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Залежність продуктивності фермерських господарств від їх економічних розмірів

У ході аналізу на основі застосування формули залишкового прибутку проведено вимірювання продуктивності діяльності приватних фермерських господарств різної економічної потужності. Використаний для дослідження числовий матеріал отримано з бази європейської системи збору бухгалтерських даних - Farm Accountancy Data Network. Дослідження проводилося на прикладі фермерських господарств розподілених за економічним розміром, що діють на території Польщі.

Проведені дослідження підтвердили, що частка обігового майна та зобов'язань збільшується пропорційно росту економічної потужності фермерських господарств, що у свою чергу віддзеркалює збільшення масштабу виробництва. Разом із зростом загального обсягу виробництва збільшується і частка обігового майна. Встановлено, що паралельно із ростом економічної потужності, зростає і рівень залишкового прибутку, що свідчить про вищу продуктивність діяльності фермерських господарств. Для всіх досліджуваних груп господарств характерний додатній рівень залишкового прибутку, що вказує на рентабельність сільськогосподарського виробництва.

Ключові слова: *фермерське господарство, економічна потужність, продуктивність, залишковий прибуток.*

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Зависимость продуктивности фермерских хозяйств от их экономических размеров

В ходе анализа на основе применения формулы остаточной прибыли проведено измерение продуктивности деятельности частных фермерских хозяйств различной экономической мощи. Использованный для исследования числовой материал получен из базы европейской системы сбора бухгалтерских данных - Farm Accountancy Data Network. Исследование проводилось на примере действующих на территории Польши фермерских хозяйств распределенных по экономическим размерам.

Проведенные исследования подтвердили, что доля оборотного имущества и обязательств увеличивается пропорционально росту экономической мощи фермерских хозяйств, что в свою очередь отражает увеличение масштаба производства. Вместе с ростом общего объема производства увеличивается и доля оборотного имущества. Установлено, что параллельно с ростом экономической мощи, растет также уровень остаточной прибыли, что свидетельствует о более высокой производительности деятельности фермерских хозяйств. Для всех исследуемых групп хозяйств характерен положительный уровень остаточной прибыли, что указывает на рентабельность сельскохозяйственного производства.

Ключевые слова: *фермерское хозяйство, экономическая мощь, производительность, остаточная прибыль.*

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Farm Productivity Depending on Economic Size*

In the study, effectiveness of functioning of individual farms varying in terms of economic strength was measured using the residual income formula. The values used have been obtained from the European data collection system - Farm Accountancy Data Network for year 2011. The study encompassed farms in Poland, divided according to economic size.

On the basis of the research conducted, it was found that the share of current assets and liabilities increased along with the economic strength of farms, which reflects the increasing production scale. As the standard value of production of a farm increased, so did the share of current assets. Increase in economic strength also resulted in an increase in the level of residual income, which indicates higher effectiveness of a farm. All of the groups of farms examined recorded a positive result of residual risk, which proves that agricultural activity of these farms is profitable.

Keywords: *farm, economic strength, effectiveness, residual income.*

Introduction

Analysis of effectiveness of business entities can be conducted using various measures. The accounting methods of measuring effectiveness in form of profitability indicators, also known as rates of return, are among the most popular measurement tools [4]. The quality of measurement results obtained, on the basis of the accounting results, depends on the rules and standards applied in the accounting activity of the enterprise [3]. The objective of activity of a business unit is not only to maximize the accounting measures of effectiveness over the short-term perspective, but aiming at a high average rate of return over the long-term periods [4]. This has led to establishment, in the eighties of the 20th century, of the concept of stakeholders' value. The concept was based on the assumption that by maximizing the stakeholders' value, or the sum of benefits received by owners due to the shares held in an enterprise, we maximize the benefits of all entities related to the enterprise [11].

Approach to the concept of increasing of the enterprise value may lead to substantial changes in the mode of management, and focusing on value instead of other measures may change completely the decision-making process [2].

Like in the case of enterprises, measurement of effectiveness of farming activity generates many problems. The specific reporting system for individual farms within the framework of the Farm Accountancy Data Network (FADN) makes it difficult to compare the accounting results obtained with other departments of economy. At the same time, farm managers are usually the principal owners. From the perspective of the managers, the accounting rate of return, which is often very far from the cash result, is not the objective of the activity conducted. Individual farm owners invest their property and work for the objective, which is identical as the concept of stakeholder value, hoping to attain an increase in the value of their assets. Therefore, it is necessary to adapt the formula of measurement of stakeholder value – residual income – to the financial data of farms. The basic difference between residual income, used in measurement of stakeholder value and the traditional book profit is due to the fact that upon calculation of book profit, only the cost of borrowed capital is taken into account, while residual income is a surplus that remains after covering the costs of all types of capital [4].

