.3

Agricultural production in kg *per capita* in 2007

Specification	Russia	Ukraine	Belarus	Poland
Cereals	576	630	744	553
Potatoes	259	411	901	309
Vegetables	109	147	222	150
Fruit	28	32	43	45
Meat	41	41	84	101
Milk	226	264	608	308
Eggs (number)	267	302	333	258

Source: Statistical yearbooks of Russia, Ukraine, Belarus and Poland.

The collapse in agricultural production observed in the Eastern European countries in question in the 1990s resulted from, among other factors, an abrupt drop in domestic demand for agri-food products, in connection with a steep fall in real disposable income of the population. But there were other causes as well, e.g. rapid restructuring (mostly in Ukraine) of the ownership structure as well as of the legal and organisational structure of state-owned and collective enterprises in agriculture and the agri-food processing industry. In Ukraine, particularly, and to a lesser extent in Russia and Belarus, there was a major shift in the area of agricultural land held by agricultural enterprises towards backyard holdings and commercial farms. At present, the share of such holdings in the total utilised agricultural area is 54% in Ukraine, nearly 18% in Russia and 13% in Belarus.

This substantial allocation of agricultural land to backyard holdings and commercial farms was not followed by a corresponding increase in agricultural output, particularly with regard to livestock production. The main obstacle to the creation of stable conditions for agricultural development in all the Eastern European countries in question was a very low level of disposable income of the population, mostly the rural and farming population. Low income was the underlying cause for almost all rural and some urban households to be engaged in food production in backyard holdings. The food market was in fact oriented towards meeting the needs of the urban population, which in turn determined a contracted internal food market. Thus, farms could not count on an improvement in income as a result of a rise in agricultural prices.

Table I.4

Consumption of basic food products in kg *per capita* in 2007

Specification	Russia	Ukraine	Belarus	Poland
Meat and meat products	58	46	75	78
Milk and dairy products	239	225	233	183
Eggs (number)	256	252	275	207
Fish*	18.6	16.7	15.5	9.5
Cereal products	121	116	89	114
Sugar	39	40	39	39
Potatoes	132	130	189	121
Vegetables	106	118	143	115
Fruit	51	42	59	41
Vegetable oil	13	14	15	12

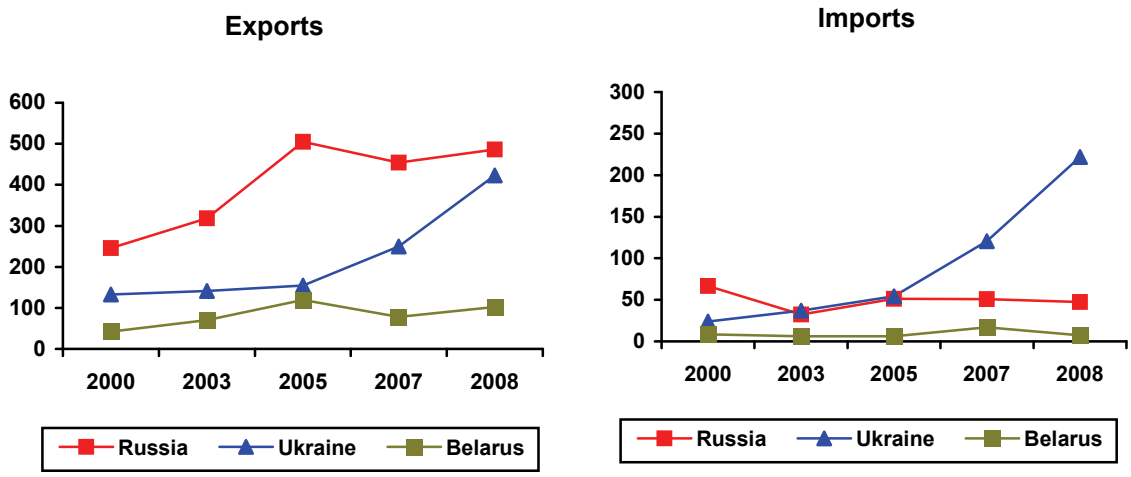
* FAO Yearbook: Fishery and Agriculture Statistics, 2007.

Source: Statistical yearbooks of Russia, Ukraine, Belarus and Poland.

In the above-mentioned conditions observed in the Eastern European countries in question, there was an increase in food imports aimed to enhance supply to the urban population, primarily the provision of highly processed livestock products. It particularly concerned Ukraine and Russia. In Belarus food consumption *per capita* was much higher than in the two countries, even slightly higher than in Poland, but it was largely attained through prescriptive regulatory mechanisms targeted at maintaining low prices for food and enhancing its availability at the expense of economic operators in the food sector, particularly in agriculture.

As a consequence, under rising disposable income of the population in Russia, Ukraine and Belarus (the upward trend has already started and is likely to be continued) as well as improving food consumption levels and food quality, the growth in agricultural production recorded in recent years and expected in the near future has not led, and in the years to come is not projected to lead, at least in Russia and Ukraine, to a major decline in imports of livestock products and to an improvement in food self-sufficiency of these countries. It is very clear in Russia, an ever-larger importer of agricultural and food products, in particular animal products. According to analyses, even a full implementation of tasks laid down in the Russian agricultural development programme and of the guidelines for improving the security of food supply would not lead to full food self-sufficiency even by 2020.

Figure I.5. Poland's foreign trade in agri-food products with Russia, Ukraine and Belarus in 2000–2008 (EUR million)



Source: Own calculations based on data of the Institute of Agricultural and Food Economics – National Research Institute (IERiGZ-PIB), Foreign Trade Information Centre (CIHZ), Analytical Centre of Customs Administration (CAAC), Ministry of Finance (MF), Ministry of Agriculture and Rural Development (MRiRW).

* * *

The analysis conducted has demonstrated that in the next few years Poland's foreign trade in agri-food products with the countries in question will continue, perhaps even increase.

At the same time, recent years confirm that Russia and Ukraine may become large and growing exporters of crop products, particularly of cereals, oilseeds and vegetable oil. Such exports, especially in years of bumper crops, will have a significant impact on the world market of agri-food products, and an indirect effect of the competitiveness of Polish agriculture.

However, if the Eastern European countries in question take measures aimed to boost the livestock population in order to reduce imports of animal products, they will need to allocate certain cereal output to animal feed and to increase the share of forage plants in the sowing structure at the expense of other crops. Such a situation will also affect the Polish agri-food market, although it will partly concern a different group of products.

II. DEVELOPMENT PROSPECTS OF POLISH AGRICULTURAL HOLDINGS HELD BY NATURAL PERSONS

In 2007 2,387,200 agricultural holdings held by natural persons, also referred to as family farms, were engaged in agricultural production in Poland. This chapter solely evaluates those with an economic size equal to or greater than 2 ESU[7]. In 2007 this group included 763,400 holdings (32% of the total number), accounting for 77.2% of the total utilised agricultural area.

Agricultural holdings held by persons with more than one source of income[8]

In Poland there are approx. 1,804,000 holdings with over 1 ha of agricultural land held by family farmers. Ca. 46% represent farms where the main source of income for the holders and their families is gainful off-farm employment since they are subject to social security contributions paid to the Social Security Institution (ZUS). Thus, in the remaining group (ca. 54% of the total number) the holders insured at least themselves or their family member at the Agricultural Social Insurance Fund (KRUS), thus they have certain hopes related to their agricultural holdings.

It is a widespread belief that farms without persons insured at KRUS (with no KRUS payments) are in a worse financial situation as their holders and members of their families who are gainfully employed are not interested in a good condition and development of their own farm. It results from the fact that employment outside the holding ensures at least a sufficient livelihood to the family. This section aims to verify this opinion. The focus is on the examination of differences in the economic situation and efficiency between farms where no family member is insured at KRUS and other holdings where farm work and agricultural activities represent the main, and frequently the sole source of income for the farmer and his family, as reflected in their paying social security contributions to KRUS. This report relies on empirical data for 2005–2007 and on the Polish FADN data.

For purposes of the analysis, holdings where no persons were insured at KRUS and other holdings were broken down solely by economic size expressed

[7] 1 ESU is defined as EUR 1,200 of the standard gross margin.

[8] This section was prepared on the basis of a text by M. Zieliński, published in the following collective work: W. Józwiak (ed.), *Sytuacja ekonomiczna, efektywność funkcjonowania i konkurencyjność polskich gospodarstw rolnych osób fizycznych*, IERiGŻ-PIB, *Program Wieloletni,* 2005–2009, No 132, Warsaw, 2009.

in ESU. An additional breakdown by type of farming[9] was not taken into account, owing to the limited number of holdings without persons insured at KRUS, which precluded appropriate sampling according to the economic size and type of farming.

The analysis covered three groups of holdings of the following economic size: 1) less than 8 ESU, 2) from 8 to less than 16 ESU, and 3) 16 ESU or more. The share of these groups in the two subsets of farms in question considerably varied in 2005–2007. The subset of holdings with persons not insured at KRUS was dominated (64.2%) by those with less than 8 ESU. The share of farms with an economic size of 8 to less than 16 ESU and 16 ESU or more was 17.4% and 18.2% respectively. At the same time, the most numerous group among the remaining farms were those with an economic size of at least 16 ESU, representing a total of 44.4% of all the analysed holdings. The proportion of holdings with an economic size of 8 to less than 16 ESU was 29.3%, whereas the lowest share (26.3%) characterised the group of units with less than 8 ESU.

The most important terms used in this chapter are as follows:

- total labour input expressed in AWU (Annual Work Unit), i.e. full-time person equivalent, where 1 AWU=2,200 annual hours worked. Unpaid (usually family) labour input was expressed in FWU (Family Work Unit), with the same number of annual hours worked (2,200),
- average farm capital was defined as the arithmetic mean of closing and opening valuations of working capital,
- capital replacement is expressed as the ratio of net investment to fixed assets, including agricultural land, farm buildings, forest plantations, machinery and equipment (deadstock) as well as livestock,
- the indebtedness of holdings is the ratio of the total value, at closing valuation, of long-, medium- and short-term liabilities to be repaid to total assets,
- the share of subsidies in family farm income calculated as the proportion of total subsidies on current operations (excluding subsidies on investments) in family farm income,
- return on equity was computed as the ratio of net profit to equity. Net profit was defined as total receipts less total costs including the assumed costs of work performed by the farmers and their family members. The determination of the rates to be adopted for the remuneration of family labour (PLN/hour) in agricultural holdings was based on numerical data concerning 2004–2006

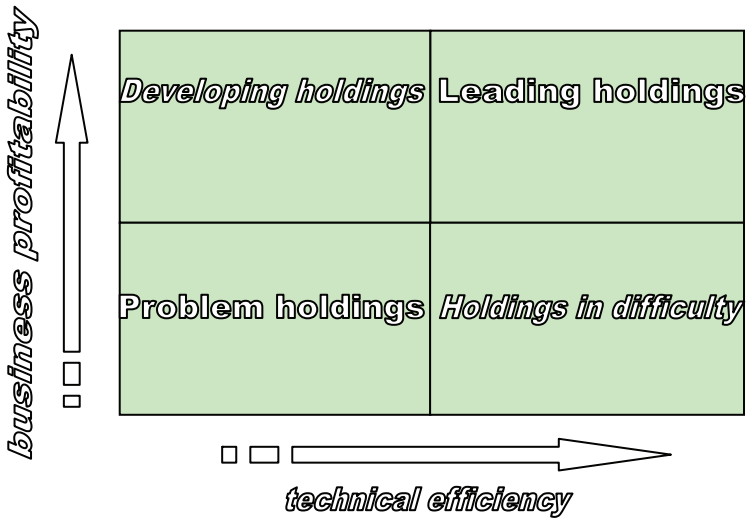
[9] The type of farming is established on the basis of the share of standard gross margins for particular agricultural activities of the holding in question in the total standard gross margin of the holding.

compiled by W. Józwiak, as well as on projected values of this remuneration for 2007 established on the basis of statistical extrapolation of data[10],

● the technical efficiency of holdings (TE) was determined on the basis of the output-oriented SFA method (Stochastic Frontier Analysis). It is the ratio of actual output to optimal output obtainable from unchanged inputs.

The measurement of technical efficiency by the SFA method only allows to establish the general trend of possible improvement in the efficiency of a given holding. For a more accurate evaluation of the situation of farms in both subsets in question, they were divided into four groups (Figure II.1.):

Figure II.1. Dependence matrix of business profitability and technical efficiency



- leading holdings, characterised by technical efficiency levels exceeding 95% and positive business profitability. This group includes farms making efficient use of machinery and equipment, appropriately utilising production infrastructure and allocating reasonable inputs of current means of production,
- developing holdings, with positive business profitability, but at the same time not making the most efficient use of the available means of production. Therefore, there is scope for performance improvement in such farms; however, it largely depends on farm managers, or specifically, on their commitment, skills and knowledge of modern farming techniques and technologies,

[10] Extrapolation was understood as the estimation of a given variable outside the range of available data, by fitting it to an existing function, and then computing its value at a specific point.

- problem holdings, reporting negative financial results, but with a certain efficiency gap stemming from the difference between agricultural inputs and the output obtained. Such farms may enhance their efficiency, provided that they make a more reasonable use of the available resources of production factors,
- holdings in difficulty, i.e. the least desirable ones in this matrix. Even though they make the most efficient possible use of the available production factors, they are characterised by negative business profitability. In order to maintain their presence in the market and grow, such farms should be active investors, which seems hardly manageable for units running at a loss.

Holdings with an economic size of less than 8 ESU

On the basis of the average numerical data for 2005–2007, farms without persons insured at KRUS, as compared to the remaining holdings, were assessed to have lower labour inputs (by 18.8%), a smaller utilised agricultural area (by 13.4%) as well as lower average farm capital (by 11.9%). They employed paid labour nearly to the same degree, but they were more inclined to rent agricultural land. In the three-year period in question, holdings without persons insured at KRUS had a greater stock of assets such as livestock buildings, warehouses, machinery and equipment, which played a vital role of supporting and substituting labour input by the holder and members of his family.

Farms in the two subsets differed in the level of income (Table II.1). In the three-year period 2005–2007, the annual average farm income in holdings without persons insured at KRUS amounted to PLN 12,600, 29.2% lower than that of the compared group (PLN 17,800). The reason for this gap was the fact that farms without persons insured at KRUS obtained lower income (calculated without subsidies) from agricultural production than the remaining holdings in question.

Table II.1

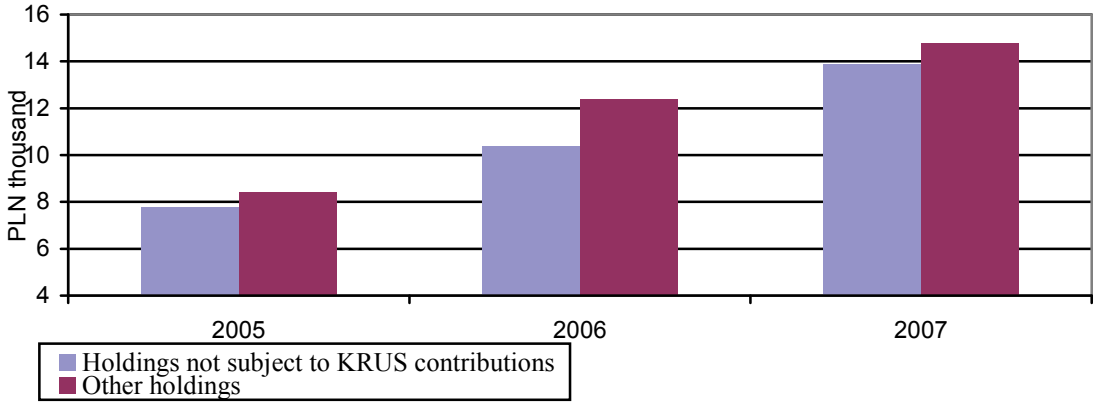
Farm income and the share of subsidies in farm income in holdings with an economic size of less than 8 ESU, held by natural persons and without persons insured at KRUS, as compared to other farms (2005–2007)

Variable	Unit	Holdings without persons insured at KRUS			Other holdings		
		2005	2006	2007	2005	2006	2007
Income from agricultural activities	PLN thousand	10.8	11.5	15.4	12.5	18.7	22.1
Share of subsidies on current operations in farm income	%	54.6	76.6	50.0	42.8	55.6	39.8

Source: Calculations by M. Zieliński on the basis of the Polish FADN data.

The gap in farm income between the two subsets of holdings was less reflected in the difference in income per full-time person equivalent of family labour (1 FWU). In the three-year period in question, in holdings not subject to KRUS contributions this income was an average of PLN 10,700, whereas it amounted to PLN 11,900 in other farms. Therefore, there was only a 10.1% difference to the disadvantage of the former (Figure II.2) as this group was characterised by markedly lower (by approx. 19%) labour inputs.

Figure II.2. Farm income per FWU in holdings with an economic size of less than 8 ESU and without persons insured at KRUS as compared to other holdings (2005–2007)



Source: As in Table II.1.

Both subsets of farms were characterised by a negative capital replacement ratio (Table 1.3). In 2005–2007 the average capital replacement ratios in holdings held by natural persons not insured at KRUS and in other holdings were -2.3% and -1.8% respectively. Should this adverse trend continue, the future existence of farms would be in jeopardy.

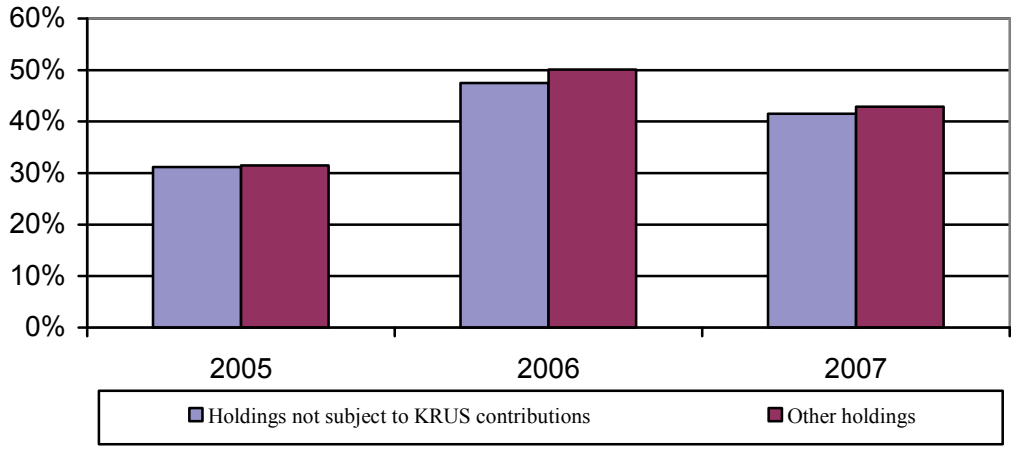
At the same time, farms in both subsets in question were reluctant to use bank loans. In the period in question the average debts exceeded 5% only exceptionally.

Between 2005 and 2007, holdings of the two subsets compared had negative returns on equity (they were unprofitable), and those without persons insured at KRUS were in a somewhat worse situation in this respect. In such farms the average return on equity was -5.1%, whereas it reached -4.7% in the other group. Hence, in both cases investments by farm managers in their own holdings involved substantial losses.

Similar conclusions can be drawn from the analysis of Figure II.3. In holdings without persons insured at KRUS and in other farms the average value of output reached a mere 40% and 41.5%, respectively, of the output obtained by the best holdings, with optimal outputs. Insufficient knowledge about

agricultural production technologies and marketing as well as managerial shortcomings are likely to have been important determinants of this unfavourable phenomenon.

Figure II.3. Technical efficiency determined by the SFA method in holdings with an economic size of less than 8 ESU and without persons insured at KRUS as compared to other holdings (2005–2007)



Source: As in Table II.1

The analysis of the relationship between the return on sales and technical efficiency indicates that in 2005–2007 the vast majority of both subsets of farms were unprofitable and did not make a fully efficient use of the available production factors (Figure II.4). Naturally, it concerned problem farms and holdings in difficulty.

Figure II.4. Inclusion in KRUS, business profitability and technical efficiency in holdings with an economic size of less than 8 ESU (2005–2007)

Source: As in Table II.1.

