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UTILIZATION OF CAPITAL RESOURCES IN FARMS WITH THE PREDOMINANCE OF CROP PRODUCTION IN POLAND ON THE EXAMPLE OF DOLNOŚLĄSKIE VOIVODESHIP

WYKORZYSTANIE ZASOBÓW KAPITAŁU W GOSPODARSTWACH ROLNYCH Z PRZEWAGĄ PRODUKCJI ROŚLINNEJ W POLSCE NA PRZYKŁADZIE WOJEWÓDZTWA DOLNOŚLĄSKIEGO

DOI: 10.15611/br.2016.1.11
JEL Classification: Q120, M410

Summary: The aim of the article was to evaluate the utilization of capital factor in farms with the dominant crop production. Such farms occur in Poland in Dolnośląskie Voivodeship. This voivodeship, despite very favorable natural conditions, has weaker and weaker production results compared to other parts of the country. There were used data from mass research (CSO, FADN) and own research conducted in 2013 on a sample of 282 farms from Dolnośląskie Voivodeship. Using survey and literature a material was gathered which was analyzed by simple statistical methods. Studies have shown that farms in the voivodeship have outdated production assets and were underfunded. EU subsidies are spent primarily on current activities and investments are financed mainly from loans. Furthermore, the capital of farms in the voivodeship is characterized by lower productivity than the capital of farms in the country as a whole. It is therefore used in a worse way.

Keywords: fixed assets, current assets, farms, capital utilization.

Streszczenie: Celem artykułu była ocena wykorzystania czynnika kapitału w gospodarstwach rolnych z dominującą produkcją roślinną. Gospodarstwa takie występują w Polsce w województwie dolnośląskim. Województwo to, mimo bardzo sprzyjających warunków naturalnych, osiąga coraz słabsze wyniki produkcyjne na tle kraju. Do analiz wykorzystano wyniki badań masowych GUS i FADN oraz badań własnych przeprowadzonych w 2013 roku na próbie 282 gospodarstw rolnych z terenu województwa dolnośląskiego. Wykorzystując metodę ankietową i badania literaturowe, zgromadzono materiał badawczy, który analizowano prostymi metodami statystycznymi. Badania

wykazały, że dolnośląskie gospodarstwa rolne dysponują przestarzałym majątkiem produkcyjnym i są niedoinwestowane, zarówno na tle Polski, jak też UE. Dopłaty unijne są przeznaczane przede wszystkim na bieżącą działalność, a inwestycje finansuje się głównie z kredytów. Ponadto kapitał dolnośląskich gospodarstw cechuje niższa produktywność niż kapitał gospodarstw rolnych w kraju ogółem. Jest on zatem gorzej wykorzystywany.

Słowa kluczowe: środki trwałe, środki obrotowe, gospodarstwa rolne, wykorzystanie kapitału.

1. Introduction

Agriculture, despite the declining share in GDP of the country, is a still important manufacturing sector of the Polish economy [Crescenzi 2004]. Like other types of economic activity, it is based on the use of three basic factors of production, i.e. land, labor and capital. They represent resources whose size changes relatively slowly in agriculture. Their use is incomplete and depends on many interrelated natural, demographic and economic factors. The interaction of these factors makes that some voivodeships, although possess greater wealth of production resources, supply less agricultural raw materials to the market than those with lower production capacity. A good example is Dolnośląskie Voivodeship, where the use of agricultural productive resources is relatively low.

The complexity of manufacturing processes in agriculture requires the involvement of many means and objects of labor. The seasonality of agricultural production makes that very valuable assets are not used for the part of the year, and the financial capital which is “frozen” in them does not work. Therefore the problem of rational utilization of the property comes down to determine the appropriate balance between fixed assets and current assets used in agricultural production. Makeham and Malcolm [2003] research shows the need for changes in the relationship of elements within a system of total fixed assets and the need to adapt relations of other production factors resources to them