Goal and methods of the research

The goal of the study is to determine the effectiveness of functioning of individual farms, characterized by diversified economic strength, using the residual income formula.

The values used have been obtained from the European data collection system - Farm Accountancy Data Network (FADN). The network collects data from commercial farms, which have their share in creation of added value in agriculture. FADN is an European system for collection of data from farms, formally established in 1965 (Regulation of the Council no. 79/65/EEC). FADN is a tool used for creation of the Common Agricultural Policy. Data gathered within the framework of this structure is used mostly for the purpose of[5]:

- Annual determination of income of farms in the European Union,
- Analysis of activity of farms,
- Assessment of effects of the planned changes that exert impact on farming in the European Union.

Farms have been divided according to the criterion of economic size, referred to as the total value of standard production of all types of agricultural activity at the farm [1]. The standard farm production is determined on the basis of the average production size for five years in a specific field of agricultural activity (plant and animal), obtained from 1 hectare or 1 animal during the year, under average production conditions, typical for a given

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region [6]. The financial data used was gathered for year 2011 – at the time of research, it was the most recent set of data published by FADN. The farm group identification is based on methodology used at the Institute for Economics of Agriculture and Food Economy – the State Research Institute (IERiGŻ-PIB), which is the Liaison Agency.

Table 1 presents the number of farms in each group according to economic size and the number of farms subject to research within the framework of FADN. In Poland, there are 738038 commercial farms in Poland, in which the value of *standard production* in 2011 exceeded the equivalent of 4000 €. These farms constitute the population, for which representative statistical data is gathered for a sample consisting of 11082 farms. The most numerous group is that of farms of economic size of 8 to 25 thousand € (326070 pc); therefore, the sample consists of 4223 farms with accounting data representative for this group. The second most numerous group are very small farms, and the sample included 1109 farms of this type. The smallest number of farms in Poland attained the standard production level above 500 thousand €, that is, 1465 entities were represented by the sample of 85 farms.

Chart 1

Number of individual farms of various economic sizes in Poland in 2011

Economic size class (in thousand €)	Total (pc)	Very small 4≤€<8		Small 8≤€<25		Rather small 25≤€<50		Rather big 50≤€<100		Big 100≤€ <500		Very big €≥500	
		pc	%	pc	%	pc	%	pc	%	pc	%	pc	%
Number of farms in sample	11082	1109	10,0	4223	38,1	3073	27,7	1763	15,9	829	7,5	85	0,8
Number of farms represented	738038	305882	41,4	326070	44,2	72660	9,8	21602	2,9	10359	1,4	1465	0,2

Source: *Plan for selection of sample of farms from the Polish FADN 2004* [9].

For measurement of effectiveness, a simplified residual income formula was used. It was based on calculation of surplus of the operating cash flows after taxation above the costs of capital [12]. Residual income served as a basis for creation of other measures of stakeholder value, such as the economic value added (EVA).

$$RI = ZS (1 - Tx) + A - WACC (AO + KON) \geq 0 \quad (1)$$

Where:

RI – residual income,

ZS – profit from sale,

Tx – income tax rate,

A – depreciation,

WACC – weighted average cost of capital,

AO – operating assets,

KON – net working capital

Residual income was calculated by application of financial items similar to those used in FADN financial reports. Gross profit from sale decreased by income tax was obtained by applying the item *cash flow (1).* The value of these flows is calculated by adding income from sale and other revenues, decreased by *total costs* and adjusted by the *balance of subsidies and taxes on operation and investment* [1]. The *total costs* item includes financial costs, and therefore the *cash flows (1)* were adjusted by the interest paid. The item *balance of subsidies and taxes from operation* includes taxes imposed upon individual farms. Moreover, the specific nature of the farming tax, which depends on the area and quality of arable land, allows for disregarding of the linear income tax formula in the calculations.

The weighted average cost of capital was determined on the basis of average interest rates for corporate loans in year 2011 at the level of 8.7 %. The cost of equity for individual farmers was assumed to be at the minimum level allowing for maintaining of market value of the assets [10]. For the sake of simplification, a *risk-free rate* was applied, constituting the interest on a 52-week treasury note in year 2011. The cost of equity applied was based on opinions of the farmers [8].