It appears that a major share of either subset represented problem holdings. Nevertheless, farms without persons insured at KRUS and other farms also included developing holdings. At the same time, the proportions of leading holdings and farms in difficulty were only marginal, not exceeding 0.1% in either subset. Hence, in holdings of both subsets there was much potential and scope for income improvement.

Holdings with an economic size of 8 to less than 16 ESU

Between 2005 and 2007, farms with an economic size of 8 to less than 16 ESU and without persons insured at KRUS, as compared to other holdings, were characterised by a larger area of agricultural land (by 5.9%), lower total labour inputs (by 11.9%) and lower average farm capital (by 3.9%). Thus, the gap was narrower than in the case of smaller holdings analysed above. However, the former were more inclined to employ external factors of production – land and labour.

At the same time, holdings in both subsets distinctly differed in the capital/labour ratio. In the period in question, the difference was an average of 10.4% to the advantage of farms not subject to KRUS contributions, which is understandable. They were characterised by a higher level of the technologisation of labour, which involved greater substitution of farm work performed by the holder and members of his family with capital, and perhaps also with information and control activities.

The two subsets showed significant differences in farm income (Table II.2). In the three-year period in question, income in holdings not subject to KRUS contributions amounted to an average of PLN 32,300, which represented 83.6% of farm income obtained by the group of holdings compared. However, income per FWU was PLN, 21,600, i.e. roughly the same as in the other group of farms (Figure II.5). One of the underlying causes of this situation was greater substitution of capital for labour in holdings without persons insured at KRUS, as has been mentioned above.

Subsidies on current operations represented a special component of farm income in both subsets of holdings. In the three-year in question, their share in income from agricultural activities in holdings without persons insured at KRUS was an average of 41.4%, 5.8 percentage points higher than that in the reference farms. Most probably, it stemmed from lower income (excluding subsidies) obtained from agricultural production.

Table II.2

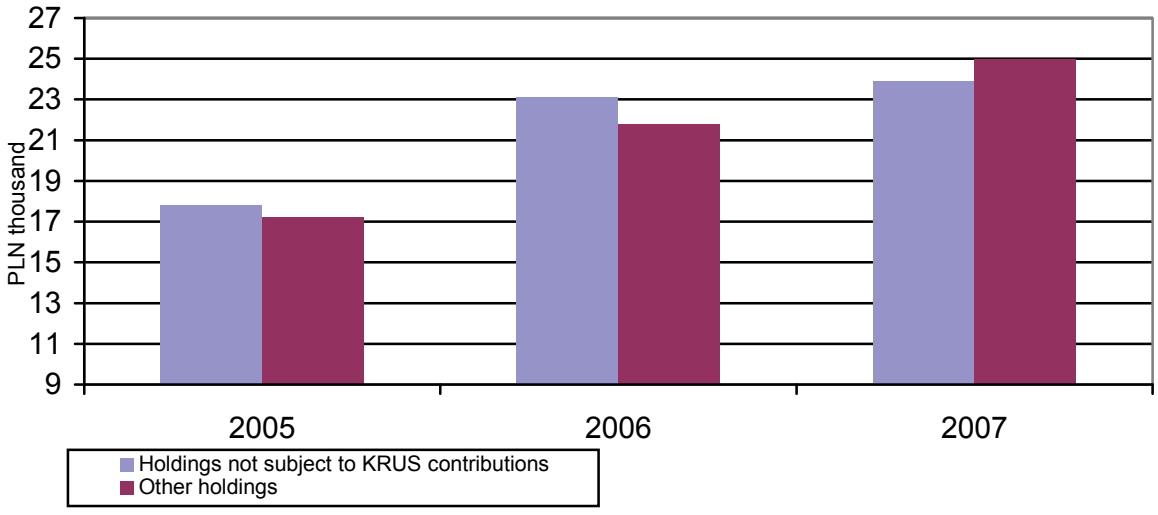
Farm income and the share of subsidies in farm income in holdings with an economic size of 8 to less than 16 ESU and without persons insured at KRUS as compared to the other holdings (2005–2007)

Variable	Unit	Holdings not subject to KRUS contributions			Other holdings		
		2005	2006	2007	2005	2006	2007
Income from agricultural activities	PLN thousand	31.0	32.3	33.7	30.3	39.2	43.3
Share of subsidies on current operations in farm income	%	33.8	53.5	37.1	35.3	42.0	29.5

Source: As in Table II.1.

Holdings of both subsets in question showed sufficient investment activity for capital extension. The capital replacement ratio in farms of persons not insured at KRUS was an average of ca. 0.8%, 0.1 percentage point lower than in the holdings compared. Therefore, it seems by all means justified to say that in 2005–2007 holdings without persons insured at KRUS and other farms mainly implemented minor investments, essential to maintaining the previous level of productive assets. At the same time, the indebtedness of farms in either subset hovered at 10–11%, i.e. their liquidity was not jeopardised. It should be presumed that holdings with an economic size of 8 to less than 16 ESU financed their investments partly from income.

Figure II.5. Farm income per FWU in holdings with an economic size of 8 to less than 16 ESU and without persons insured at KRUS as compared to other holdings (2005–2007)



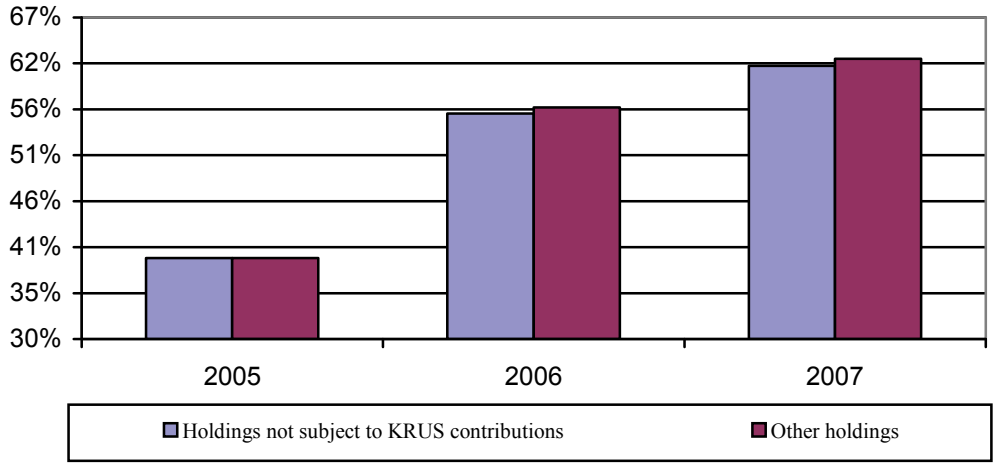
Source: As in Table II.1.

In the three-year period in question, in both analysed subsets of holdings the average return on equity was only slightly above zero. In farms without persons insured at KRUS and in other holdings it was 0.6% and 1.0% respectively. In such a situation, it was unprofitable to invest available funds in the farm. It was more reasonable to invest in bank deposits as in 2005–2007 the interest rate was an average of 4.6%.

The 2005–2007 annual average technical efficiency was very similar in the two groups of holdings in question (with a difference of a mere 0.5 percentage point to the disadvantage of those without persons insured at KRUS). But it should be emphasised that the rapid improvement in technical efficiency observed in both subsets of farms in subsequent years largely resulted from changed agri-climatic conditions and the situation in markets for agricultural products rather than from greater input/output efficiency (Figure II.6).

Both subsets of holdings showed polarisation into developing and problem farms (Figure II.7). In the period in question, in the group of entities without persons insured at KRUS the share of developing holdings reached an average of 42%, whereas problem farms accounted for 57.5%.

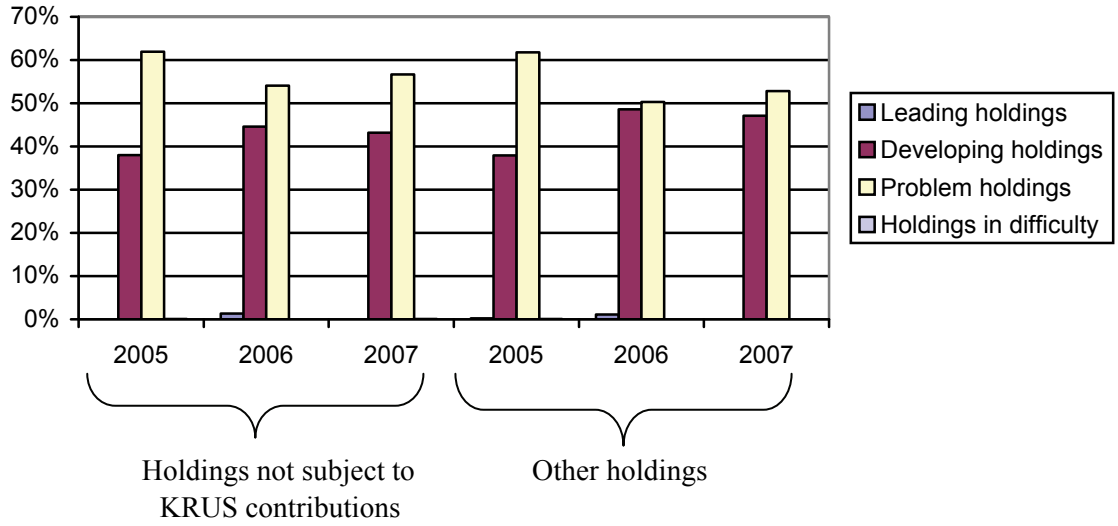
Figure II.6. Technical efficiency determined by the SFA method in holdings with an economic size of 8 to less than 16 ESU and without persons insured at KRUS as compared to other holdings (2005–2007)



Source: Own calculations based on the Polish FADN data.

The technical efficiency indices were roughly the same as those computed for other holdings (the reference group). The share of developing and problem farms was 44.5% and 54.9% respectively. The proportion of leading holdings and entities in difficulty was rather marginal in either subset. From every indication, there is significant potential in the holdings, as in the group of farms analysed above (with an economic size of less than 8 ESU). Mobilising this potential would undoubtedly result in improved farming efficiency.

Figure II.7. Inclusion in KRUS, business profitability and technical efficiency in holdings with an economic size of 8 to less than 16 ESU in 2005–2007



Source: Own calculations based on the Polish FADN data.

Holdings with an economic size of 16 ESU or more

In 2005–2007, holdings with an economic size of 16 ESU or more, held by natural persons and without persons insured at KRUS were characterised by higher employment (by 42.3%), larger area of agricultural land (by 81.6%) and a greater amount of average farm capital (by 58.2%) than other holdings. Such differences resulted from the use of external factors of production on a larger scale. Furthermore, in spite of distinctly higher total labour inputs, in the case of farms not subject to KRUS contributions the capital/labour ratio was 8.7% higher than that for other farms, which undoubtedly favoured the reduction in labour inputs by substituting this factor of production with capital.

Income from agricultural activities varied between holdings of the two subsets (Table II.3). In the three-year period in question, it was an average of PLN 64,200, i.e. ca. 62%, higher in farms without persons insured at KRUS than in other holdings. Farms not subject to KRUS contributions received more subsidies on current operations relative to income than other entities, due to a large utilised agricultural area.

Table II.3

Farm income and the share of subsidies in farm income in holdings with an economic size of 16 ESU of over and without persons insured at KRUS, as compared to other farms (2005–2007)

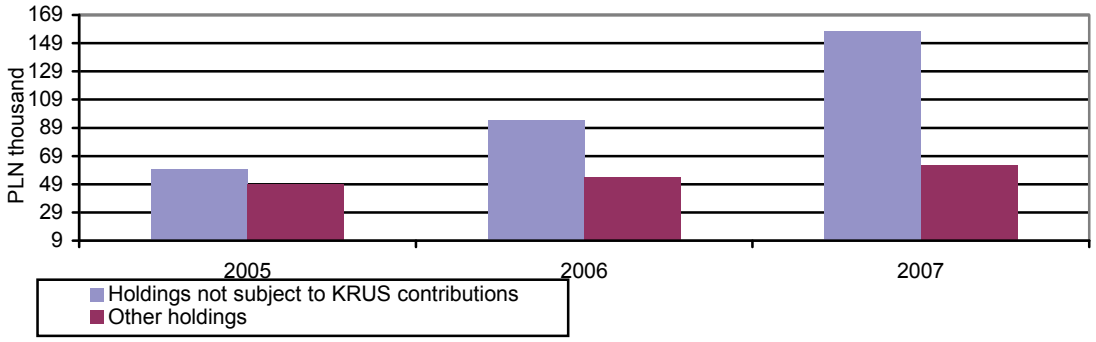
Variable	Unit	Holdings not subject to KRUS contributions			Other holdings		
		2005	2006	2007	2005	2006	2007
Income from agricultural activities	PLN thousand	110.8	141.6	252.1	92.4	102.9	116.8
Share of subsidies on current operations in income	%	29.1	47.9	30.1	27.5	35.1	25.1

Source: Own calculations based on the Polish FADN data.

The described differences in income from agricultural activities between the two subsets of farms were also reflected in income per FWU (Figure II.8). In this case, the difference was also to the advantage of holdings without persons insured at KRUS. In the three years in question, the average gap was 12.3%.

Capital extension was observed in holdings belonging to both groups. In 2005–2007 the annual average capital replacement ratio was lower (by 2.5 percentage points) in holdings without persons insured at KRUS than in other farms. It is probable that such farms see the prospects for agricultural activities in the future and therefore make development-oriented investments.

Figure II.8. Income per FWU in holdings with an economic size of 16 ESU or more and without persons insured at KRUS as compared to other holdings (2005–2007)



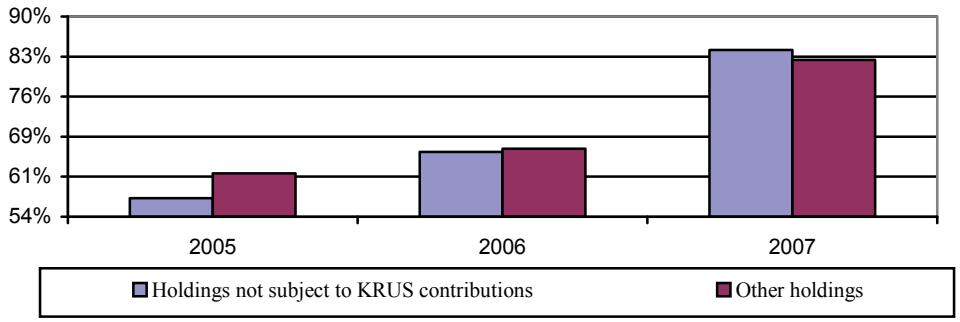
Source: Own calculations based on the Polish FADN data.

Some assets of farms of either subset were financed by external capital, but in the period in question its share did not exceed 20%. This level poses no threat to the financial standing of the analysed farms.

As far as return on equity is concerned, in the case of both subsets of holdings it was reasonable for farmers to invest free funds in their own holdings. In the three-year period in question, in farms without persons insured at KRUS return on equity reached an annual average of 11.4%, 2.3 percentage points higher than in the reference holdings. Between 2005 and 2007 the two subsets of

farms showed only minor differences in average technical efficiency (Figure II.9). In the case of holdings not subject to KRUS contributions and other holdings it was 69.2% and 70.3% respectively.

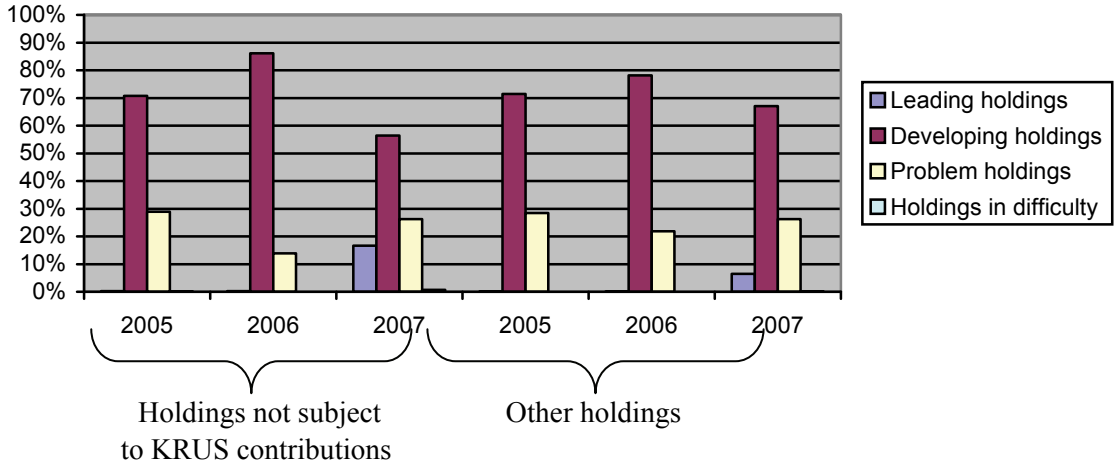
Figure II.9. Technical efficiency determined by the SFA method in holdings with an economic size of 16 ESU or more and without persons insured at KRUS as compared to other holdings (2005–2007)



Source: Own calculations based on the Polish FADN data.

The two compared subsets were dominated by developing holdings (Figure II.10). In the three years covered by the analysis, their average share was 71% in holdings without persons insured at KRUS and 72.2% in other holdings, thus the difference was marginal.

Figure II.10. Distribution of holdings with an economic size of 16 ESU or more, held by natural persons and not subject to KRUS contributions as compared to other holdings according to business profitability and technical efficiency in 2005–2007



Source: Own calculations based on the Polish FADN data.

The favourable situation of farms with an economic size of 16 ESU or more is also reflected in the fact that problem holdings accounted for 22.9% and

25.5%, respectively, of the total number of entities in the two subsets. It is worth adding that in 2007 leading holdings represented a marked share in either subset.

* * *

In agricultural holdings income from farming activities should perform the consumption, production and motivation functions, but in actual fact a number of smaller farms fail to ensure a sufficient level of income to fully serve the three functions. Therefore, holders of such farms are compelled to seek alternative incomes. At the same time, in the group of large and very large holdings the situation is different, although the consequences seem quite similar. Such entities steadily enhance technologies of agricultural production, extend the utilised agricultural area and increase capital, which has a favourable effect on agricultural income, and thus on the living standards of agricultural producers and their families. Not infrequently, in such large holdings raising the level of utilisation of objectified labour reveals excess workforce and spurs the search for additional sources of income. Hence, gainful off-farm employment grows in importance in the structure of income obtained by the farmer and his family members who hold large and very large holdings.

According to estimates, in Poland there are approx. 830,000 farms with over 1 ha of agricultural land where farmers combine farm income with gainful work outside the holding. It is indeed a significant number, but the Polish economic and agricultural literature continues to pay little attention to the issue. This report attempts to describe the characteristics of this numerous group of agricultural holdings.

According to the comparison of the economic situation and efficiency of farms without persons insured at KRUS and of other holdings (where at least one person is subject to KRUS contributions) in 2005–2007, the farm size plays a much greater role in farm economics than the structure of income obtained by families of agricultural producers. Furthermore, the analysis demonstrated the following:

● holdings without persons insured at KRUS and having an economic size of less than 8 ESU faced a difficult economic situation. They obtained a limited level of income, significantly dependent on subsidies. Moreover, the negative return on equity was also alarming as it effectively discouraged farm holders from undertaking investment projects, which is reflected in the continuing negative capital replacement. This group of farms had a considerable share of problem holdings, or those to run at a loss, even though there was scope for improving production efficiency;

● holdings without persons insured at KRUS and having an economic size of 8 to less than 16 ESU obtained lower income than other farms. As a matter of fact, they were characterised by a low return on equity, which resulted in the farmers' little interest in farm investments. In addition, the limited capital extension observed in the period in question indicates that actual investments were minor, rather insignificant. At the same time, it is worth stressing that developing holdings, i.e. those to report profits, but failing to make most efficient use of the available means of production, accounted for a major share in this group of holdings;

● as regards holdings with an economic size of 16 ESU or more, held by natural persons and not subject to KRUS contributions, the average income from agricultural activities was higher than in the case of other farms. Moreover, the former were distinguished by a very high return on equity, thus agricultural producers found it profitable to undertake farm investments, as reflected in capital extension. The structure of this group of farms was dominated by developing holdings, although their share declined in favour of leading holdings in 2007.

The analysis conducted above proves that in 2005–2007 it was possible to combine running an agricultural holding with gainful work outside the farm, regardless of its size. But only in large holdings (16 ESU or more) investments aimed at modernisation and capital extension were justified economically.