2. Characteristics of selected elements in the agriculture of Dolnośląskie Voivodeship

Dolnośląskie Voivodeship is the seventh largest voivodeship in Poland. Utilized agricultural area (UAA) occupies 60% of its surface and represents 6.2% of its national resources (also seventh place in the country). According to the last Common Agricultural Census from 2010 [CAC 2010] the rate of technical equipment of land in Dolnośląskie Voivodeship was 8.4% lower than the average one in Poland and amounted to 6397.91 zł per ha UAA against 6982.08 zł per ha in the country. Higher than the average in Poland gross investments on fixed assets in agriculture (5709.37 against 5315.84 zł per ha UAA) which occurred in 1999-2008 failed to change the

situation. In Dolnośląskie Voivodeship there are fewer tractors per 100 ha UAA – 5.1 (versus 8.3 on average in Poland). The number of cattle and pigs was only $\frac{1}{3}$ of national livestock density (11.4 head of cattle and 31.5 pigs per 100 ha versus 37.0 and 98.3 in the country in total). The consumption of mineral fertilizers and feed in Dolnośląskie Voivodeship was lower – in sequence 114.7 kg of pure ingredient NPK per 1 ha UAA and 188.4 kg per conversion piece LSU (in Poland on average 140 kg per 1 ha and 737.2 kg at LSU) [Bank Danych... 2016]. These data show that farms in Dolnośląskie Voivodeship are poorly equipped in fixed assets and current assets and they are focused mainly on crop production.

Dolnośląskie Voivodeship has one of the country's best natural conditions for agriculture. Land of the highest quality (I-III bonitation class) occupies 40.8% of it of the total UAA (in Poland – 25.9%) [GUS 2013a]. An indicator of agricultural production space valorisation (IAPSV), taking into account also agroclimate, water conditions and landform, was one of the highest in Poland and amounted to 74.9 against 66.6 in the country in total [IUNG 2000]. The assessment of the utilization of the agricultural production space carried out by the Institute of Crop, Fertilization and Soil Science (ICFSS) for 2003-2005 showed that Dolnośląskie Voivodeship took advantage of its agricultural production potential in 75.6%. Calculating in the same way the relation of actual crop production, expressed in units of cereal, realistically possible to obtain in Poland, amounted to 71.7% [Kukuła, Krasowicz 2006].

Above data show that Dolnośląskie Voivodeship slightly better utilized agricultural potential than the country's total. However, the results of agriculture in Dolnośląskie Voivodeship are getting weaker against the country. According to results from CAC 2002 the share of Dolnośląskie Voivodeship in the global value of agricultural production in the country amounted to 5.4% (7th place in the country), and in 2013 it decreased to 4.8% (8th place) [Bank Danych... 2016]. This may be caused, among others, by the resignation of farmers from the voivodeship from livestock production and their focusing mainly on less valuable crop production. Data from the last two agricultural censuses partially confirm this thesis. In 2002, the proportion of holdings involved in crop production, livestock and mixed was as follows: 70.3%, 14.3%, 15.4%, while in 2010: 73.3%, 14.0%, 12.7%. For comparison, in Poland the total of these proportion in 2002 were as follows: 50.8%, 29.7%, 19.5%, and eight years later: 54.8%, 29.7%, 15.5% [GUS 2013]. Also own research, conducted in Dolnośląskie Voivodeship in the first half of 2013, confirmed the dominance of the number of farms producing crops and marginalization of livestock production and a much higher percentage of units with mixed production (in sequence 68.2%, 0.5%, 31.3%).

In Poland a progressive regional specialization of agriculture is observed. These are voivodeships involved heavily in livestock production, e.g. Wielkopolskie, Mazowieckie, Podlaskie. Dolnośląskie Voivodeship is an example of the region specializing in the crop production. Specialization should improve economic

efficiency [Latruffe et al. 2004; Matthijs, Swinnen 2001]. Then, what is the source of the worsening position of Dolnośląskie Voivodeship in agricultural production against the country, when it has such favorable natural conditions for crop production? As it is known, in modern agriculture, the importance of capital grows and increasingly replaces the human factor [Syed, Miyazako 2013]. The problem may lie in the insufficient stock of capital or its inefficient use.

3. The degree of utilization of production fixed assets

Following earlier considerations, to evaluate the management effectiveness of means of labor at first synthetic measures of the productivity of capital were used, which refers to fixed assets. It was calculated as the ratio of annual global production in agriculture to the gross value of fixed assets, which is disposed in this section. In Figure 1, this ratio called *global productivity* is shown.

In 2013, over 60% of global production in agriculture accounted for intermediate consumption [GUS 2014], but fixed assets are best used when they are producing new values. Therefore, in addition the ratio of gross value added to the gross value of fixed assets in agriculture and hunting was calculated, calling this relationship as an indicator of *pure productivity* (Figure 1).

In 1999, every złoty (zl) involved in the production of fixed assets of Polish agriculture gave 0.46 zl of global production value and 0.29 zl of added value.