Results of the research

Table 2 presents the sources of financing and the structure of assets in individual classes of farm economic size. As *standard production* increased, so did the value of assets used by farms. At very small farms, the managers had at their disposal the assets of the value of PLN 312.4 thousand, where 0.9 % was financed by borrowed capital. This was the lowest debt ratio in all economic size classes. Farms with the lowest economic size also showed the lowest share of current assets, which indicates a low level of intensity of agricultural production. As the economic size increased, the share of current assets in the property of farms increased. Greater scale of production resulted in the necessity to maintain stocks of materials and products and to a higher level of receivables from recipients and cash. On the average, in the entire population, current assets constituted 12.7 % of all assets, while at the very big farms; the share of these was higher by 24.6 percentage points. The level of financing with borrowed capital was also increased as did the economic size of the farms. In comparison with very small farms, the level of debt at the *rather small farms* was higher by 5 percentage points and at the *very big farms* – by 24.5 percentage points. When the scale of production was greater, farm managers were more eager to make purchases with deferred payment dates and to incur loans for operating and investment purposes. Greater value of income earned provided a better security for debt repayment, both for creditors and for the managers themselves. On the average, the level of debt at a farm amounted to 5.6 %, being the equivalent of 34.2 thousand PLN. At the same time, it should be underlined that the farming tax applicable in Poland, depending on the area and quality of arable land, does not allow individual farms to take advantage of the tax shield effect.

Chart 2

The assets and sources of financing of farms

No.	Economic class sizes (in thousand €)	Total assets 100%	Current assets		Fixed assets		Equity		Total liabilities	
		PLN thousand	PLN thousand	%	PLN thousand	%	PLN thousand	%	PLN thousand	%
1	Very small 4≤€<8	312,4	29,7	9,5	282,7	90,5	309,6	99,1	2,8	0,9
2	Small 8≤€<25	552,4	61,7	11,2	490,7	88,8	536,7	97,2	15,7	2,8
3	Rather small 25≤€<50	1111,8	130,5	11,7	981,3	88,3	1046,4	94,1	65,4	5,9
4	Rather big 50<=€<100	1836,9	228, 3	12,4	1608,6	87,6	1675,0	91,2	161,9	8,8
5	Big 100≤€<500	3468,4	632,8	18,2	2835,6	81,8	2913,2	84,0	555,2	16,0
6	Very big €≥500	13683,0	5101,4	37,3	8581,6	62,7	10084,7	73,7	3598,3	26,3
7	Average	613,6	78,1	12,7	534,5	87,3	578,4	94,4	34,2	5,6

Source: *Standard results for 2011 obtained by farms participating in FADN* [7].

Table 3 presents the values of individual parameters used for calculation of residual income at Polish farms. The value of cash flows attained increased along with the economic size of a farm. On the average, the amount of cash flow per farm amounted to PLN 51366. The level of costs due to interest was similar as the share of borrowed capital in financing of farms belonging to individual classes of economic size. At very small farms, in year 2011, only 116 PLN of interest was paid, while at large farms, this value was one hundred times higher.

The average value of depreciation of fixed assets at the farms examined was PLN 16865. The highest costs due to depreciation were recorded at the big and very big farms. Due to the fact that arable land is not subject to depreciation, the high associated costs are associated with use of the remaining fixed asset items of high balance sheet value. The value of net working capital in all classes of economic size was positive, which reflects a conservative approach towards management of current assets. Even in the class of very big farms, despite the highest debt ratios, the managers maintained a high share of current assets financed by equity (KON). The weighted average cost of capital at farms of various economic size depended on the debt ratios, as the cost of borrowed capital was higher than that of equity. The cost of capital was slightly above the risk-free rate applied in the research at the very small farms, amounting to 4.63 %, while at the rather big farms it was higher by 0.26 percentage points. The highest weighted average cost of capital was recorded at very big farms (5.31 %). On the average, for the entire group of farms subject to research, the weighted average cost of capital amounted to 4.77 %.