It should not be overlooked, however, that in the group of holdings without persons insured at KRUS income from agricultural activities only represented a certain share in the total income of the family of the agricultural producer.

Agricultural holdings in less-favoured areas (LFAs)

Holdings situated in less-favoured areas (LFAs) face various obstacles to agricultural production, resulting not only from economic conditions, but also from natural and demographic handicaps. Those include poor soil quality, unfavourable relief and rural depopulation. Upon EU accession, Poland started to apply the EU compensatory aid scheme. Its objective is to compensate agricultural holdings for the loss of income related to farming in less-favoured areas. Compensatory allowances depend on the area of agricultural land, and the payment rates vary between the four LFA categories. Farming in less-favoured areas represents a major problem as it concerns approx. 43% of farms in Poland, accounting for 57% of the total utilised agricultural area.

In the economic and agricultural literature, the issue of the performance of agricultural holdings in LFAs is rarely raised, and studies tend to be based on

partial or incomplete empirical materials. This section addresses the question of how farming handicaps affected the economic situation and investment activity of holdings in less-favoured areas in 2005–2007. The analysis covered farm located in areas categorised as the so-called Lowland I as well as mountain and submountain areas.

Holdings in LFA Lowland zone I[11]

According to the European Union regulations, lowland areas in need of special treatment (in the form of the so-called compensatory allowances) are considered to be those in danger of abandonment of agricultural land-use owing to difficult agri-environmental conditions. They include areas with handicaps limiting agricultural productivity due to poor soil quality, adverse climate, including water conditions, unfavourable relief, as well as those with a significant share of the farming population.

Lowland LFAs in Poland were determined according to the valuation index of the agricultural production area and a demographic criterion. The latter concerned districts (*gmina*) with a share of the working population engaged in agriculture exceeding 15% of the total population. However, districts not categorised as LFA could delimit LFAs at the level of geodetic districts only on the basis of the valuation index of the agricultural production area. Lowland LFAs were divided into two zones: Lowland I and Lowland II.

This section focuses on agricultural holdings situated in less-favoured areas classified as Lowland zone I. Such areas are between those characterised by favourable farming conditions and the Lowland zone II, with extremely unfavourable (as for lowland areas) conditions for agricultural production. The three-year period covered by the analysis allowed to largely eliminate the effect of random factors (such as volatile weather conditions and market fluctuations) on the variables in question. Furthermore, this section also examines the technical efficiency of farms as it indicates whether the holdings in question were capable of optimal transformation of inputs into outputs or not.

The report was prepared on the basis of data collected from nearly 9,000 holdings keeping farm accounts within the framework of the Polish FADN in 2005–2007. The survey sample was broken down by type of farming, namely: field crops, horticulture, milk production (dairy cows), pig or poultry farming (granivores) and non-specialist crop-livestock production (mixed).

[11] J. Sobierajewska gathered and compiled the empirical material which was used by W. Józwiak to write the text *Gospodarstwa rolne na terenach o niekorzystnych warunkach gospodarowania*, [in:] collective work ed. by W. Józwiak, *„Sytuacja ekonomiczna, efektywność funkcjonowania i konkurencyjność polskich gospodarstw rolnych osób fizycznych”*, IERiGŻ-PIB, *Program Wieloletni),* 2005–2009, No 132, Warsaw, 2009.

Table II.4

Characteristics of holdings in LFAs and in other areas (2005–2007)

Variable	Unit	Holdings in LFAs	Other holdings	Difference in % [(3-4)/4]*100
1	2	3	4	5
2005				
Utilised agricultural area	ha	35.3	38.9	-9.25
- of which: rented land	%	35.4	40.4	-5.0*
Total labour inputs	AWU	2.07	2.37	-12.65
- of which: paid labour	%	17.1	28.7	-11.6*
Average farm capital	PLN	415,695	493,881	-15.83
Farm income	PLN	51,223	51,905	-1.31
Compensatory allowances	PLN			
- share in income	%	8.3	0.5	+7.8*
Indebtedness	%	14.75	16.2	-1.45*
Capital replacement ratio	%	2.63	1.6	+1.03*
2006				
Utilised agricultural area	ha	40.5	40.9	-8.9
- of which: rented land	%	41.3	42.4	-1.1*
Total labour inputs	AWU	2.28	2.45	-6.9
- of which: paid labour	%	25.2	31.6	-6.4*
Average farm capital	PLN	482,031	512,268	-5.9
Farm income	PLN	78,990	63,160	+25.06
Compensatory allowances	PLN			
- share in income	%	7.0	0.7	+6.3*
Indebtedness	%	17.3	16.3	+1.0*
Capital replacement ratio	%	3.53	3.0	+0.53*
2007				
Utilised agricultural area	ha	40.0	40.5	-1.2
- of which: rented land	%	40.2	42.0	-1.8*
Total labour inputs	AWU	2.25	2.33	-3.43
- of which: paid labour	%	24.6	30.7	-6.1*
Average farm capital	PLN	511,516	527,652	-3.05
Farm income	PLN	68,935	76,194	-9.52
Compensatory allowances	PLN			
- share in income	%	6.0	0.4	+5.6*
Indebtedness	%	17.1	16.0	+1.1*
Capital replacement ratio	%	3.45	2.75	+0.7*

* Difference in percentage points (3-4).

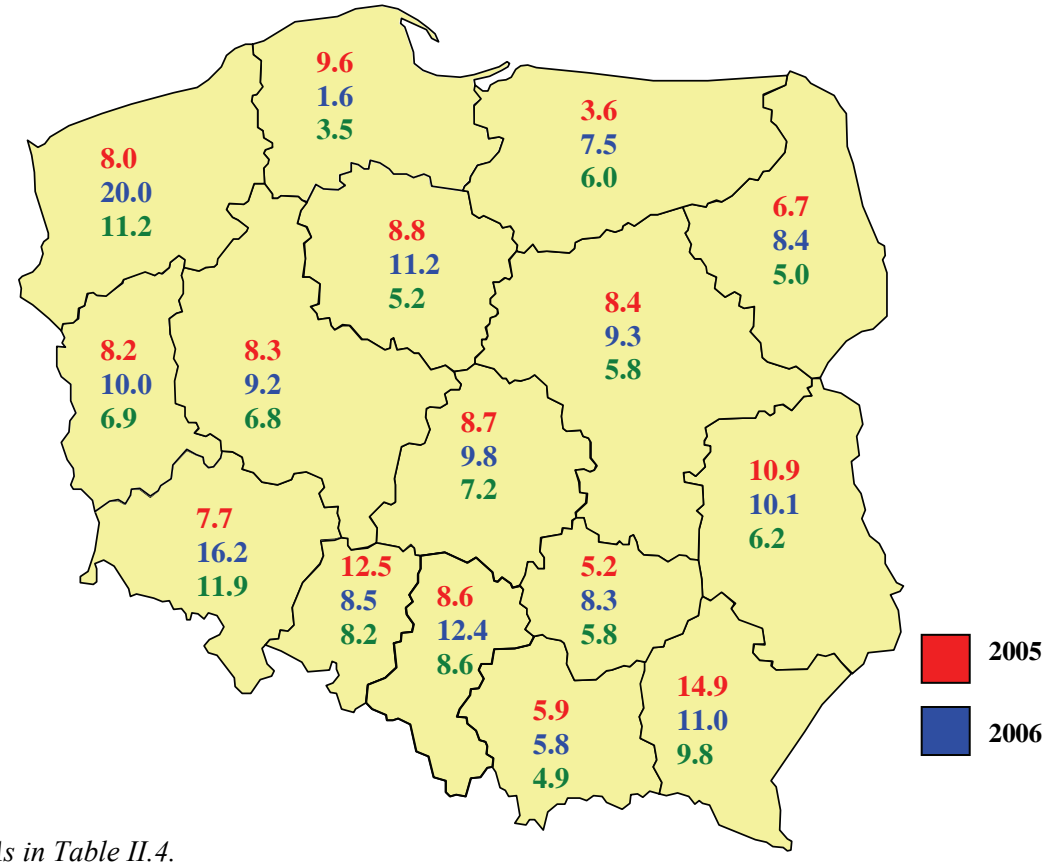
Source: Calculations by J. Sobierajewska on the basis of the Polish FADN data.

Holdings in each group were further divided into two sub-groups according to the location, i.e. LFA Lowland I and other farms, operating in areas characterised by favourable farming conditions. All the holdings in question were characterised by a large utilised agricultural area. Farms in LFAs and those from the reference group had at their disposal an average of 38.6 ha and 40.1 ha respectively, approx. five times more than the average area of agricultural land of Polish holdings. The terms used in this section were defined in the previous section.

It follows from Table II.4 that in 2005–2007 holdings in LFAs had an average of 3.7% smaller utilised agricultural area and 8.1% lower average farm capital in comparison with farms located in areas with more favourable farming conditions. At the same time, they incurred lower labour costs (by 7.6%). One reason for this situation was a lower share of rented land and paid labour. However, the compared groups of holdings used external capital nearly to the same degree.

In the three-year period in question, the annual average farm income in LFAs was ca. PLN 2,600 (by 4.1%) higher than in the reference holdings, mostly due to compensatory allowances. Their share in income obtained by farms in LFAs was an average of 7.1% in 2005–2007, whereas the respective proportion for holdings situated in areas with more favourable conditions was a mere 0.5%. Without compensatory allowances, farm income of LFA holdings would have been approx. PLN 2,100 (by 3.3%) lower than that of farms used for comparison. The share of compensatory allowances in income of the analysed holdings from LFA Lowland zone I varied between voivodships (Figure II.11).

Figure II.11. Share of compensatory allowances in farm income (%) in LFA Lowland I by voivodship (2005–2007)



Source: As in Table II.4.

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Since the rates were the same across Poland, it was due to regional differences in production intensity. The lower the intensity of production, the higher the share of compensatory allowances in farm income.

Farm income including all subsidies per unit of work performed by the farmer and his family members (1 FWU = 2,200 annual hours worked) was higher in holdings situated in LFAs, but in this case by a mere 1.1%.

LFA holdings allocated a part of farm income for investments rather than for consumption. Therefore, it can be presumed that compensatory allowances contributed to a similar level of the remuneration of family labour in LFA holdings to that noted in the reference farms, despite worse farming conditions, a smaller average area of agricultural land and lower average farm capital.

Both farms in LFAs and other holdings undertook sufficient investments to ensure capital extension, but in the three-year period in question LFA holdings appeared to be more active investors, as reflected in their capital replacement ratio, 0.7 percentage point higher. Thus, the gap in fixed assets narrowed between the compared sub-groups of farms.

The structure of LFA holdings differed from that observed in areas characterised by more favourable farming conditions. Farms engaged in mixed crop-livestock production accounted for the highest share of the former (47.0%), which is hardly surprising since organic fertilisation balance is of crucial importance when soil quality is poor. Not surprisingly therefore, the proportion of holdings specialising in the rearing of granivores (pigs and poultry) and dairy cows is also higher (by 10.7 percentage points) than in holdings located in other areas. However, it is rather puzzling that farms cultivating field and horticultural crops represented a relatively major proportion (nearly 23%). Rather few species of plants grown in Poland tolerate the conditions in areas with poor quality soils if organic fertilisation is insufficient.

Table II.5 presents figures describing the sub-groups of holdings in question broken down by type of farming.

Holdings specialising in field crops

Holdings where field crops contributed a predominant share to farm income were the largest farms in the group in question, and approx. 50% of agricultural land was rented. In addition, LFA holdings had at their disposal ca. 18% larger utilised agricultural area, but they also had lower employment and lower average farm capital than the farms used for comparison, by approx. 6% and 4% respectively. Although more heavily indebted (by ca. 5 percentage points), they were not in danger of financial collapse.

Table II.5

Characteristics of holdings broken down by type of farming, situated in LFAs and in other areas (annual average values for 2005–2007)

Variable	Unit	Field crops	Horticultural crops	Dairy cows	Granivores	Mixed
Holdings in LFAs						
Utilised agricultural area	ha	78.1	14.0	23.6	42.0	31.0
- of which: rented land	%	50.9	11.4	27.0	39.6	31.7
Total labour inputs	AWU	2.41	2.84	1.9	2.65	1.90
- of which: paid labour	%	36.1	45.6	2.3	33.8	11.5
Average farm capital	PLN	506,159	525,902	364,333	790,569	338,119
Farm income	PLN	61,939	51,041	56,076	140,816	37,730
Share of compensatory allowances in income	%	11	2.7	5.5	6.7	13.8
Indebtedness	%	23.4	13.3	12.0	19.5	11.3
Capital replacement ratio	%	2.1	1.6	4.6	3.0	1.6
Other holdings						
Utilised agricultural area	ha	66.3	12.5	23.5	26.3	36.1
- of which: rented land	%	48.4	12.3	28.5	26.8	39.9
Total labour inputs	AWU	2.56	2.92	1.97	2.08	2.1
- of which: paid labour	%	38.8	47.5	6.1	18.3	20.8
Average farm capital	PLN	525,346	598,808	389,796	579,462	421,673
Farm income	PLN	70,436	64,592	59,349	76,811	45,825
Share of compensatory allowances in income	%	0.6	0.2	0.5	0.6	0.7
Indebtedness	%	18.8	10.4	10.9	15.0	12.2
Capital replacement ratio	%	2.2	1.0	3.8	2.63	1.1

Source: As in Table II.1.

In the three-year period in question, the average income in LFA farms was PLN 8,497 (ca. 12%) lower than in the holdings used for comparison, despite considerably higher subsidies. Without compensatory allowances this gap would have increased to PLN 15,201 (i.e. to 21.7%).

Both compared sub-groups in question hardly differed in terms of share of efficient agricultural holdings, but this proportion was minor. At the same time, in both cases the share of entities where efficiency was lower than in the leading holdings reached ca. 98%. Hence, as many as 98 out of 100 farms specialising in field crops could boost their economic performance if they enhanced managerial skills, strengthened market links and improved their agronomic and zootechnical knowledge.

But significantly lower farm income did not restrain LFA holdings from undertaking investments ensuring capital extension, and the capital replacement ratio was nearly identical with that noted in holdings located in areas with more favourable farming conditions. In order to finance their investment projects, holdings in LFAs raised more loans.

Horticultural holdings

In terms of utilised agricultural area, holdings specialising in fruit production were at the other extreme as compared to farms with field crops. Those were the smallest holdings in the analysed group, although distinguished by the greatest employment and the highest share of paid labour.

Horticultural holdings in LFAs had at their disposal a 12% larger utilised agricultural area, but their employment and average farm capital were lower in comparison with the reference farms, by ca. 3% and 12% respectively. At the same time, their indebtedness was slightly higher (by 2.9 percentage points), although it was limited in both groups.

In the period in question, the labour force of and labour inputs by LFA holdings allowed to obtain an average of PLN 13,551 (i.e. 21%) lower farm income than that recorded in the compared farms. Without subsidies, however, the income difference would only have increased to PLN 14,447, i.e. 22.4%, owing to the fact that the small utilised agricultural area of such farms limited direct payments and that they received no compensatory allowances.

The share of profitable and efficient specialist horticultural holdings situated in LFAs was 5.6%, only a slightly lower proportion than in the case of non-LFA farms. Horticultural LFA holdings not making the most efficient use of agricultural inputs accounted for 93.5%, ca. 3 percentage points more than the figure for other holdings. Therefore, the share of farms under-utilising their potential was similar in both groups compared.

Despite a considerable income gap, horticultural holdings in LFAs showed similar investment activity to that observed in the case of other farms, i.e. they undertook investments ensuring capital extension, and the capital replacement ratio was even slightly higher. Most probably, it was due to greater use of loans, as has been mentioned above.

Holdings with dairy cows

The average LFA holding engaged in specialist dairy production had a utilised agricultural area nearly identical with that of the reference farms. Employment was also similar, but farm capital was approx. 12% lower.

Income obtained by holdings with dairy cows and located in LFAs was PLN 3,273 (i.e. 5.5%) lower in comparison with those operating in more favourable conditions. Without compensatory allowances, the income gap would have almost doubled, up to PLN 6,172, i.e. 10,4%.

There was a small group of profitable and fully efficient holdings, and the difference in share between the groups compared was marginal. At the same

time, the proportion of farms not making the most efficient use of their production factors was ca. 99%, which indicates a vast scope for improvement in the economic performance in either sub-group of dairy holdings.

The farms in question sought ways of enhancing their efficiency through investments. They were even distinguished by the highest capital extension ratio among all the analysed groups of holdings, and the ratio for LFA entities was additionally 0.8 percentage point higher than that for farms situated in areas with more favourable conditions. Most probably, this difference was attributable to more frequent use of loans since the indebtedness of LFA holdings was 1.1 percentage point higher.

Holdings rearing granivores (pigs and poultry)

Holdings located in LFAs and engaged in specialist pig and poultry farming had at their disposal a much larger (by 15.7 ha, i.e. approx. 60%) utilised agricultural area than farms operating in more favourable conditions. They were also characterised by 27.4% higher employment and 36.4% higher farm capital. It means that the capital/labour ratio[12] was approx. 7% higher, and the area of agricultural land per full-time worker (1 AWU) was ca. 25% larger.

Higher land/labour and capital/labour ratios as well as greater labour inputs by LFA holdings stemmed from greater use of rented land, paid labour and loans.

The above-mentioned differences between the sub-groups compared resulted in a major income gap: farms operating in LFAs obtained 83.3% higher income than the reference holdings. Without compensatory allowances, the gap would have narrowed to 72.1%.

It should be added that among LFA holdings those engaged in pig and poultry farming obtained higher income than entities in all the other sub-groups in question. Farm income per full-time person equivalent of family labour (1 FWU) was ca. triple the parity rate[13] of labour remuneration. The respective ratio calculated for non-LFA holdings rearing granivores was much lower, but it still exceeded the parity rate by 70–80%.

In both sub-groups compared, farms engaged in specialist pig and poultry farming were characterised by similar shares of profitable and fully efficient entities. Therefore, the proportion of holdings not making the most efficient use of their potential was almost identical, at ca. 97%, which suggests significant opportunities for improving economic results without major investments in means of production.

[12] The value of farm capital per full-time worker.
[13] Equal to the average net wages and salaries in the whole national economy.

Capital extension was observed in holdings of either sub-group, and the capital replacement ratio was even somewhat higher in LFA farms.

Non-specialist (mixed) holdings

The average utilised agricultural area of LFA holdings engaged in mixed crop-livestock production was 14.1% smaller in comparison with farms situated in other areas. Employment and capital were also lower (by 9.5% and 19.8% respectively). It was due to limited use of external factors of production. Therefore, it is hardly surprising that LFA holdings obtained PLN 8,095 (i.e. 17.7%) lower income than the reference farms. Had farms of both sub-groups in question not received compensatory allowances, the gap would have widened to PLN 12,981 (i.e. to 21.8%).

Farm income in LFA holdings engaged in mixed crop-livestock production was lower in comparison with holdings of all the other sub-groups. Furthermore, income per FWU was below the parity rate of labour remuneration.

Efficient holdings accounted for a minor share, nearly identical in both sub-groups in question. It means that the proportion of not fully efficient entities was also similar, at approx. 99%. Thus, there was a vast scope for improving the economic performance of the analysed farms.

Non-specialist holdings undertook investments as well. Their investment activity allowed capital extension, and the capital replacement ratio was even slightly higher in farms located in LFAs. The use of loans to finance investment projects was similar in the two sub-groups compared, as reflected in their indebtedness.

* * *

It is a general belief that holdings in less-favoured areas (LFA holdings) are less prosperous owing to handicaps resulting from unfavourable natural conditions. In order to verify this opinion, this section analysed a sample of farms operating in LFA Lowland zone I between 2005 and 2007. The field of observation excluded holdings with a utilised agricultural area of up to 8 ha and an economic size of less than 2 ESU.

Thus, what were the distinguishing features of LFA holdings as compared to those operating in areas with favourable conditions for agricultural production (other holdings)? The conducted analysis allowed to draw several conclusions.

1. The structure of the analysed sample of LFA holdings differed from that of farms situated in areas with more favourable conditions. Non-specialist holdings, engaged in mixed crop-livestock production, accounted for a predominant share (47.0%), which is hardly surprising since organic

fertilisation balance is of crucial importance when soil quality is poor. For the same reasons, it is also understandable that the proportion of specialist holdings rearing pigs, poultry and dairy cows was higher (by 10.7 percentage points) than in other areas. However, it is rather puzzling that farms cultivating field and horticultural crops represented a relatively major proportion (nearly 23%). It could contribute to the high share of not fully efficient holdings with field crops. After all, rather few species of plants grown in Poland tolerate the conditions in areas with poor quality soils if organic fertilisation is insufficient.

2. Holdings engaged in specialist pig and poultry rearing were distinguished by substantial farm income and capital. Furthermore, in the three-year period in question in LFA holdings representing this type of farming the annual average income per holding was 83.3% higher than in their counterparts operating in favourable conditions. It stemmed from the fact that LFA holdings were characterised by a considerably higher share of compensatory allowances in farm income and had at their disposal a much larger utilised agricultural area (by ca. 60%) and higher capital (by 36.4%). They were also distinguished by 27.4% higher employment. The prime reason for this situation was greater use of external factors of production.

Both LFA holdings and other farms undertook investments ensuring capital extension, also using external funds. Nevertheless, not fully efficient entities accounted for approx. 97% of holdings in either sub-group.

3. LFA holdings representing the remaining four types of farming in question (field crops, horticultural crops, dairy cows and mixed crop-livestock production) obtained lower income than farms operating in favourable conditions. The gap ranged between 5.5% in the case of specialist dairying and 21% for horticultural crops.

Such differences cannot be solely attributed to the insufficient level of compensatory allowances which contributed from 2.7% to 13.8% to farm income, depending of the type of farming. The income gap stemmed from a smaller area of agricultural land, lower farm capital and lower labour inputs. The average LFA holding had a smaller utilised agricultural area (by 3.7%), a lower value of other capital (by 8.1%) and allocated a lower labour input (by 7.6%). Importantly, farms in LFAs used external factors of production (rented land, loans and paid labour) to a lesser extent.

The reasons for little interest shown by the holders of LFA farms in using external production factors could be twofold: subjective and/or objective. As regards the former, those concern agricultural producers' attitude to risk-taking and their level of knowledge, whereas the latter comprise the market supply of land and labour. Agricultural producers in LFAs were not risk-averse

since their investment activity allowed capital extension, as in the case of those operating in areas with more favourable conditions. Furthermore, agricultural producers in LFAs were not inferior to their counterparts in areas with more favourable conditions in their level of knowledge and farming skills, which is reflected in a very similar share of those operating below full production efficiency (93.5–99%). However, they might face the barrier of insufficient supply of land and labour.

4. According to surveys carried out in previous years (2007 and 2008), LFA holdings with a similar size received higher total subsidies than farms in other areas in respective years. But without compensatory allowances, income obtained by holdings in LFAs would have dropped by 1.4% to 11.2%. Horticultural holdings would have been the least affected, whereas it would have hit the most those specialising in field crops, pig or poultry rearing.

5. It is rather puzzling that the vast majority of agricultural producers, both those operating in LFAs and in areas with more favourable conditions, are disinclined to improve their income by increasing production efficiency. Only minor differences in this respect were observed between the types of farming in question. The situation in horticultural holdings was slightly better, whereas it was the worst in the case of farms engaged in specialist dairying. Could it mean that the knowledge once learned at school and at a young age is not further improved in later life? The corroboration of this hypothesis would imply that Polish agricultural producers are not accustomed to constantly improve their managerial and marketing skills or their agronomic and zootechnical knowledge.

Holdings in mountain and submountain areas[14]

Mountain and submountain areas are characterised by major handicaps for agricultural land-use and significantly higher production costs than lowland areas. They include various environments. High mountain areas are distinguished by a relative height of over 800 metres and rocky slopes. Medium and low mountain areas (with a relative height of 400–800 metres and 250–400 metres respectively) are dominated by steep slopes (the slope angle of 30% or more) and the so-called skeletal (rock) soils. The submountain type of relief with wide humps and a varying slope angle (10% to 30%) is typically characterised by concave-convex slopes and level valley floors.

[14] Prepared on the basis of: (a) Prof dr hab. W. Musiał: *Uwarunkowania rozwoju i specyfika rolnictwa Karpat Polskich*, typescript, Kraków, December 2009, and (b) Dr T. Wojewodzic: *Zjawiska schyłkowe w gospodarstwach osób fizycznych i prawnych na obszarze Karpat Polskich*, typescript, Kraków, December 2009. Both authors are researchers at *Instytut Ekonomiczno-Społeczny* (Economic and Social Institute) of *Uniwersytet Rolniczy w Krakowie* (Kraków University of Agriculture).

Furthermore, mountain and submountain areas in Poland have a much shorter vegetation period than the country's lowland regions.

In Poland the so-called LFA Mountain zone includes districts where more than half of the utilised agricultural area is situated at altitudes exceeding 500 metres above sea level. It comprises districts located in the Polish Carpathians and Sudetes.

Considerable land fragmentation and difficult farming conditions have become important reasons for limiting agricultural production in holdings situated in mountain and submountain areas. This section aims to analyse such farms operating in the *poviat* of Wadowice in western Małopolska. The *poviat* is partly located in the Western Beskids, and partly in the Western Beskid Foothills. In the *poviat* there are approx. 11,000 agricultural holdings with a utilised agricultural area of over 1 ha. Ca. 50% of this group have an area of agricultural land of 1 to 2 ha, and another 40% – 2 to 5 ha. The small farm size has long forced the rural population to seek additional sources of income outside agriculture. In this *poviat* approx. 70% of agricultural holdings limits their production.

The analysis was based on an empirical field survey carried out in 2007 on the sample of 262 holdings held by natural persons. The average utilised agricultural area of the surveyed farms was slightly above the average for the *poviat*, nearly 4 ha, and family labour inputs to agricultural production were very high (ca. 0.27 FWU per ha of agricultural land).

The survey sample was divided into six groups, depending on the period when a given holding was taken over by its current holder: group A/ 1960–1969, B/ 1970–1979, C/ 1980–1989, D/ 1990–1994, E/ 1995–2000 and group F/ holdings taken over after 2000.

It should be added that the *poviat* of Wadowice is not fully representative of mountain and submountain areas. Therefore, the analysis conducted should be treated rather as a case study showing trends characteristic of the Western Beskid Foothills and the Western Beskids.

The concepts of the diversification of incomes obtained by farming families and the so-called multifunctional rural development, popularised in the past two decades, has been successfully implemented in this region. Combined with land fragmentation and relatively easy access to jobs in local and regional economic centres, it has stimulated taking up off-farm employment, which strengthened the model of peasant-worker families. Consequently, the argument that holders of small holdings situated in the Beskid Foothills need to supplement agricultural income by taking up jobs outside agriculture should be dismissed. Rather, a hypothesis should be put forward that small farms (the so-

called supplementary holdings) held by families whose main source of income is off-farm employment represent a factor hindering the modernisation of agriculture and agrarian transformation in the Carpathian countryside.

The downward trends observed in the farms in question should be reflected in a substantial supply of agricultural land in the local market. Instead, limited land supply is characteristic of the surveyed holdings, which hampers the expansion of farms with development potential. Transactions involving agricultural land tend to be concluded between family members or neighbours, and at an early stage they usually concern land lease. The interest in the lease of agricultural land is limited by the common practice of retaining by the land owner the "entitlement" to receive direct payments and to pay social security contributions to KRUS, even though the owner also has financial obligations arising from land ownership (agricultural tax and insurance against civil liability). Furthermore, the willingness to sell or formally lease the land owned, commonly declared in 2004, also reduces compensatory allowances for farming in less-favoured areas (LFAs) as any transactions involving the land are formally precluded for five years from the date of receiving the first allowance.

Only 11.4% of the surveyed holdings sold their land in 2001–2006, and the transactions usually concerned agricultural parcels of over ten to several dozen ares. At the same time, a mere 5.2% of the farms reported leasing their land after 2000, and another 10% of the holdings had done so earlier. The average area of land leased was approx. 3 ha, which suggests that individual farms leased almost the whole area of the land owned. The described phenomenon of land lease is very often informal, and farmers are reluctant to reveal it even in anonymous surveys. Thus, it can be presumed that land lease is somewhat more frequent.

The possibility of selling their agricultural land in the future was only declared by ca. 5% of the surveyed farmers. It was far more frequent (approx. 25% of the respondents) for them to consider dividing the land into plots (implicitly: building plots), on account of the substantial increase in the value of land. In most cases, however, dividing the holdings into plots will be very difficult for reasons such as an unfavourable shape (long and very narrow plots), no possibility to indicate access roads, unresolved property ownership issues, etc. Such hindrances may contribute to an increased interest in land lease and the set-aside of land. At the time of the survey, the latter solution was being considered by 15–16% of the respondents. Most frequently, however, the farmers wished to continue land cultivation or to transfer the land to a successor.

Increasingly often, the taking over of the holding by a successor or the division of the holding between the descendants is formal. In practice, however,

the new owner (owners) very frequently remains a helper, at most, of the former holder of the farm (the parents, parents-in-law). Such actions are sometimes aimed to obtain the entitlement to agricultural social security benefits, i.e. pensions.

The survey findings have produced evidence of a purely formal character of land transfers. Thus, persons who took over a holding after 2000 performed an average of 53.5% of farm work, whereas the time spent on farm work accounted for a mere 38.9% of their working time. It follows that much of the farm work was performed by the older generation. Both above-mentioned indicators rose as the duration of holding of a given farm by the current owner increased.

In 2007 only every tenth respondent was inclined to invest in agricultural land. The propensity to invest in land varied depending on the period of holding of a given farm and the respondent's age. In the group of respondents who took over their farms before 1960 and after 2000 the share of those disposed to invest in agricultural land was several percent, whereas it slightly exceeded 23% in the case of persons who took over their holdings in 1990–1994. Such results should be primarily attributed to the respondents' age. Older people associated land mainly with farm work which was becoming ever more burdensome for them, and younger respondents tend to have different priorities from the responsibility for the agricultural holding, usually unwanted.

Agricultural activities are very rarely the sole source of income for the surveyed farming families. A mere 1% of the surveyed families with agricultural holdings had no non-agricultural livelihoods. At the same time, it is common to obtain income from gainful work performed for other economic operators: as many as three-fourths of the surveyed families had incomes from gainful employment, and 60% of the respondents considered it to be the main income source for their families. Agricultural and non-agricultural pensions (including those arising from employment in former state-owned enterprises) constituted an important source of income for nearly half of the surveyed families, and in the case of 27.5% of the respondents they represented the main income source. In the survey sample the importance of income from gainful employment diminished as the period of holding of the farm by the current owner (owners) lengthened, and the opposite was the case for the role played by social security benefits (Table II.6).

Farm owners' age, changing lifestyles and the fact that agriculture as a section of the economy is in decline all affected the trends observed. Certain deviations from those patterns could be found only in the case of holdings taken over after 2000. Most probably, some owners belonging to this group continued

their education, thus having limited opportunities to take up paid employment. Furthermore, this group of holdings was characterised by the highest share of families reporting non-agricultural economic activity (self-employment) to be their main source of income.

Table II.6

Main sources of family income
(depending on the period when the holding was taken over)

The holding taken over in:	Paid employment		Non-agricultural economic activity	Social security benefits	Agricultural production
	in Poland	abroad			
A/ 1960–1969	21.4	0.0	0.0	78.6	0.0
B/ 1970–1979	50.0	2.6	2.6	36.8	7.9
C/ 1980–1989	57.7	0.0	6.4	25.6	10.3
D/ 1990–1994	60.0	3.3	10.0	16.7	10.0
E/ 1995–2000	86.7	0.0	0.0	13.3	0.0
F/ after 2000	61.9	4.8	14.3	19.0	0.0
Average	58.8	1.4	5.7	27.5	6.6

Source: study by T. Wojewodzic (see footnote14).

The introduction of area payments in 2004 and their dependence on the maintenance of good agricultural conditions stopped the intensifying process of setting-aside of land, and agricultural production was restored on certain areas previously set aside.

However, the surveyed holdings showed a tendency to extensify agricultural production. Larger farms increased production intensity only sporadically, at the expense of the intensity of organisation.

The upward trend of area under cereals, observed across Poland, was also found in the surveyed agricultural holdings. The increased importance of cereals was particularly evident in farms taken over after 2000 and in those held by persons at retirement age. In the two groups in question, the average share of area under cereals in the total utilised agricultural area went up by a dozen or so percentage points over a few years. It may confirm the thesis that young people, agreeing to take over the holding, simplify production and choose less labour-intensive types of farming. The trends observed are also partly attributable to the cessation of agricultural production in farms held by elderly people.

Moreover, the survey findings also suggest that the land rented to holdings with development potential is almost always sown with cereals. It limits the so-called patchwork of crops. Farms ceasing agricultural production rent their land to a nearer or farther neighbour who removes the boundary strips and creates larger fields under one cereal species. Thus, relatively large homogenous stretches of land, with an area of several hectares, appear in the

patchwork of crops typical of this region. If land in proximity to a holding engaged in livestock production is leased on a long-term basis, it is usually under the monoculture of maize for silage after the field has been fertilised with solid dung.

The farms in question limited or discontinued the production of potatoes, even for own consumption. Potatoes were grown by 86% of the surveyed holdings, with the average area under potatoes reduced to 0.34 ha, whereas in the majority of the farms it did not exceed a dozen or so ares. There were significant changes in the scale and structure of livestock production. In the surveyed holdings livestock density reached 0.24 livestock units (LSU) per ha of utilised agricultural area (UAA), i.e. it was 56% lower than at the moment of take-over.

Approx. 87% of the surveyed holdings were active in livestock production, and farms with cattle and/or pigs accounted for 72.0%, which means that 15.2% of the total number of the surveyed farms only kept poultry.

In 2006 the average number of cattle per farm in the surveyed holdings was 2.2, ca. one-third lower than in the period of take-over. In addition, no sheep farming was reported. Thus, the current ruminant population was not only unable to rationally consume the green fodder produced, but it was also too small to perform environmental and landscape functions.

As regards the average stock of pigs and poultry in holdings keeping such farm animals, in 2006 it was 6 and 20.5 heads respectively. Therefore, as in the case of the rearing of cattle, the scale of pig and poultry farming was very small.

The causes of the reduction or cessation of agricultural production by the surveyed holdings should be sought in the economic and social areas. As regards economic reasons, the respondents indicated the unprofitability of production and difficulties with selling their agricultural products (Table II.7). Characteristically, insufficient farming efficiency was not an issue. Furthermore, economic analyses of the reasons for limiting output cannot exclude other aspects: health problems, a complicated family situation or difficulties with combining farm work with gainful activity outside the holding.

General access to education, patterns and models derived from the media as well as other factors lead to changes in needs and expectations, and consequently to changes in lifestyles and to the blurring of distinctions between the living conditions in rural and urban areas. The rapid economic growth encourages taking up employment outside agriculture. Under such circumstances, young people are disinclined to engage in agricultural activities, even if they agree to formally take over the holding. Thus, agricultural production is very frequently continued only thanks to the persistence of older

persons or with the aim of supplying the family with products of a certain (known) quality.

Table II.7

The reasons for the reduction or cessation of production

Specification	Share of respondents (%)
Health problems	38.2
Family situation	15.6
No successor, the reluctance of young people to engage in farm work	46.9
Difficulties with combining farm work with employment outside the holding	38.5
Going abroad	10.3
Unprofitable production	77.5
Difficulties with selling agricultural products	35.9
Unforeseeable circumstances	4.2
Lack of funds for farm equipment	26.0
Other	5.0

Source: Musiał W., Wojewodzic T.: Przesłanki upadku ekonomicznego gospodarstw rolniczych na obszarach górzystych, Problemy Zagospodarowania Ziem Górskich, PAN, Issue 55, Warsaw 2008.

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The processes of reducing or ceasing agricultural production in regions characterised by significant land fragmentation, particularly in mountain areas, tend to be much more rapid than in other regions of Poland. Even in the period preceding the survey, work in small agricultural holdings could not ensure a fair income to the farmers and their families. According to the surveyed farmers (respondents), agricultural production represented the main source of income for a mere 13.6% of their neighbours formally regarded as farmers, and by 2007 every third holding had stopped agricultural activities, and the land was rented or set aside. A considerable share of the population of the region in question went abroad to take up employment. The respondents expressed opinions that in the years to come the share of holdings which would have ceased farming would increase to 50%, and 35% of the farmers would be willing to sell their land. Presumably, such expectations are rather exaggerated, primarily due to unresolved property ownership issues, restrictions on the reclassification of agricultural land as building plots and very fragmented agricultural parcels.

The analysis has confirmed accelerated processes of reducing production and the economic decline of the surveyed agricultural holdings. The vast majority of those are economically weak farms which have already accepted the downward trend of their agricultural activities. Even if such entities had free

funds at their disposal, they would be very reluctant to invest in the restoration and enhancement of the farm potential.

There are grounds for arguing that in most of the surveyed holdings the processes of economic decline will be permanent. The reality of farming is that holdings with an area of several hectares, with a traditional non-specialist production profile, do not have a satisfactory level of income or the profitability of production. The current support instruments available under the CAP are not sufficient to prevent the reduction in agricultural production by small holdings, particularly by those situated in mountain areas.

For a long time, in such areas there were peasant-worker holdings where agricultural income was supplemented with income from paid off-farm employment. At the same time, there were farms enhancing their production potential, becoming the so-called specialist holdings, leading holdings, etc. On account of the upswing in the economy observed at the turn of the 21st century and the declining character of agriculture as an economic sector, agricultural income has diminished in importance, as a result of which the large majority of peasant-worker and agricultural holdings in the region have become supplementary holdings, auxiliary or even social holdings. Consequently, this region witnesses the development of a new balance and the formation of a new model of agriculture, with the following features:

- few agricultural enterprises and large commercial holdings held by natural persons, mostly located in the Beskid Foothills, capable of exploiting the benefits of the Common Agricultural Policy;
- stable supplementary agricultural holdings where the main sources of family income are gainful employment outside agriculture and agricultural support transfers;
- dormant agricultural holdings, making their land available to other farms in exchange for maintaining it in good condition and minor rents;
- speculative holdings whose owners hold or acquire land for non-agricultural purposes such as an employment of capital, the preparation of land for non-agricultural investments, access to preferential KRUS insurance;
- residual holdings, with land which will not attract holders or buyers, owing to relief, location, land configuration or other parameters.

Institutional measures should be aimed to strengthen stable supplementary farms and agricultural holdings with development potential. Processes of the "phasing out" of production should not be hampered; on the contrary, efficient transfer of means of production to farms where they would be put to better use should be promoted. The stimulation of economic growth will speed up the outflow of labour force from agriculture to other sections of the economy, but it

will also accelerate the freeing of land. Redefining an agricultural holding and reducing public support for speculative and residual holdings will enable greater assistance to the remaining groups of farms.

Consideration should be given to a possible introduction of premiums for the so-called dormant holdings, in exchange for concluding long-term lease contracts to guarantee the availability of land to agricultural enterprises, economically viable holdings held by natural persons and stable supplementary farms. This would facilitate the maintaining of agricultural production potential in this region. It is indispensable to take measures aimed to streamline land consolidation as this is the only way to stimulate transactions involving land and to avoid an uncontrolled spreading of bushes and trees in certain areas which would then be unfit for agricultural production. Entities excluded from support granted under the Common Agricultural Policy should be covered by the social policy.

The economic decline of a holding need not be dramatic for the farming family involved, insofar as the process is gradual and allows family members to take up jobs outside agriculture. Technological and organisational progress or the development of stable supplementary holdings and agricultural enterprises would not be possible without the economic decline of some farms.

Profitability of material factors of production[15]

This section aims to identify the economic conditions determining the stock of land and other resources in agricultural holdings as well as labour inputs involved. To this end, it examines the marginal profitability of material factors of production: land, capital and labour.

The section contains the summarised results of surveys conducted mainly in 2005–2007. Analyses of the profitability of material production factors were based on data collected from family farms keeping farm accounts under the Polish FADN. Due to the fact that the empirical data were not weighted, the findings only concern the holdings in question and the resulting conclusions should not be generalised to the field of observation of the Polish FADN.