Chart 3

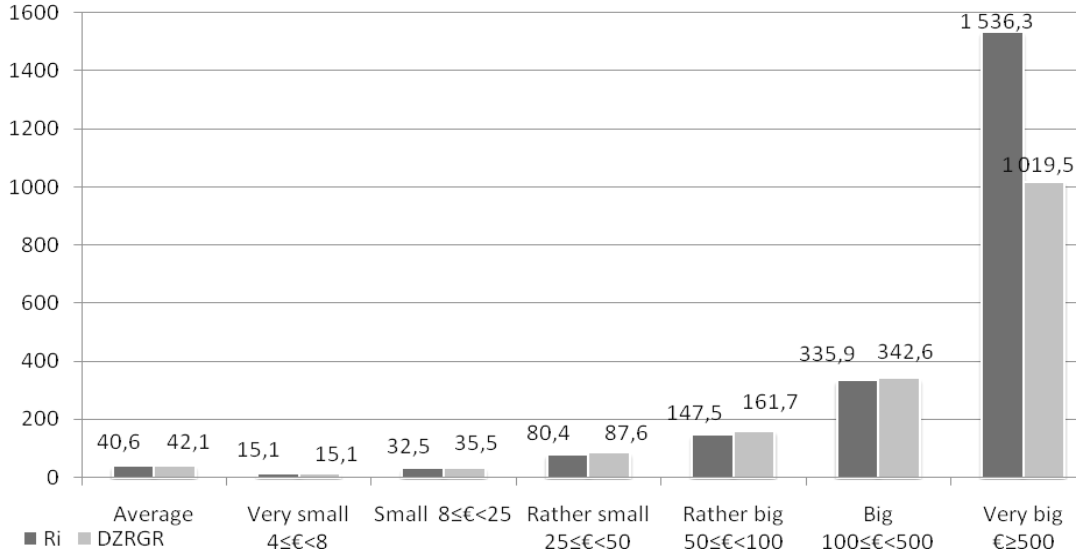
Parameters applied to calculation of residual income (PLN)

No.	Economic class sizes (in thousand €)	Flows	Interest	Depreciation	Net working capital	WACC (%)
1	Very small 4≤€<8	20800	116	8641	28716	4,63
2	Small 8≤€<25	42917	609	14653	56949	4,69
3	Rather small 25≤€<50	101754	2308	28876	114145	4,79
4	Rather big 50<=€<100	182037	5272	48061	187211	4,89
5	Big 100≤€<500	386155	15810	103328	474731	5,12
6	Very big €≥500	1520698	85343	559280	3261706	5,31
7	Average	51366	1090	16865	66917	4,77

Source: *Own research.*

Figure 1 presents the residual income (RI) value and income from a family farm (DRGR) in individual classes of economic size. On the average, in the entire group of farms, the value of income from a family farm attained by the managers was higher by 1.5 thousand PLN than the residual income, which amounted to PLN 40.6 thousand. A similar tendency was recorded at standard production farms of 8 to 500 thousand €. The basic reason for this difference is the fact that the cost of equity was included in the RI formula. Although it was assumed to be at the minimum level, the high share of equity resulted in a deviation between these values. At very small farms, residual income was higher than the income from a family farm. The difference recorded was rather small (PLN 80) and it resulted from adjustment by the depreciation value, which is not considered to be a cost in residual income. The most significant difference was recorded for very big farms, where residual income was higher than family farm income by PLN 516.9 thousand. Although the weighted average cost of capital was higher in comparison with other groups, measurement of effectiveness using the residual income formula indicated a value of RI higher by 50.7 % than the DZRGR. This difference is mainly due adjustment to depreciation, which does not constitute a cost associated with money spending.

At very big farms, the depreciation costs were relatively high, which resulted in a substantial increase in the level of residual income. This may indicate that the price of use of borrowed capital being lower than the price actually paid by managers.



Source: *Own research.*

Graph 1. **Residual income and family farm income (PLN thousand)**

Conclusion

The study was aimed at measurement of effectiveness of functioning of individual farms, varying in terms of economic strength, using the residual income formula. The following conclusions were drawn on the basis of the research conducted:

1. The share of current assets and liabilities increased along with economic strength, which reflects the increasing scale of production. As the standard production value increased, so did the share of current assets used to maintain the production cycle. At the same time, increased demand for current assets was covered, partially, by external sources of financing.
2. As the economic strength increased, so did the residual income level, which indicates a growing effectiveness of farm activity. Residual income of farms, as a result of taking into account the costs of equity, which was a dominant source of financing, in most economic size classes was below the family farm income level. The difference achieved depended greatly on the level of cost of equity assumed in the residual income formula, which did not include a risk premium.
3. All of the examined groups of farms recorded a positive level of residual income, which is a proof of profitability of farming production. In the model applied, however, aid obtained within the framework of the Common Agricultural Policy was included in operating cash flows, which resulted in a substantial increase in its value. Moreover, in individual farming, the costs of work of the farmer and other family members are not taken into account.
4. The weighted average cost of capital increased along with economic strength, which is associated with increase in the share of borrowed capital in the sources of financing. The simultaneous increase in the weighted average cost of capital and the residual income level as the economic strength increases shows that the financial level is strong in the case of the biggest farms.

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