Marginal profitabilities were analysed by estimated regression equations, with gross income from production factors as the explained variable. This income is the sum of family farm income determined according to the method adopted by the Polish FADN, the remuneration of external factors of

[15] This section was prepared on the basis of the text by T. Czekaj: *Dochodowość materialnych czynników produkcji w latach 2005-2007*, collective work ed. by W. Józwiak, "Sytuacja ekonomiczna, efektywność funkcjonowania i konkurencyjność polskich gospodarstw rolnych osób fizycznych", IERiGŻ-PIB, *Program Wieloletni* 2005–2009, No 132, Warsaw, 2009.

production (paid employment[16], rent, interest paid on loans) and depreciation allowances (this variable was denoted *Y* in the equations. For the sake of simplification, "gross income from material factors of production"[17] is referred to as "income" below.

The explaining variables in the estimated regression equations are as follows: labour input expressed in AWU (Annual Work Unit), denoted *L*; the utilised agricultural area of the holding (owned and rented) in hectares, denoted *A*[18]; the value of average farm capital (livestock, permanent crops, irrigation equipment, farm buildings, machinery and equipment, circulating capital) expressed in PLN thousand and denoted *K*. The estimation random error in regression equations was denoted ε.

The assumption was that the holdings were characterised by a production technology which could be described by the Cobb-Douglas power production function. The adopted power form is a trade-off between the quality (goodness) of fit and interpretation capacity. The estimated functions (regression models), even though they concern microeconomic input-output relationships, do not represent production functions of individual farms, but those of the whole groups of holdings. Therefore, they are aggregate production functions.

The estimated regression models were characterised by a good fit to empirical data, as reflected in the coefficients of determination (R^2)[19] ranging from ca. 0.50 to ca. 0.80, which means that the three explaining variables used in the model explained the variance of income in approx. 50–80%, whereas the remaining, unexplained variance should be attributed to variables excluded from modelling (e.g. those describing management quality, etc.) and random errors. At the same time, the estimated models were characterised by high values of

[16] The remuneration of non-family labour only comprises expenses recorded in farm accounts under the Polish FADN, whereas it excludes other costs related to hired workers, e.g. the costs of board and lodging incurred by some agricultural holdings.

[17] According to the methodology adopted by the Polish FADN, gross income from material factors of production can be presented as follows: Y = SE420+SE360+SE365.

[18] In holdings representing the type of farming "vegetables and flowers" the "input" of land is considered to be the area under horticultural crops, and in holdings specialising in "permanent crops" – the area of orchards, as previous analyses suggested that they significantly influenced the dependent variable. In the case of other types of farming, the "input" of land is the total utilised agricultural area.

[19] In the case of estimating an power production function by log-linearising it, one should bear in mind that the coefficient of determination given by the computer concerns the logarithmic model. In order to establish to what degree the variance of the dependent variable is explained by the variance of independent variables in the power production model, the coefficient of determination needs to be computed e.g. using the equation below [Greene W.H.]:

$$R^2 = 1 - \frac{\sum_{i=1}^{n} e_i^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2}.$$

standard errors of estimation (at the level of the mean value of the dependent variable). This is not an error as the models do not serve the purpose of forecasting, being only estimated in order to determine the quantitative relationships between inputs and output.

The estimated models were applied to conduct substantive examination, with a focus on the analysis of marginal profitabilities of specific factors of production.

Marginal increases in income were calculated using general equations for the power production function. In order to compare marginal profitabilities with average unit costs of the remuneration of external factors of production incurred by the holdings in question, the profitability of such inputs was computed. The following equation was used to establish the profitability of specific production factors:

$$E_i = \frac{\Delta Y_i - jK_i}{jK_i}$$

where:
E_i – profitability of production factor i (i = L, A or K),
ΔY – marginal increase in income (profitability) arising from increasing the input of production factor i by one unit,
jK_i – unit cost of production factor i.

In the case of labour input, the analysis concerned the marginal profitability of one man-hour and the cost of remuneration of one man-hour of paid labour. The unit cost of remuneration of paid labour was subtracted from the marginal increase in income from factors of production, and this value was compared to this cost.

The analysis of the profitability of expenses incurred on expanding the stock of land was conducted for land lease. In the first version, the unit cost of land lease was assumed to be the actual average cost of the lease of agricultural land in the holdings in question. It was presumed that, in order to establish the profitability of inputs of the land purchased, the increase in income from factors of production should be adjusted by the cost of leasing an additional 1 ha. Income from production factors includes this remuneration, and in the case of land purchase the marginal value of income would be artificially overvalued to include the rent. This adjusted marginal income from factors of production was divided by the cost of acquisition of 1 ha of land.

The starting point for assessing the profitability of capital inputs (working capital) to production was to determine the average interest rate on external capital borrowed by the holdings in question, comparing the costs of repayment of loans reported in farm accounts to the estimated value of external

working capital. The last value was calculated on the assumption that working capital had the same ownership structure as total capital.

On the basis of the estimated regression equations, marginal profitabilities of the three analysed material production factors were established. Those were used to calculate the profitabilities of labour, land and capital for average holdings in the six economic size groups between 2005–2007 and the annual average results for the three-year period. The subsequent sections of the report present the analysis results for holdings broken down by type of farming and level of specialisation.

Type of farming "field crops"

The profitability of material production factors in holdings representing the type of farming "field crops" (with such crops representing a predominant share in the standard gross margin) was analysed using regression equations estimated for approx. 2,500 farms. The equations were characterised by a high goodness of fit, which was reflected in the coefficients of determination at ca. 0.80. It follows that, as in the case of the type of farming analysed above, only one-fifth of the variance of income was not explained by independent variables adopted in regression models.

The elasticity of income with respect to inputs of the production factors in question was similar in the years covered by the analysis. An increase in labour input by 1% caused an increase in income by an average of 0.5%, a rise in land input by 1% pushed up income by ca. 0.6%, and an additional 1% of capital augmented income by an average of 0.3%.

Table II.8 shows profitabilities of the analysed factors of production for model (average) holdings broken down by economic size.

The profitability indicators show that increasing labour input was profitable in all the groups of farms, with the exception of the smallest entities (2 to less than 4 ESU). At the same time, in all economic size groups the profitability of labour diminished in the three-year period in question, which suggests the need to reduce employment in holdings of all economic sizes.

It should be pointed out that the profitability of labour fell between 2006 and 2007, i.e. in the period regarded as favourable for agriculture, due to relative prices for products and services sold and purchased.

The profitability of land lease was high in all the analysed groups of economic size. On average, the return on land lease was almost sixfold. The highest profitability was noted in the case of land rented by holdings of the smallest economic size (nearly ninefold return on land), and this profitability

showed a downward trend in subsequent groups of economic size (the largest farms recorded ca. fivefold return).

Table II.8

Marginal profitability of material factors of production in holdings representing the type of farming "field crops" in 2005–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Number of holdings	2005	2,507	363	624	756	549	191	24
	2006	2,553	352	638	762	585	189	27
	2007	**2,727**	**386**	**722**	**774**	**622**	**186**	**37**
Profitability of labour [%]	2005	97	-9	26	74	160	272	284
	2006	88	0	18	59	142	258	250
	2007	75	-26	-7	40	148	262	273
	2005–2007	**87**	**-12**	**12**	**57**	**150**	**264**	**269**
Profitability of land [%]	2005	375	873	684	560	457	337	214
	2006	640	862	836	848	668	561	576
	2007	738	937	882	965	826	698	683
	2005–2007	**584**	**891**	**801**	**791**	**650**	**532**	**491**
Profitability of capital [%]	2005	6	4	4	4	6	7	14
	2006	7	5	6	6	7	8	13
	2007	7	3	4	6	7	9	13
	2005–2007	**7**	**4**	**5**	**5**	**7**	**8**	**13**

Source: study by T. Czekaj on the basis of monitoring data of the Polish FADN.

The average marginal profitability of capital in holdings with field crops was 7%. The profitability of expenses related to raising farm capital went up as the economic size of holdings increased, from 4% in the smallest farms to 13% in the largest entities.

Type of farming "vegetables and flowers"

The profitability of inputs of material production factors in holdings representing the type of farming "vegetables and flowers" (farms specialising in the growing of vegetables and flowers, or horticultural holdings) was analysed using regression equations estimated for ca. 400 farms for the years 2006–2007. The equations are characterised by a high goodness of fit to empirical data since only one-fifth of the variance of income was not explained by the estimated models.

Elasticities of income with respect to the factors of production in question were found not to differ much in the years covered by the analysis. An increase in labour input by 1% brought about a rise in income by an average of 0.6%, growth in land input by 1% augmented income by ca. 0.05%, and an additional 1% of capital entailed an increase in income by an average of approx. 0.5%. The estimated elasticities corroborate that horticultural holdings use land merely as

a space rather than as a means of production (input), and that their production is principally labour- and capital-intensive.

The marginal profitability of labour (Table II.9) in holdings representing the type of farming "vegetables and flowers" was only negative in 2006, and solely in entities with an economic size of 2 to less than 4 ESU and 4 to less than 8 ESU. As regards average profitability, it was positive in all economic size groups in 2006–2007. Thus, in farms specialising in the growing of vegetables and flowers increasing labour inputs was profitable in both years in question.

Table II.9

Marginal profitability of material factors of production in holdings representing the type of farming "vegetables and flowers" in 2006–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Number of holdings	2006	406	18	45	87	152	85	19
	2007	391	12	41	77	153	88	20
Profitability of labour [%]	2006	75	-5	-1	28	60	108	132
	2007	68	29	20	40	67	79	116
	2006–2007	**71**	**12**	**10**	**34**	**64**	**94**	**124**
Profitable of land [%]	2006	175	199	176	65	124	252	303
	2007	321	70	1246	315	1,101	139	-63
	2006–2007	**248**	**135**	**711**	**190**	**613**	**196**	**120**
Profitability of capital [%]	2006	10	11	11	10	10	9	12
	2007	7	8	11	9	7	6	6
	2006–2007	**8**	**9**	**11**	**9**	**8**	**8**	**9**

Source: As in Table II.8.

The marginal profitability of land was the lowest among the analysed types of farming. Nevertheless, the average return on expenses related to the lease of this factor of production was ca. 2.5-fold. At the same time, the marginal profitability of land input significantly varied between economic size groups. One should bear in mind, however, that land lease was rather rare in the holdings in question.

In 2006–2007 the marginal profitability of capital in holdings representing the type of farming "vegetables and flowers" was an average of ca. 8%.

Type of farming "permanent crops"

The profitability of material production factors in holdings representing the type of farming "permanent crops" (mostly specialist orchards) was analysed using regression equations estimated for approx. 1,400 farms.

The estimated regression equations were characterised by a satisfactory goodness of fit to the empirical data presented in this report. The coefficients of determination indicate that approx. 40% of the variance of income was explained by independent variables describing labour, land and capital inputs.

Considerable differences were found between the estimated elasticities of income with respect to inputs of the production factors in question, particularly of land and capital. Increasing labour input by 1% entailed a rise in income by an average of 0.60% in both years, growth in land input by 1% resulted in an augmentation in income by an average of ca. 0.01% in 2006 and by approx. 0.35% in 2007. An additional 1% of capital pushed up income by an average of 0.60% in 2006 and by ca. 0.34% in 2007. Most probably, the calculation results stemmed from fluctuating prices for fruit produced by orchard holdings. In 2007 fruit production plummeted nearly by half, which caused an approx. threefold increase in average purchase prices for fruit, to ca. PLN 2/kg in 2007 against PLN 0.62/kg in 2006.

On the basis of regression equations estimated for 2006–2007, the marginal productivity of input of each material factor of production was determined for both years in question. Marginal productivities were related to average unit costs of those inputs, thus establishing the profitability of labour, land and capital, shown in Table II.10.

It follows from the computed profitabilities that, on average, increasing labour inputs was profitable in all economic size groups in the two years in question. Only in 2007 the smallest holdings recorded a negative marginal profitability of labour.

Table II.10

Marginal profitability of material factors of production in holdings representing the type of farming "permanent crops" in 2006–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Profitability of labour [%]	2006	73	17	35	81	93	120	
	2007	68	-7	25	68	112	138	
	2006–2007	**70**	**5**	**30**	**75**	**103**	**129**	
Profitability of land [%]	2006	223	134	306	47	524	637	
	2007	1,936	463	1329	691	1,036	2,902	
	2006–2007	**1,079**	**299**	**818**	**369**	**780**	**1,769**	
Profitability of capital [%]	2006	9	7	8	9	9	10	
	2007	3	3	3	3	4	5	
	2006–2007	**6**	**5**	**5**	**6**	**7**	**7**	

Source: As in Table II.8.

The marginal profitability of land lease varied substantially, both between economic size groups and between years. The causes of this phenomenon have already been explained. It should be emphasised that, as in the case of previously analysed horticultural holdings (production of vegetables and flowers), farms with permanent crops leased land on a limited scale.

The marginal profitability of capital in holdings with permanent crops was an average of ca. 6%. This profitability rose as the economic size increased, from 5% in the smallest entities to 7% in the largest holdings.

The analysis of elasticities of income with respect to inputs of material factors of production and the examination of their marginal profitabilities suggest that farms with permanent crops were largely dependent on agro-meteorological and market conditions. Such holdings (as well as horticultural ones) benefited from CAP instruments to a lesser extent, owing to a smaller utilised agricultural area.

Type of farming "dairy cows"

The profitability of material production factors in holdings representing the type of farming "dairy cows" (specialist dairying) was analysed using regression equations estimated for ca. 2,500 farms. The equations were characterised by a considerable goodness of fit (the coefficient of determination was approx. 70%) to empirical data. Elasticities of income with respect to inputs of labour, land and capital were ca. 0.2%, 0.5% and 0.6% respectively, and remained unchanged in the years in question.

Table II.11 contains marginal profitabilities of the analysed factors of production computed using estimated regression equations and data concerning unit input costs (remuneration of paid labour, rent and interest paid on loans).

Table II.11

Marginal profitability of material factors of production in holdings representing the type of farming "dairy cows" in 2005–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Number of holdings	2005	891	47	196	413	224	0	.
	2006	876	51	202	404	208	11	.
	2007	815	38	158	381	223	15	.
Profitability of labour [%]	2005	-27	-71	-60	-36	8	0	.
	2006	-22	-73	-54	-24	17	.	.
	2007	-36	-77	-66	-37	-11	42	.
	2005–2007	**-28**	**-74**	**-60**	**-32**	**5**	**42**	.
Profitability of land [%]	2005	1,116	654	1,378	1,283	1,209	0	.
	2006	1,096	846	1,727	1,164	1,063	.	.
	2007	1,074	479	1,069	1,065	1,084	1,761	.
	2005–2007	**1,095**	**660**	**1,391**	**1,171**	**1,119**	**1,761**	.
Profitability of capital [%]	2005	9	7	7	9	10	0	.
	2006	9	7	8	8	9	.	.
	2007	10	9	9	10	11	13	.
	2005–2007	**9**	**8**	**8**	**9**	**10**	**13**	.

Source: As in Table II.8.

The marginal profitability of labour was negative in holdings with less than 16 ESU. In 2007, also in farms with an economic size of 16 to less than 40 ESU the marginal growth in income arising from increasing labour input was lower than the cost of remuneration of paid labour. Between 2005 and 2006, in the group of holdings with an economic size of 16 to less than 40 ESU the profitability of labour was positive but minor. As a consequence, the average profitability of labour in this group of farms was limited, at 5%. A positive marginal profitability of labour in holdings with an economic size of at least 40 ESU was only determined for one year, it was impossible to publish the analysis results for 2005–2006 due to an insufficient number of entities in this group. Presumably, holdings representing this type of farming could not increase labour inputs and it was necessary to substitute this factor of production, e.g. with capital, whose marginal profitability was at least 9% in each year of the period in question.

Land inputs were characterised by considerable marginal profitability. On average, a rise in income resulting from increasing land input by 1 ha was 11 times higher than the cost of land lease. Only the smallest holdings had relatively lower marginal profitability of this production factor.

Type of farming "grazing livestock"

The profitability of material production factors in holdings representing the type of farming "grazing livestock" (the rearing of cattle, sheep and/or goats) was analysed using regression equations estimated for approx. 1,400 holdings from the FADN sample. It follows from the equations that farms increasing their labour inputs by 1% could count on an augmentation in income by an average of ca. 0.47%, an additional 1% of utilised agricultural area could improve income by 0.24%, whereas a rise in capital by 1% resulted in growth in income by an average of 0.63%. The estimated equations were characterised by a high (75%) goodness of fit to empirical data.

On the basis of the regression equations estimated for 2005–2007, marginal profitabilities of inputs of particular factors of production were determined for each year, as presented in Table II.12.

As in the case of farms keeping dairy cows, also in the holdings in question the profitability of labour inputs was negative in most economic size groups. Thus, they too had excess labour inputs, inadequate to the scale of production. The sole exception were the largest holdings of this type of farming (40 to less than 100 ESU).

Table II.12

Marginal profitability of material factors of production in holdings representing the type of farming "grazing livestock" in 2005–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Number of holdings	2005	1,312	47	147	420	580	104	14
	2006	1,378	54	142	416	630	124	12
	2007	1,489	39	147	429	693	168	13
Profitability of labour [%]	2005	-38	-81	-66	-54	-24	19	.
	2006	-42	-76	-73	-49	-24	7	.
	2007	-29	-76	-58	-48	-17	33	.
	2005–2007	**-36**	**-78**	**-66**	**-50**	**-22**	**19**	.
Profitability of land [%]	2005	845	1,366	1,102	917	855	446	.
	2006	935	1,373	1,302	1,104	996	1,001	.
	2007	770	2,046	987	998	796	819	.
	2005–2007	**850**	**1,595**	**1,130**	**1,006**	**882**	**755**	.
Profitability of capital [%]	2005	11	9	9	9	10	13	.
	2006	10	9	10	10	10	11	.
	2007	12	7	11	10	12	14	.
	2005–2007	**11**	**8**	**10**	**10**	**11**	**13**	.

Source: As in Table II.8.

Marginal profitabilities of land exceeded the average cost of lease in all groups of farms. On average, the marginal profitability of land lease was 850% in 2005–2007. The highest marginal profitability was noted in holdings with 2 to less than 4 ESU, the lowest, although still high, was found in entities with an economic size of 40 to less than 100 ESU.

Between 2005 and 2007, the marginal profitability of capital inputs was an average of 11%, ranging from 8% in the smallest farms to 13% in holdings with an economic size of 40 to less than 100 ESU.

Type of farming "granivores"

The profitability of material production factors in holdings representing the type of farming "granivores" (specialist rearing of pigs and/or poultry) was analysed using regression equations estimated for 1,500 farms. The equations were characterised by the lowest goodness of fit to the empirical data presented in this chapter since the coefficients of determination were approx. 0.50. Thus, a mere half of the variance of income was explained by the variance of labour, land and capital inputs.

Elasticities of income with respect to inputs of the analysed production factors were found to be similar in the years in question. A rise in labour input by 1% entailed an increase in income by an average of 0.3%, a 1% growth in

land input brought about an augmentation in income by ca. 0.3%, whereas an additional 1% of capital pushed up income by an average of 0.7%.

Table II.13 shows profitabilities of the production factors in question, computed on the basis of the estimated models and empirical data collected from the holdings, for model (average) farms broken down by economic size.

According to the profitabilities determined, increasing labour inputs only improved income in holdings with an economic size of at least 16 ESU, although not in each year of the period in question.

The profitability of land was high in all the economic size groups. The average return on lease was 473%, similar to that noted by farms having an economic size of less than 100 ESU. Only in holdings with 100 ESU or more the return on land lease was nearly sevenfold.

On average, the marginal profitability of capital in holdings rearing granivores was 10%. It went up as the economic size of farms increased, from 7–8% in entities with 2 to less than 4 ESU and 4 to less than 8 ESU to 12% in the largest holdings, having at least 100 ESU.

Table II.13

Marginal profitability of material factors of production in holdings representing the type of farming "granivores" in 2005–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Number of holdings	2005	1,567	25	115	311	658	385	73
	2006	1,717	45	171	349	692	391	69
	2007	1,636	36	135	274	658	447	86
Profitability of labour [%]	2005	7	-73	-40	-33	5	51	95
	2006	-9	-67	-54	-41	-4	30	69
	2007	5	-65	-63	-32	1	51	90
	2005–2007	**1**	**-68**	**-53**	**-35**	**1**	**44**	**85**
Profitability of land [%]	2005	387	358	520	395	367	401	510
	2006	529	733	633	437	556	495	770
	2007	503	466	311	451	516	470	776
	2005–2007	**473**	**519**	**488**	**428**	**480**	**455**	**685**
Profitability of capital [%]	2005	11	9	9	11	11	11	13
	2006	10	9	8	10	10	10	12
	2007	8	6	5	7	8	8	10
	2005–2007	**10**	**8**	**7**	**9**	**9**	**10**	**12**

Source: As in Table II.8.

Both the analysis of elasticities of income with respect to inputs of material production factors and the analysis of marginal profitabilities of such inputs confirm a rather obvious conclusion that in holdings representing the type of farming "granivores" income is chiefly generated by capital inputs, whereas the remaining factors of production play a lesser role.

Type of farming "mixed crops-livestock"

The profitability of material production factors in holdings representing the type of farming "mixed crops-livestock" (non-specialist holdings engaged in mixed crop-livestock production) was analysed using regression equations estimated for approx. 4,500 farms. The equations were characterised by a high goodness of fit to empirical data (the coefficient of determination was ca. 80%). Average elasticities of income with respect to inputs of labour, land and capital were ca. 0.3%, 0.6% and 0.4% respectively, and they remained unchanged in the years covered by the analysis.

Table II.14 contains marginal profitabilities of the factors of production in question, calculated on the basis of the estimated regression equations and data concerning unit costs of inputs (the remuneration of paid labour, rent and interest paid on loans).

Table II.14

Marginal profitability of material factors of production in holdings representing the type of farming "mixed crops-livestock" in 2005–2007

Specification		Total	2–<4 ESU	4–<8 ESU	8–<16 ESU	16–<40 ESU	40–<100 ESU	≥ 100 ESU
Number of holdings	2005	4,506	479	1,116	1,399	1,256	227	29
	2006	4,384	482	1,090	1,310	1,230	246	26
	2007	4,421	461	1,097	1,302	1,272	262	27
Profitability of labour [%]	2005	-39	-61	-53	-35	13	74	42
	2006	-40	-72	-59	-46	-8	39	33
	2007	-44	-72	-62	-42	-5	45	30
	2005–2007	**-41**	**-68**	**-58**	**-41**	**0**	**52**	**35**
Profitability of land [%]	2005	761	891	991	956	827	765	826
	2006	940	1,185	1,275	1,124	908	792	1,193
	2007	739	892	1,159	994	858	795	605
	2005–2007	**813**	**989**	**1,142**	**1,025**	**864**	**784**	**875**
Profitability of capital [%]	2005	5	3	3	4	5	7	13
	2006	5	3	4	5	6	6	12
	2007	6	3	4	5	6	7	17
	2005–2007	**5**	**3**	**4**	**5**	**5**	**7**	**14**

Source: As in Table II.8.

The average marginal profitability of labour was negative, at -41%. In other words, a rise in paid labour by one unit led to an increase in income 41% lower than the cost involved. Positive marginal profitability of labour was only found in groups of farms with an economic size of 40 to less than 100 ESU and of 100 ESU or more.

The marginal profitability of land was significant: the lease of an additional hectare of utilised agricultural area brought about more than

eightfold growth in income over the rent adopted for calculations. Characteristically, the marginal profitability of lease showed a negative correlation with the economic size of farms. Most probably, larger holdings were engaged in more extensive farming.

The marginal profitability of capital inputs in holdings representing the type of farming "mixed crops-livestock" was an average of 5%, among the lowest for the types of farming in question. This profitability ranged between 3% in the smallest entities and 7% in holdings with an economic size of 40 to less than 100 ESU. Only those having an economic size of 100 ESU or more were characterised by very high marginal profitability of capital, at 14%. Only the last group was likely to be undercapitalised.

* * *

The analyses conducted have demonstrated that in 2005–2007 the profitability of material factors of production varied between years, according to the type of farming and the scale of production. Furthermore, it also appeared that inputs of specific production factors, i.e. labour, land and capital, followed different patterns.

The most significant differences were observed in the case of labour inputs. Small holdings were characterised by a negative marginal profitability of inputs of this factor of production.

The examination of farms broken down by type of farming has indicated that the marginal profitability of paid labour was negative in holdings with an economic size of less than 40 ESU engaged in specialist rearing of pigs and poultry (type of farming "granivores") or cattle (type of farming "grazing livestock"). As far as milk-producing farms are concerned (type of farming "dairy cows"), a negative marginal profitability of labour was found in entities with an economic size of less than 16 ESU. In holdings with field crops (type of farming "field crops") this was the case for farms smaller than 4 ESU. The marginal profitability of labour was positive in horticultural and orchard holdings (types of farming "vegetables and flowers" and "permanent crops") of all economic size groups.

Negative marginal profitabilities indicated that increasing inputs of paid labour by another unit was economically inefficient. The costs involved in hired labour exceeded the expected growth in income resulting from augmenting inputs of this factor of production. Marginal unprofitability of labour in smaller holdings may have stemmed from the lack of managerial skills and low occupational competence of the farmers. It might also point to excess employment arising from hidden unemployment, which should be considered

a likely cause, even though the first years of Poland's membership of the EU were favourable for agriculture.

In all types of farming, regardless of the economic size of a given holding, the marginal profitability of rented land was exceptionally high, which resulted from low rents. It should be stressed that a considerable proportion of leased land in the total utilised agricultural area was mainly found in larger farms where land from the stock of the Agricultural Property Agency (*Agencja Nieruchomości Rolnych* – ANR) accounted for a major share. The holdings signed long-term lease contracts in periods of downturn in agriculture, which determined low levels of rent. At the same time, rents in private transactions tended to be much higher. Moreover, it is well-known (see, for instance, section "Holdings in mountain and submountain areas" in this report) that it was not infrequent, although against the law, for the owner rather than the actual holder of the land to receive direct payments and compensatory allowances. Thus, it is most likely that the rent was not e.g. PLN 100 or PLN 200 per ha as assumed in this section, but as much as PLN 500 per ha or more. The surveyed farmers, quite aware that the receipt of subsidies by the owner of the land is illegal, only revealed the rent. On the other hand, perhaps this practice varied between regions. Thus, the actual profitability of land lease is likely to have been much lower in small holdings than the analyses suggest.

Should this presumption be correct, high actual costs of land lease and the related low profitability of land would be the probable cause of a lower share of rented land in smaller farms where such agreements are often informal. The continuation of this analysis would require differentiated rents, depending on whether subsidies are received by the owner or by the holder of the land leased. However, it would be extremely difficult to capture this differentiation, for understandable reasons.

The marginal profitability of capital inputs was high in all types of farming and economic size groups. It mostly resulted from low interest rates on loans raised by agricultural holdings. Most of them benefited from preferential loans, with rates much lower than those on commercial loans (depending on the credit line, the interest rate ranged from 1% to 3% in annual terms). But why did small holdings undertake no investments? The cause of this may have been that owners of smaller farms were mostly elderly persons who could not make full use of investment results or were unable to obtain a loan or funds offered under the Sectoral Operational Programme for the "Restructuring and modernisation of the food sector and rural development 2004–2006".

Furthermore, the above-mentioned situation is attributable to the fact that the farm income in a holding of small economic size was not the main source of

income for the family, thus limited inputs of capital and labour to farming activities. According to the data collected by the Agricultural Accountancy Department, income from agricultural activities in holdings with an economic size of 2 to less than 4 ESU and 4 to less than 8 ESU constituted approx. 60% and 40%, respectively, of the total income obtained by the farming family concerned. In the remaining economic size groups the share of farm income in the total income of agricultural holdings could be as much as 95%.

The presented findings from analyses of marginal profitabilities of material production factors allow to draw the conclusion that farms of small economic size (differing between types of farming) substituted labour and capital with inputs of family labour, without consideration of its profitability, which stemmed from excess family labour. Larger holdings, making full use of family labour, could hire seasonal workers owing to the positive profitability of labour.

Only larger farms (differing in economic size between types of farming) were characterised by positive marginal profitabilities of all material factors of production in question (labour, land and capital) and could increase their inputs, thus expanding the scale of production, which will help them cope with global competition in the future.

III. THE COMPETITIVENESS OF HOLDINGS HELD BY NATURAL PERSONS[20]

The period of preparations for, and especially Poland's membership of the European Union, markedly improved the conditions for farming in Polish agriculture. But only a relatively limited group of holdings held by natural persons made actual use of it, modernising and extending their farm capital. At the same time, a significant share of holdings responded rather passively, only deriving some benefits (of the Polish version) of the Common Agricultural Policy, chiefly direct payments, whereas others did not even apply for such payments. Therefore, it is justified to pose the question of assessing the competitiveness (the ability to compete) of Polish farm in comparison with holdings in other EU Member States.

Competitiveness is a permanent ability of economic operators (including agricultural holdings) to gain, and then retain a share in the local, regional, domestic, or oven international market, under conditions of market access. The competitiveness of farms is primarily reflected in income and investment activity. Substantial income indirectly shows a strong economic position of holdings, which indicates not only the living standards of producers, but also the current market share and the possibility to finance investments from own funds (at least in part). Investment activity implies occupational skills and the willingness to adapt to the changing environment, a vital prerequisite for maintaining long-term competitiveness of agricultural holdings.

Issues concerning the competitiveness of Polish agriculture have been raised in the Polish economic and agricultural literature. Some studies referred to the period preceding the break-through year 2004, some discussed the following years, but only few addressed the subject of competitiveness of various groups of farms.

Due to improved economic conditions, in 2004 the income of Polish agricultural holdings more or less doubled on the previous year, but the following years witnessed continued polarisation of agricultural income which had already started prior to EU accession. On the one hand, the vast majority of small farms obtained low incomes, and on the other hand, there were relatively few large, prosperous holdings. The polarisation of the economic situation of farms also had a crucial impact on their development prospects.

[20] This chapter was prepared on the basis of the text by W. Józwiak and Z. Mirkowska *Zdolność konkurencyjna polskich gospodarstw rolnych w zestawieniu z gospodarstwami węgierskimi i niemieckimi*, collective work ed. by W. Józwiak: "Sytuacja ekonomiczna, efektywność funkcjonowania i konkurencyjność polskich gospodarstw rolnych osób fizycznych" IERiGŻ-PIB, *Program Wieloletni,* 2005–2009, No 132, Warsaw, 2009.

In 2007, out of approx. 1,402,000 holdings held by natural persons who were active in agricultural production and applied for subsidies, as many as ca. 83% had an economic size of less than 8 ESU and the average utilised agricultural area of approx. 6 ha. Between 2004 and 2007, such entities only provided part of income to their holders (a predominant share of income was derived from other sources such as gainful employment of the farmer or his family members). This group of farms was characterised by negative capital replacement (they were unable to fully replace fixed capital consumed in production), and merely ca. 18% promised to improve their economic performance (naturally, provided that they would enhance their agronomic and zootechnical knowledge as well as managerial and marketing skills). Thus, the overwhelming majority of small farms had no prospects for development, which means that in the next 15 to 20 years they will lose their farm buildings, machinery and equipment due to economic wear and tear. It is unclear how agricultural land held by such entities (accounting for ca. 36% of the total utilised agricultural area in Poland) will be utilised then.

Every tenth holding applying for subsidies had an economic size of 8 to less than 16 ESU, and the average utilised agricultural area was 17.3 ha. In 2005–2007 such farms obtained sufficient income to undertake investments allowing capital extension (although to a limited degree) and to have farm income per full-time worker close to the parity rate, equal to the average net wage in non-agricultural sections of the national economy. Thus, between 2005 and 2007 holdings with an economic size of 8 to less than 16 ESU had development prospects. Furthermore, from 45% to 50% of farms in this economic size group had a chance of improving their economic performance.

After 2004, the number of holdings with 8 to less than 16 ESU rose at a very slow pace, due to changes in economic size. As a consequence, in 2007 there were approx. 145,000 such farms.

However, the slowdown in the Polish economy resulting from the global economic crisis is projected to have an adverse impact on this group of economic operators. Moreover, it is even likely that by e.g. 2013 only more or less every thirtieth farm will be able, as in 2005–2007, to ensure simple capital replacement and the remuneration of family labour[21] at a level close to the parity rate. The situation of other holdings, ca. 94,000, will be as unfavourable as that of entities with less than 8 ESU between 2005 and 2007.

In 2005–2007 only the largest commercial farms, with an economic size of at least 16 ESU, and the average utilised agricultural area of approx. 42 ha (although varying significantly, from 31 ha to 496 ha), were characterised by

[21] In holdings held by natural persons the remuneration of family labour is included in farm income.

considerable farm capital extension, and the average remuneration of labour by the farmer and members of his family was above the parity rate. According to projections, the largest Polish holdings held by natural persons will guarantee above-parity remuneration of family labour and funds for investments allowing capital extension, i.e. financial resources to modernise and extend farm capital, also until 2013.

But will the largest Polish holdings held by natural persons be able to compete with farms from other EU Member States? In order to find an answer to this question, agricultural holdings broken down by type of farming (production structure) and economic size were analysed and compared with their counterparts in Poland's EU neighbours, Germany and Hungary. The production structure of agriculture in these countries is similar to that in Poland, therefore German and Hungarian holdings compete with Polish farms in the EU market. Furthermore, between 1997 and 2004 very similar trends and processes had been observed in agricultural holdings in certain EU-15 countries, i.e. in Germany, Denmark and Sweden, which served as the basis for reducing the field of observation and, consequently, for comparisons. At the same time, Austrian farms were not comparable with Polish holdings due to a much higher share of farms situated in mountain and submountain areas, rendering agro-tourism services and engaged in organic farming. Agricultural holdings in the remaining EU-15 countries would be an even less suitable basis for comparisons, chiefly due to significant differences in natural conditions, particularly the climate. As regards countries acceding to the European Union in 2004, Hungarian agriculture was chosen. It has a rather substantial stock of agricultural land among Central and Eastern European countries. Furthermore, owing to the fact that Hungary became an EU Member State in the same year as Poland, Hungarian holdings have had similar experience. Czech and Slovak agriculture would be a worse basis for comparison as after 2004 their development followed different patterns from those observed in Poland. In the Czech Republic, and even more so in Slovakia, a prominent role is played by large agricultural enterprises established from assets of former state-owned or cooperative farms.

The analysis was based on empirical data for 2004–2006, a relatively good basis for drawing conclusions. Obviously, more recent data would have been more desirable, but at the time of preparing the analysis they were not yet available. The comparison of holdings with an economic size of 16 ESU or more was additionally backed by the fact that in Germany income monitoring only covered this group of farms.

The analysed sample of agricultural holdings accounted for approx. 80% of Polish farms with 16 ESU or more, but this report only describes a part of the cases examined.

Cereal holdings

Cereal holdings (specialising in cereal production) produce not only cereal grain, but also seeds of rape, legumes, etc., obtained using the same technology.

Only two economic size groups were compared, i.e. 16 to less than 40 ESU and 40 to less than 100 ESU, since the monitoring under the Polish FADN did not cover larger farms.

It follows from the figures presented in Table III.1 that Polish and Hungarian holdings obtained comparable incomes in both economic size groups. Notably, incomes of Polish and Hungarian farms with 16 to less than 40 ESU were several times higher than income derived by their German counterparts. Lesser differences between holdings in the countries in question were observed in the case of the other analysed economic size group.

Table III.1

Income obtained by Polish, Hungarian and German cereal holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU[a] in 2004–2006 (in EUR per holding)

Year	Holdings with an economic size of (ESU):					
	16–<40			40–<100		
	Polish	Hungarian	German	Polish	Hungarian	German
2004	15,353	19,512	8,027	34,351	37,862	24,430
2005	13,248	16,571	4,830	33,408	29,915	18,906
2006	25,360	18,841	7,319	52,747	30,858	25,150

[a] Income was calculated for holdings with an economic size of at least 16 ESU since Germany did not monitor the situation of smaller farms, and in Poland holdings with less than 16 ESU are not competitive. Neither were holdings with at least 100 ESU compared as they were not covered by the monitoring under the Polish FADN.

Source: Own study based on data of the Polish FADN concerning Polish holdings held by natural persons and of the EU FADN with regard to Hungarian and German farms.

A more in-depth analysis leads to a surprising conclusion that the high incomes of Polish and Hungarian holdings were largely contributed to by subsidies. In 2006, for instance, Polish farms received 48% to 59% higher subsidies than German entities, and the difference was 19% to 23% in the case of Hungarian farms. Simply, in the years covered by the analysis the agricultural subsidy calculation systems in both countries privileged farms with large utilised agricultural area, such as cereal holdings. At the same time, Germany applied a different method for calculating subsidies (on the basis of the so-called

reference yields), and the average area of agricultural land at the disposal of German cereal farms was half as large.

The remuneration of family labour in Polish holdings was estimated to be 68% and 100%, respectively, of the parity rate, compared to net wages in industrial and service enterprises with 10 or more employees. At the same time, in Hungarian and German farms this remuneration did not exceed (respectively) 60% and 90% of the corresponding remuneration of labour outside agriculture. These differences in the remuneration of family labour were the likely reason that fixed capital replacement in Polish holdings was significantly greater than that in their Hungarian and German counterparts.

Table III.2

Fixed capital replacement[a] (%) in Polish, Hungarian and German cereal holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU in 2004–2006

Year	Holdings with an economic size of (ESU):					
	16–<40			40–<100		
	Polish	Hungarian	German	Polish	Hungarian	German
2004	3.0	1.6	0.1	2.0	-1.8	-0.8
2005	8.0	1.8	0.5	7.0	0.3	-0.5
2006	7.0	5.0	0.3	6.0	6.6	0.5

[a] Capital replacement is expressed as the ratio of net investment (gross investment less depreciation) to the value of fixed assets (land, buildings and fixed equipment, machinery and equipment, livestock and forest plantations).

Source: Own calculations based on monitoring data of the Polish FADN and data of the EU FADN.

Thus, in 2004–2006 Polish cereal holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU were competitive with respect to their counterparts in Hungary and Germany. Polish farms were characterised by lower income disparities relative to average wages in industrial and service enterprises with 10 or more employees. Moreover, their income allowed farmers to undertake investments ensuring capital extension. At the same time, the competitiveness of Hungarian and German holdings was less clear as the remuneration of family labour differed to a greater degree from the parity remuneration, and they were characterised by much lower investment activity, which in German farm only allowed simple capital replacement.

Pig holdings

Pig holdings belong to farms engaged in specialist rearing of the so-called granivores, i.e. pigs and poultry. Since the share of the latter group of animals is limited, this section refers to granivore farms as pig holdings. The analysis

covered three economic size groups of such economic operators: 16 to less than 40 ESU, 40 to less than 100 ESU and 100 ESU or more.

In the period in question, the annual average income of Polish pig holdings with an economic size of 16 to less than 40 ESU was nearly identical with the income of Hungarian farms, whereas it was high (by ca. 58% and 29% respectively) in the two subsequent economic size groups (Table III.3). However, the reasons for such differences could not be identified on the basis of the empirical material available.

At the same time, income obtained by Polish agricultural holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU were markedly lower (by ca. 24% and 23% respectively) than income derived by their German counterparts, whereas in the largest farms it was 17% higher. Such disparities probably stemmed from different livestock structures. Polish farms of all the three economic size groups were mostly engaged in the rearing of piglets from own breeding sows (in a closed cycle), whereas in Germany holdings with an economic size of less than 100 ESU were oriented towards commercial production of piglets, sold to even larger farms for fattening.

Table III.3

Income obtained by Polish, Hungarian and German pig holdings with an economic size of 16 ESU or more[a] in 2004–2006 (in EUR per holding)

Year	Holdings with an economic size of (ESU):								
	16–<40			40–<100			100 or more		
	Polish	Hungarian	German	Polish	Hungarian	German	Polish	Hungarian	German
2004	12,768	7,890	21,859	27,635	-11,554	37,280	68,415	30,207	66,335
2005	11,608	16,897	15,694	27,194	32,385	40,207	84,191	157,571	69,481
2006	12,885	12,759	11,614	26,974	30,781	29,020	63,682	-19,755	48,635

[a] Income was calculated for three groups of holdings, with an economic size of at least 16 ESU, since the monitoring in Germany excludes smaller farms, and in Poland agricultural holdings below this threshold are not competitive.

Source: As in Table II.1.

Further calculations indicate that the contribution of subsidies to income obtained by Polish and German pig holdings was limited. Pig production was not subsidised, thus subsidies received by pig farms were solely dependent on subsidised crops (e.g. cereals). But is was unnecessary to have a large area under cultivation as the modern rearing of pigs is mostly based on purchased feed concentrates. In contrast, subsidies played a significant role in Hungarian holdings. Arguably, the importance of subsidies to Hungarian farms resulted from large-scale growing of cereals combined with pig production.

According to estimations, in Polish pig holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU income ensured the remuneration of family labour at 56% and 68%, respectively, of the average wage in industrial and service enterprises with 10 or more employees, and the

parity remuneration was only found in the largest analysed farms. As far as Hungarian and German holdings are concerned, the corresponding remuneration of family labour was approx. 50% and 60% respectively, whereas in the largest entities it represented 87% and 108%, respectively, of the parity level.

Table III.4

Fixed capital replacement[a] (%) in Polish, Hungarian and German pig holdings with an economic size of 16 ESU or more in 2004–2006

Year	Holdings with an economic size of (ESU)								
	16–<40			40–<100			100 or more		
	Polish	Hungarian	German	Polish	Hungarian	German	Polish	Hungarian	German
2004	1.0	2.6	1.7	2.0	-1.9	-0.8	2.0	0.1	-1.2
2005	0.9	8.1	-2.4	4.0	-5.9	0.6	4.0	-1.6	-0.1
2006	4.0	-0.7	-2.3	8.0	0.6	0.1	10.0	-3.6	0.9

[a] Capital replacement is expressed as the ratio of net investment (gross investment less depreciation) to the value of fixed assets (land, buildings and fixed equipment, machinery and equipment, livestock and forest plantations).

Source: As in Table III.2.

Polish and Hungarian pig holdings were distinguished by capital extension, but the capital replacement ratios were higher for the former group. At the same time, German pig farms in question noted negative, simple or close to simple capital replacement, even when the estimated remuneration of family labour was above the parity level (entities with an economic size of at least 100 ESU). It is attributable to sufficient capitalisation of German holdings. The equity of German pig farms with an economic size of 16 to less than 40 ESU was ca. four times higher than that of their Polish counterparts. In the subsequent economic size group the difference was twofold, and the largest analysed German holdings had approx. 150% higher equity.

Therefore, the competitiveness of Polish pig holdings is unquestionable, both in the period covered by the analysis (2004–2006) and in the future. Such farms ensure tolerable economic living conditions to agricultural producers and provide funds for investments increasing farm capital (particularly in entities with an economic size of at least 40 ESU).

As regards Hungarian pig holdings with an economic size of 40 ESU or more, their future is not clear as they were characterised by negative capital replacement. German holdings were in a similar situation to that of Hungarian farms. They were competitive in 2004–2006, but without the extension of fixed assets their competitiveness may be in jeopardy in the future as this reduces adaptability to changing conditions for farming.

Mixed holdings

Mixed holdings (those engaged in non-specialist production) combine the rearing of livestock, frequently of different species, with a varying structure of fodder and commercial crops. Such farms are numerous in Poland, less frequent in Hungary and even fewer in Germany. It is a rather plausible thesis that this type of holdings is in decline since mixed production organisation impedes improvement in production efficiency. Mixed farming, however, contributes to the stabilisation of farm income in subsequent years, which facilitates operating in volatile market conditions.

The income of Polish non-specialist holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU was lower than that of their Hungarian counterparts in each year of the period in question (Table III.5). At the same time, larger Polish farms performed much better. Furthermore, non-specialist holdings in Poland obtained higher income than German farms, in all the three economic size groups and throughout the period covered by the analysis. The adaptation of Polish agricultural holdings (as well as of the whole agri-food sector) to the new conditions existing from 2004 was only accompanied by very gradual market stabilisation, which favoured non-specialist farms.

Subsidies played a vital role in the groups of holdings in question. In 2006, for instance, they accounted for 64%, 68% and 91%, respectively, of the income of Polish farms. The respective shares were even higher in the case of their Hungarian counterparts, whereas subsidies generated nearly 100% of income derived by German holdings.

Table III.5

Income obtained by Polish, Hungarian and German mixed holdings with an economic size of 16 ESU or more[a] in 2004–2006 (in EUR per holding)

Year	Holdings with an economic size of (ESU):								
	16–<40			40–<100			100 or more		
	Polish	Hungarian	German	Polish	Hungarian	German	Polish	Hungarian	German
2004	13,851	19,842	9,400	31,776	41,743	21,570	104,975	49,373	64,394
2005	13,224	14,641	7,396	26,398	37,591	26,398	136,664	48,837	55,920
2006	18,276	22,148	7,422	34,960	48,742	24,710	123,771	113,116	58,324

[a] Income was only calculated for holdings with an economic size of at least 16 ESU since the monitoring in Germany excludes smaller farms, and in Poland agricultural holdings below this threshold are not competitive.

Source: As in Table III.1.

According to estimates, income obtained by Polish holdings in the three economic size groups allowed the remuneration of family labour at 56%, 68% and 100%, respectively, of the average wage in industrial and service enterprises

with 10 or more employees, whereas in Hungarian farms the respective shares were 49%, 59% and 87%. As regards German holdings with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU, the estimated remuneration of family labour reached approx. 50% and 60% respectively, and it was 108% in the case of entities with 100 ESU or more.

When comparing pig holdings with mixed farms, there is no obvious correlation between the level of remuneration of family labour and subsidies received. Polish mixed holdings exploited favourable farming conditions existing in 2004–2006 to modernise farm equipment and increase productive assets, as reflected in capital replacement ratios presented in Table III.6.

The situation in Hungarian farms was different. Capital extension (although limited) was found only in holdings with an economic size of 16 to less than 40 ESU, entities in the two remaining economic size groups reported close to simple capital replacement. The remuneration of family labour was perhaps insufficient in relation to wages in the reference enterprises with 10 or more employees. For a similar reason, probably, negative capital replacement was observed in German farms with an economic size of 16 to less than 40 ESU and 40 to less than 100 ESU, whereas in the largest group it only insignificantly exceeded simple replacement.

Table III.6

Fixed capital replacement[a] (%) in Polish, Hungarian and German mixed holdings with an economic size of 16 ESU or more in 2004–2006

Year	Holdings with an economic size of (ESU):								
	16–<40			40–<100			100 or more		
	Polish	Hungarian	German	Polish	Hungarian	German	Polish	Hungarian	German
2004	11.0	1.8	-0.3	17.0	2.1	-0.8	23.0	0.7	0.0
2005	11.0	1.8	-1.5	19.0	-2.7	-0.8	16.0	-3.9	0.3
2006	13.0	2.0	-0.6	20.0	-0.4	0.6	21.0	0.9	1.2

[a] Capital replacement is expressed as the ratio of net investment (gross investment less depreciation) to the value of fixed assets (land, buildings and fixed equipment, machinery and equipment, livestock and forest plantations).

Source: As in Table III.2.

Bearing the above in mind, it can be responsibly argued that between 2004 and 2006 Polish holdings with an economic size of at least 16 ESU and engaged in mixed production were competitive in comparison with their Hungarian and German counterparts. Polish farms obtained income providing fair living conditions to the farmers and their families and allowing capital extension. Importantly, the latter indicates that the current favourable position will be maintained in the future.

Bearing in mind the above analysis and studies conducted in 2005–2010 on this or similar subject, it can be concluded that in 2004–2006 the Polish

agricultural holdings in question, held by natural persons and with an economic size of 16 ESU or more, were competitive relative to Hungarian, German, Danish and Swedish farms, i.e. with respect to their counterparts operating in similar climatic conditions and in the single market of the European Union. Furthermore, there are indications that Polish agricultural holdings with an economic size of at least 16 ESU will maintain their good competitive position also in the years of recovery from the crisis.

In Poland the number of farms with an economic size of 16 ESU or more increased by 24,000 (32%) between 2002 and 2007, and in the last year of the period in question they accounted for a 6.7% share of the total number of holdings applying for subsidies. Such figures, however, are hardly impressive. In Denmark, for example, the proportion of holdings as large as 100 ESU or more soared from 6.3% to 22.4% in 1990–2005, and similar trends have been observed in many other EU-15 countries. In a developed economy, therefore, there are market opportunities for even larger farms than those currently operating in Poland.

What should be done in order to stimulate growth in the number of agricultural holdings with the ability to compete? The analysis of marginal profitabilities of material factors of production casts some light on this issue. It appears that:

- low mobility of labour was the reason that hiring workers tended to be unprofitable in farms with an economic size of less than 8 ESU, whereas it was profitable (with few exceptions) in larger entities. Thus, improvement in the mobility of labour force between regions and types of farming will be conducive to increased income derived by holdings with 16 ESU or more;
- when lease contracts were concluded with the Agricultural Property Agency, rented land was distinguished by very high profitability. It stemmed from low rents since long-term lease contracts had been signed before 2004, i.e. in the period of a general downturn in agriculture. The prime beneficiaries included larger farms, which is reflected in the high share of rented land in the total utilised agricultural area at their disposal. Hence, the revision of rents and additional restrictions on the lease of state-owned land will be unfavourable for larger entities;
- the marginal profitability of capital was very high, irrespective of the type of farming and economic size of holdings, in all the macro-regions of Poland. This was chiefly exploited by farms with 16 ESU or more, to the extent allowing capital extension, whereas farms with an economic size of 8 to less than 16 ESU were only characterised by simple capital replacement. It suggests the hypothesis that the lack of own free funds in entities with 8 to less than 16 ESU

represented an obstacle for farms to benefit from support measures targeted at the development of agricultural holdings.

A permanent change in farming conditions, e.g. arising from changes in the level and scope of subsidies for farms or fluctuations in agricultural prices in world markets, could force a revision of the above assessment and inferences. EU agricultural holdings vary (sometimes considerably) in the share of subsidies in farm income, remuneration of family labour, means of production, propensity to invest, etc. Polish farms, as compared to their counterparts in other EU Member States, are distinguished by a lower proportion of subsidies in income and a higher propensity to invest, which inspires optimism with respect to possible changes in farming conditions.

The adaptation of agricultural holdings to changing conditions for farming is related to specialisation in Polish agriculture. The established structure of agricultural production in Poland is likely to change within a new division of labour in the European Union. Only farms competitive relative to their foreign counterparts can hope for a long-term position as suppliers of agricultural products to the domestic and foreign markets. Uncompetitive holdings require restructuring and major investments in order to find a stable place in the market. Otherwise their products will be replaced by imports, unless other Polish farms prove to be competitive enough.

In conclusion, it should be added that, as in other EU Member States, holdings engaged in "leisure farming" (agricultural production carried out in one's spare time) are likely to exist also in Poland. Such farms will use farm capital to produce, as a subsidiary occupation, agricultural products to meet the needs of the local market and to derive additional income. The functioning of such entities is very different from the functioning of large agricultural holdings, constituting the main or the sole source of income for farming families.

IV. ADJUSTMENT PROCESSES IN LARGE AGRICULTURAL HOLDINGS[22]

Large agricultural holdings represent a marginal share in the total number of entities in Polish agriculture. On account of the volume of commercial production supplied, however, they co-determine Poland's food self-sufficiency and the competitiveness of Polish agriculture in the EU and world markets. Their common advantage is the scale of economic activity, established on the basis of utilised agricultural area (more than 100 ha per holding) or receipts from specialist types of farming (growing of vegetables, horticulture, glasshouse growing, poultry farming, etc.). In mid-2007 there were 8,020 such farms in Poland (0.6% of the total number of holdings applying for subsidies), but they accounted for 18.3% of Poland's utilised agricultural area.

Among large holdings, the most numerous group (a total of over 6,000) were those in the form of companies and partnerships as well as those held by natural persons. There were also agricultural cooperatives, but their share did not exceed 10%. The remaining farms in the group in question belonged to the public sector.

The aim was to identify the trends and to assess the measures taken by large holdings in order to adapt to new economic conditions. The analysis also sought to answer the question of to what extent the new conditions determined the economic and financial performance of this group of entities, and to what degree those results resulted from changes in the utilisation of their production potential.

The study was based on information collected through steered interview in approx. 150 large Polish farms established, in whole or in part, from assets owned the State Treasury, and through questionnaires sent to ca. 50 agricultural production cooperatives.

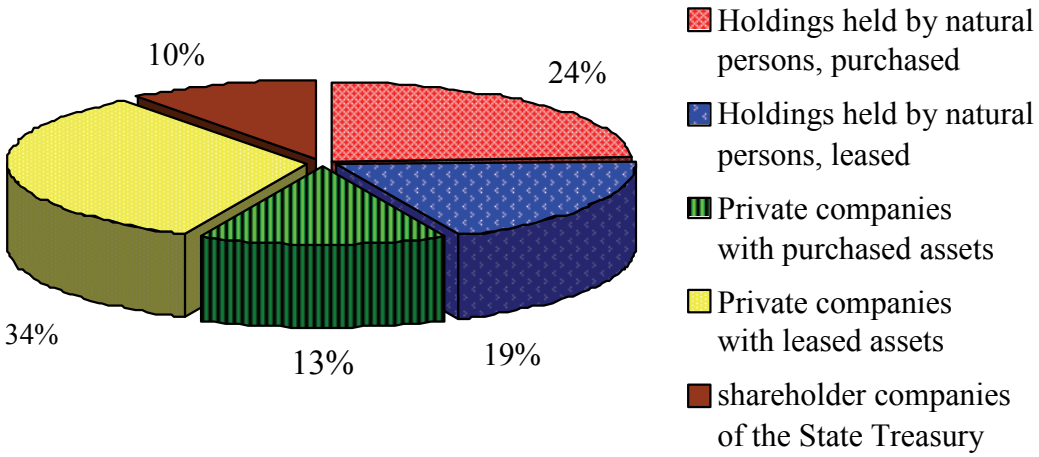
Holdings established, in whole or in part, from assets owned by the State Treasury

Large agricultural holdings have not been in the market very long as they were established on the basis of assets owned by the State Treasury as a result of ownership transformation and the liquidation of former state-owned agricultural holdings (*Państwowe Gospodarstwa Rolne* – PGR), whereas other farms (those held by natural persons) leased or purchased state-owned assets. What they have

[22] This chapter was prepared on the basis of the text by A. Kagan, *Procesy dostosowawcze zachodzące w wielkoobszarowych gospodarstwach rolniczych*, IERiGŻ-PIB, typescript, Warsaw, January 2010.

in common is hiring paid labour. Employees account for a predominant share in total labour inputs by holdings held by natural persons, whereas in commercial law companies they represent the sole category of staff.

Figure IV.1. Structure of the large agricultural holdings in question in 2008



The objectives of the functioning of such entities vary, sometimes significantly, but there are two primary goals. One is profitability, i.e. achieving a financial return on the capital invested, at a level equal to or greater than the market remuneration of the employment of external factors of production. The other is increasing the value of the holding, which amounts to generating a financial surplus or attaining a sufficient rise in the market value of owned assets to ensure the remuneration of own production factors (labour, land, capital) and the compensation for business risk.

The starting point in describing this group of large holdings was the pre-accession period, although it was not homogenous.

Between 1995 and 1997 the economic conditions for agriculture were favourable but gradually deteriorating. Owing to advantageous price relationships, the return on sales (expressed as the percentage ratio of sales to the main operating costs) exceeded 107%, which allowed large holdings to make profits from economic activities. However, the return on equity (22% in 1995 and 8.6% in 1997) was lower than the yield on Treasury bonds (by ca. 4 percentage points in 1995, the most favourable year, and nearly 13 percentage points in 1997), which meant a relative loss in equity since safe capital market instruments offered a higher return on investment.

In response to the deteriorating economic conditions for agricultural production in markets for selected products (cereals, pigs for slaughter, sugar, etc.), the government began to intervene, directly or indirectly, in the market

mechanism regulating demand and supply. The instruments applied comprised tariff protection, intervention buying-in, premiums on purchase prices, export support. In spite of efforts to counteract the downward trend of prices, the years 1998–2001 proved to be the most difficult period when large agricultural holdings incurred financial losses.

Between 1995 and 2001, the financial results of large farms were almost exclusively determined by price conditions. The share of subsidies representing direct support in income obtained by private holdings was less than 1%, and only state-owned companies benefited from subsidies to a greater extent. In 1999–2000 budget subsidies to biological progress in crop and animal production accounted for approx. 5% of receipts.

Until Poland's integration into the European Union, it was characteristic of the group of large agricultural holdings in question to cut employment and to switch from permanent workers to seasonal labour, both treated as ways of improving the efficiency of production, thus increasing income. Due to unstable market conditions, accompanied by significant costs of commercial loans and a relatively low remuneration of labour, those measures failed to bring the expected results. Apart from employment reduction, however, there were also other methods for enhancing performance: the simplification of production technology, the specialisation of production and increasing the area of farms, with the remaining material factors of production unchanged.

After 2002, there was a change in state intervention measures as new non-price instruments of direct income support were introduced, e.g. fuel vouchers and private storage aid for cereal producers.

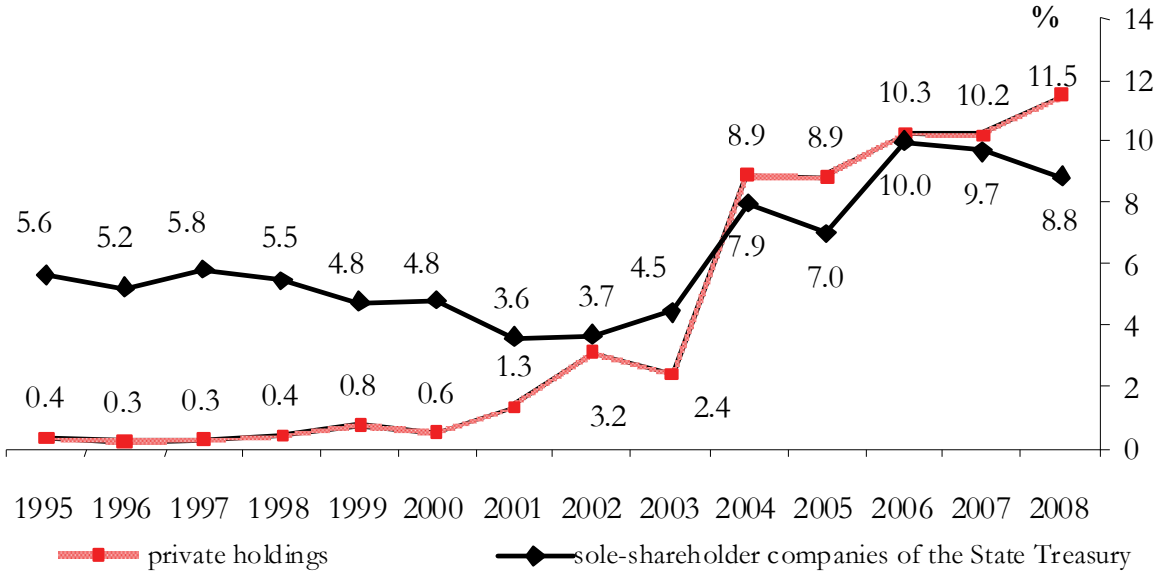
Only from 2004 direct public support was applied on a more significant scale, its level and share in the financial results of large holdings started to increase slowly but steadily. Subsidies (in the group of non-cooperative entities) represented 9% of total receipts in the first two years of membership, whereas in 2006–2007 they exceeded 10%, and went up to nearly 12% in 2008.

Poland's accession to the European Union resulted in changes in subsidies to state-owned companies. Due to limitations on investment subsidies and subsidised biological progress, the share of subsidies in total receipts of this group of entities fell below the respective proportion for private farms. In 2008 the difference was almost 3 percentage points.

A somewhat simplified reflection of the impact of direct budget support on the performance of farms (subject to effects of financial costs and revenues) was the widening gap between the curves of business profitability and sales in all the groups of holdings in question in 2004–2008. It should be recalled, however, that state intervention in the form of budget payments did not merely play the role of

a factor stimulating profits of large holdings, but it also reduced business risk, making a part of receipts independent of price movements. Moreover, budget payments helped boost investment activity.

Figure IV.2. Share of subsidies in total receipts of the analysed private holdings and sole-shareholder companies of the State Treasury in 1995–2008



After accession to the European Union, there was a marked improvement in the overall productivity of resources in the group of entities in question. Between 2004 and 2007 productivity measured by the Malmquist index went up in the latter group by an annual average of 4%, on account of a combination of several favourable factors: a low cost of external capital, improved business profitability allowing a rise in investment financed from reinvested earnings, stricter legal requirements concerning production conditions and animal welfare as well as budget appropriations made available for the purchase of fixed assets under EU programmes.

During integration into the European Union, the focus of investments made by the holdings in question has moved from the acquisition of the land rented to purchases of machinery, vehicles and equipment. In 2005–2008, these items of fixed assets accounted for more than half of expenditure, and the value of investment was double the annual depreciation of fixed capital. It enabled them to introduce new technological and technical solutions, largely substituting labour inputs.

Figure IV.3. Investment ratio in large private holdings in 2001–2008

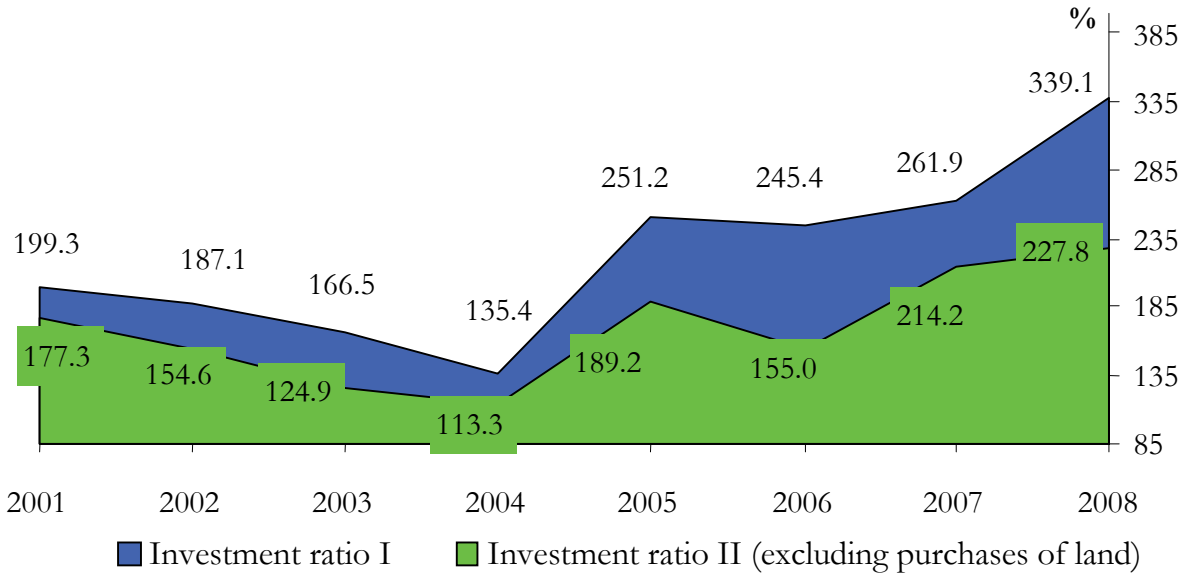
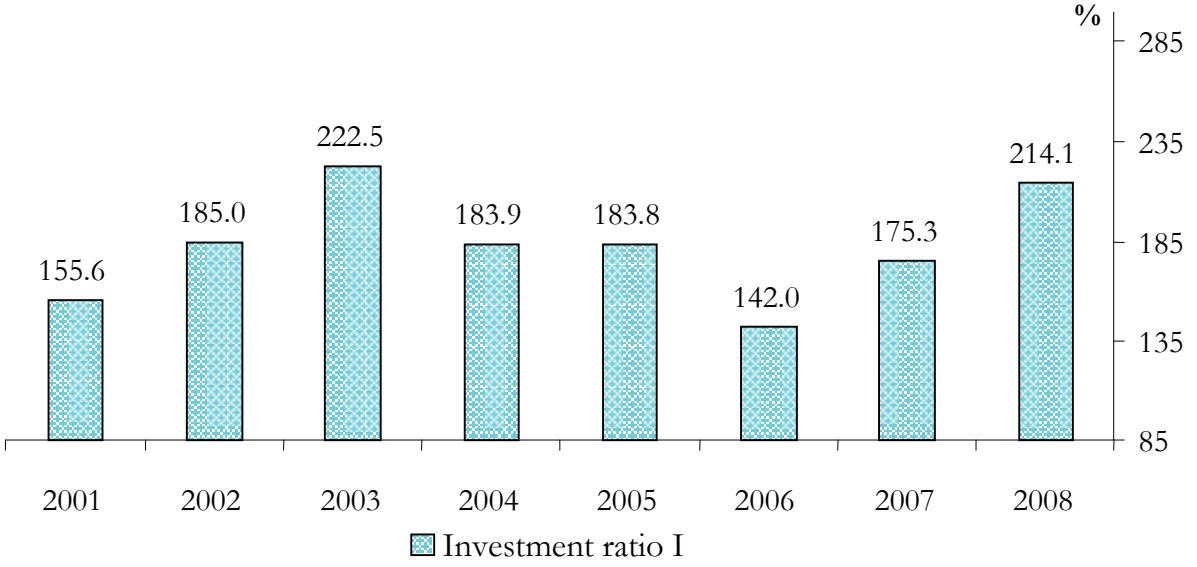


Figure IV.4. Investment ratio in sole-shareholder companies of the State Treasury in 2001–2008



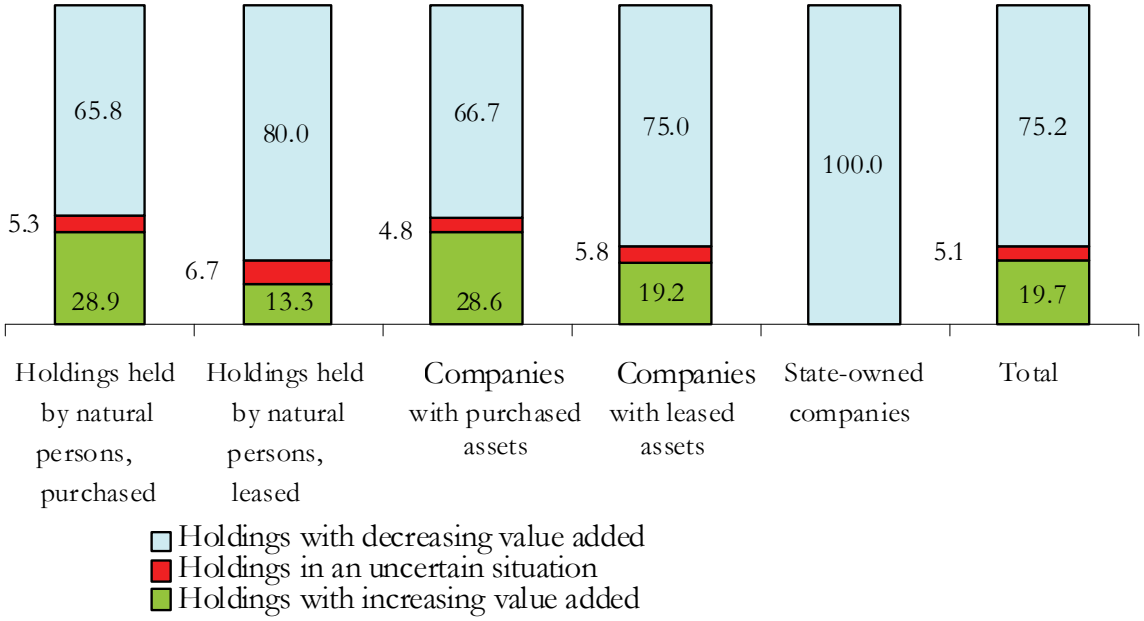
But investment activity does not mean that all holdings extended or replaced productive assets. Between 2004 and 2008 nearly half of the farms in question made no or little investment, insufficient to ensure simple replacement.

Since the productivity of resources and the ability to replace capital represent crucial elements determining the competitiveness of the analysed entities, a certain stratification has been observed. Fully efficient holdings obtain funds for investments which allow them to widen the gap. It cannot continue for a long time, however, owing to development barriers. Those include legal limitations on purchasing agricultural land, the unresolved issue of capital claims by former owners and, in the case of lease, the risk of a rise in

rent or even of the discontinuation of the lease of a given asset. Agricultural land represents an immobile resource, vital for the results of crop production. The possibility to utilise land or limited access to it is not only essential to the development of large agricultural holdings through increasing or decreasing the scale of agricultural activity, but it can ultimately determine their existence or liquidation.

The holding of land has gained special importance after Poland's joining the EU, in connection with budget support instruments dependent on the farm area. From 2004, there was a rapid rise in prices for agricultural land as well as growing interest in the acquisition of land from entities previously not engaged in farming and from small and medium-sized farms. This pressure was a natural result of the improved performance of agriculture and, consequently, its increased attractiveness as a location for investment and for the capital market. Agriculture ceased to be merely a workplace for land owners with a preference for a particular lifestyle, who settle for the remuneration of labour below its market value, thus subsidising the functioning of the farm by lower consumption in exchange for guaranteed employment. Since accession to the European Union large holdings have been again providing the remuneration of all production factors. In some cases, investing own funds in the farm allows to obtain an economic rent greater than the return on alternative investments in safe financial instruments, thus to increase the value of equity. For private holdings this rent reached 17.5% in 2004, and then dropped to 2.1% in 2008.

Figure IV.5. Large holdings broken down by form of ownership and type of value added in 2008



State-owned companies were characterised by deteriorated economic results. Although in 2004–2008 they reported financial profits and in 2004–2005 and 2007 their return on equity was different than from 1 to -3.3 percentage points, the last year covered by the analysis points to a very low level of financial efficiency (return on equity at 1.4%), thus to a considerable decline in the value of equity.

* * *

From Poland's accession to the European Union to 2007, the improvement in the financial and economic performance of large agricultural holdings resulted from more advantageous relative prices for products purchased and sold as well as from increased budget support. Furthermore, the stock of production factors was used to a greater extent, which was very favourable in social terms. The increase in productivity (technical efficiency) noted in the period covered by the analysis was mostly due to a rise in investment in fixed assets and the implementation of biological and organisational progress, which allowed to introduce new production technologies and methods.

Undoubtedly, integration into the European Union became a stimulus to increasing investment efforts by large agricultural enterprises and to seeking new production, organisation and financial solutions. However, a more detailed analysis of relative technical efficiency has demonstrated that there is still significant scope for improving the technical and economic results of the group of large holdings in question, by making more efficient use of the production factors at their disposal. Therefore, all instruments (including EU subsidies) aimed to stimulate innovation-oriented investments should be given priority with regard to this group of farms.

The downward trend of world agricultural prices observed in 2008–2009 was partly compensated by growing budget support. Unless there is a rapid strengthening of the zloty against the euro by 2013, price shocks should not jeopardise the functioning of the analysed holdings, and direct payments will serve as a buffer guaranteeing business profitability. But attaining high financial and economic efficiency and achieving the most important goals of such entities will be impossible without an improved return on sales through changes in relative prices.

The growing role of budget support will increase competition for land as the factor largely determining the level of subsidies received. Thus, the pressure for changing the allocation of land from the stock owned by the State Treasury will increase rather than fade, which will involve greater business risk for large farms, whose existence depends, to a significant extent, on agricultural land leased.

Sole-shareholder companies of the State Treasury lag behind other holdings from the analysed group in terms of technical and economic efficiency. The question arises whether their tasks such as work in the field of biological progress (creative and conservation breeding) could be performed by entities with a different legal and organisational form or perhaps different instruments should be used to boost their efficiency. Will the privatisation of the Agricultural Property Agency subsidiaries, i.e. those regarded as strategic from the point of view of agriculture and society, not increase the pressure to achieve the owners' objectives at the cost of deteriorated quality of their goods, or will there not be, in some cases, an irreversible loss of unique activities? This is a real threat, particularly under the national budget constraints with regard to supporting such holdings.

Agricultural production cooperatives[23]

Some agricultural production cooperatives date back to as early as the 1950s. The primary goal of their establishment and operations has been to meet the needs of their members and their families, mostly to provide employment and socially acceptable remuneration of the work performed.

Prior to accession to the European Union, important determinants of the economic performance of this specific form of large agricultural holdings were, as in the case of other legal and organisational forms discussed above, relative prices for purchased agricultural inputs and for products sold as well as the degree of utilisation of the means and factors of production. However, the income obtained by agricultural production cooperatives was insufficient to ensure the desirable remuneration of labour to their members. In such a situation, expenses related to the remuneration of labour involved using depreciation allowances for this purpose, and at times selling certain assets. Cooperatives not only failed to generate a surplus as the remuneration of equity, they were even unable to replace fixed capital consumed in production.

This poor economic situation was reflected in the steady downward trend of the number of operating agricultural production cooperatives (from 2,177 in 1989 to 820 in 2008) and of their share in total utilised agricultural area (from 3.8% in 1989 to 1.4% in 2008), observed from the early 1990s. Moreover, no new agricultural production cooperatives were set up in the period in question.

There were several reasons for the unfavourable situation of such entities. To begin with, the shortcomings of the cooperative law basically precluded

[23] Agricultural production cooperatives represent a part of a larger group of entities referred to as cooperatives of agricultural production. The former account for 90% of the total number of cooperatives of agricultural production.

rationalising the number of cooperative members and benefiting by the members from their contributions, or from their membership after retiring from working life. Furthermore, cooperatives were also deprived of privileges such as those enjoyed by holdings held by natural persons, e.g. a separate social security system with lower contribution rates. All that led to a considerable increase in social security costs incurred by cooperative members, to the level applicable to the non-agricultural social security system.

Agricultural production cooperatives have failed to exploit the opportunities offered by the inclusion of Poland's agriculture in (the Polish version of) the Common Agricultural Policy. Starting from 2004, they ensured a rise in the remuneration of members employed, but in 2006 and 2008 their income was lower than the costs of labour. Their economic inefficiency was also indicated by the share of subsidies in receipts, approx. 15% in 2007, 3 percentage points higher than the figure for other groups of large agricultural holdings. It pointed to lower incomes obtained by agricultural production cooperatives.

As a consequence, in 2004–2008 agricultural production cooperatives did not increase their investments to a level sufficient for capital extension. Only some cooperatives characterised by the largest scale of economic activity managed to ensure, owing to positive economies of scale, the level of income allowing the remuneration of labour and capital replacement at the same time.

* * *

According to the analyses conducted, the outlook for small, medium-sized and some large agricultural cooperatives is not very favourable. The downward trend of the overall number of such entities will continue, and they will be gradually replaced by large private holdings or companies.

The future of agricultural production cooperatives will depend on their members' expectations as to the remuneration of their work for the cooperative. The generational renewal of cooperative members also remains to be seen: will there be persons in local communities who will pursue their self-interest through enhanced cooperation and the attainment of collective goals in the first place? Will there be efficient managers with a priority to people-to-people links and local communities over their immediate personal benefits? The answers to these questions will depend on economic conditions as well as on amendments to the cooperative law.

V. CONCLUSIONS

Accession to the European Union brought about a considerable rise in agricultural income in Poland. However, there are two sides to this. On the one hand, it created conditions for a rapid improvement in the living standards of a major part of farmers and their families, cooperative members, land and capital owners as well as of paid agricultural workers. At the same time, other agricultural holdings were given an opportunity to continue their existence, which allowed to keep jobs and related incomes.

On the other hand, the long-term influence of (the Polish version of) the Common Agricultural Policy on the economic performance of Poland's agriculture does not seem very optimistic. The improved economic results of Polish agriculture resulted from a markedly faster rise in prices for agricultural products than in those for agricultural inputs in the first year of membership, a sweeping extension of the direct payment system and only to a moderate extent from enhanced efficiency of production. In this light, the impact of the Common Agricultural Policy should be assessed with caution since the improvement in the economic performance was mostly based on unstable, by their very nature, price fluctuations and direct income support for agriculture. Those are by no means sustainable conditions for maintaining the favourable economic effects in Polish agriculture in the long term.

Furthermore, direct income aid cannot be perceived as a factor conducive to the enhancement of the economic efficiency of Polish agriculture. On the contrary, it impedes the improvement in farming efficiency by distorting market processes, particularly the functioning of the land market, which hampers so much desired changes in the land structure of Polish agricultural holdings. Only the part of income transfers which have a moderate distorting effect on the market mechanism regulating income and stimulate the supply of socially desirable non-market services (the protection of soil, water and air quality, the preservation of the rural landscape, etc.) can be evaluated positively.

The above assessment is confirmed by the examination of efficiency changes over time. In 1999–2006 the improvement of efficiency in Polish agriculture was only slightly greater than the average for the analysed EU Member States.

It is hardly surprising. In the period in question, as many as ca. 87% of agricultural holdings eligible for income aid (with an area of at least 1 ha) did not apply for such payments, or if they did, they allocated such funds, entirely or mainly, for current consumption. It has been demonstrated that only every sixth holding in this group would be capable of improving the results achieved,

although it would involve enhancing the quality of managerial work and increasing the so-called social capital, whose favourable effects result from cooperation between agricultural producers.

Farms with negative capital replacement included small holdings held by natural persons, but also some large and very large holdings owned by legal persons and cooperative farms. The poor economic situation of agricultural cooperatives was partly due to institutional shortcomings. The cooperative law hindered the processes of employment rationalisation, and the social security system for cooperative members increased production costs in comparison with holdings held by natural persons.

In 2004–2007 only approx. 13% of farms eligible for income support were characterised by simple capital replacement or capital extension, which also means that it could have been accompanied by an improvement in farming efficiency. However, the years of recovery from the slowdown in Poland's economy caused by the global crisis will witness a deterioration in the situation of some of those holdings, to the extent that they will no longer be able to fully replace their fixed assets.

Between 2004 and 2006 a mere 5–6% (i.e. ca. 97,000) of Polish agricultural holdings entitled to income transfers were competitive with respect to their Danish, German, Swedish and Hungarian counterparts. Those were large farms, with an economic size of 16 ESU or more, and the average utilised agricultural area of 56 ha (although it significantly varied, from 32 ha to as much as over 1,000 ha). The vast majority of them were holdings held by natural persons who obtained at least most of their income from agricultural production, but this group also included farms owned by legal persons and agricultural cooperatives.

Only farms competitive relative to their foreign counterparts can hope for a long-term position as suppliers of agricultural products to the domestic and foreign markets. Uncompetitive holdings require restructuring and major investments in order to find a stable place in the market. Otherwise their products will be replaced by imports, unless other Polish farms prove to be competitive enough.

In 2002–2007 the number of competitive Polish holdings went up by 24,000 (34%), but as has already been mentioned, their share in the total number of farm eligible for income support does not exceed 6%. It is not very impressive. In Denmark, for example, the proportion of holdings as large as 100 ESU or more soared from 6.3% to 22.4% in 1990–2005, and similar trends have been observed in many other EU-15 countries. In advanced

economies only farms with very large-scale production can maintain their presence in the market.

In 2006 competitive Polish holdings supplied approx. 43% of the overall agricultural output. Efforts should be made to increase this proportion. It would be desirable to enhance the mobility of labour between regions and farms representing different economic sizes and organisation types (from small holdings engaged in extensive farming to large entities with intensive production), and to create an efficient land market. It would mobilise a greater supply of this production factor (ca. 7 million), i.e. land held by farmers obtaining poor economic results. It could be done, for instance, by limiting the illegal practice of receiving (all or part of) income transfers by the owners of leased land. However, the attention of Polish politicians is focused on large holdings, with the total utilised agricultural area of approx. 1.3 million ha, distinguished by high competitiveness. Furthermore, it would be desirable to provide greater support for farms with an economic size of 8 to less than 16 ESU as ca. 60,000 of such entities might become competitive. The share of competitive holdings in Poland could increase to 8–9% of the total number of farms entitled to income transfers.

In conclusion, it is worth adding that agriculture in Poland's neighbouring Eastern countries such as Russia, Ukraine and Belarus has been strengthening, and it has started to exert a significant influence on the world market in cereals and oilseeds (and probably oil). In a longer term, however, there might be changes resulting in reduced imports of livestock products to these markets as well as in a fall in cereal exports. Such developments, if they did not had an impact yet, will undoubtedly affect the economic situation in Polish agriculture in the future.

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