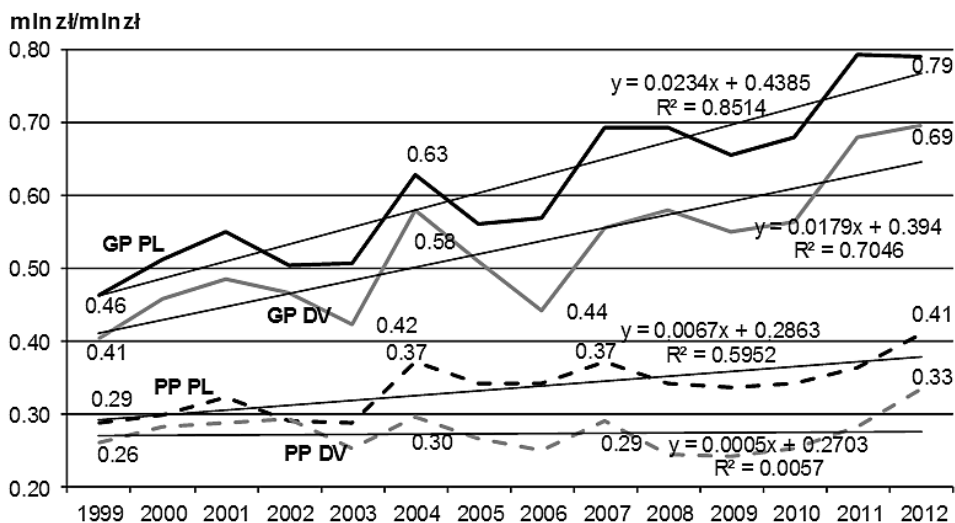


Figure 1. Global productivity (GP) and pure productivity (PP) of fixed assets in agriculture and hunting in Poland (PL) and Dolnośląskie Voivodeship (DV)

Source: own study based on [Bank Danych... 2016; GUS 2001; 2006; 2010; 2013].

A significant improvement in productivity of this property took place in 2004 and in 2007, and reached the highest value in 2012 (respectively 0.79 and 0.41). The degree of utilization of fixed assets in the reporting period grew, with the much faster increase of global productivity (annual average of 0.023) than pure productivity (0.007). Too slow improvement in the use of fixed assets to create new value may indicate imbalance of ratio between fixed and current assets. Big freeze of funds in fixed assets is inefficient [Wasilewski, Nowak 2006; Katchova 2005].

Productivity of capital in Dolnośląskie Voivodeship was, in the analyzed period, lower than the average in Poland, although the trends were similar. Unfortunately, the growth rate of the global productivity in the voivodeship (annual average of 0.018) was lower than the national (0.023). It is difficult to compare trends in pure productivity, because the degree of fit the trend line to the empirical data for the voivodeship is very low ($R^2 = 0.006$). A step improvement in these indicators was observed in the periods of economic upturn in agriculture and the economy (already mentioned the years 2004, 2007, 2012). Due to higher prices affecting the value of generated production, also discussed indicators of productivity periodically grew. Management of operating resources had low impact on the value of these indicators. Lower, than in Poland total productivity of fixed assets in the voivodeship is surprising for at least two reasons:

1. Dolnośląskie Voivodeship is a region with very favorable natural conditions for agricultural production (mentioned above).
2. The gross value of fixed assets in agriculture grew more slowly during 1999-2012 than the national average, i.e. from 9% to 19% [Bank Danych... 2016].

As it can be seen the degree of utilization of fixed assets in the agriculture of Dolnośląskie Voivodeship is lower than in the country's total. This affects, among others, worse equipment of farms in the voivodeship in mobile production assets and its increased consumption, and therefore technological backwardness. The number of new tractors purchased after 2004 in the voivodeship accounts for only 3.5% of national resources. The introduction of new technologies in agriculture contributes to the reduction of production costs and makes better use of other productive resources. It does not always have to be associated with investments in own expensive machinery park. The most important directions of rational mechanization include [Lorencowicz, Cupiał 2012):

- new technology to reduce production costs,
- acquisition of machinery outside holding (e.g. machinery companies),
- use of own machines outside a farm.

When discussing the indicators of capital productivity in Polish agriculture, it is worth paying attention to the formation of their value in so-called modern agriculture of the "old" EU member states. Thus in 2012, the pure productivity of fixed assets in this sector of economy, amounted to 0.06 in Denmark and 0.10 in the Netherlands [Eurostat 2016]. The European agricultural model, developed over decades in the Community assumed the reduction of land and labor resources, which was replaced by

capital [Kulýk 2013; Ball et al. 1993]. Polish agriculture has to be considered against this background (and even more Dolnośląskie Voivodeship) for being very little capital-intensive, and at the same old-fashioned [Tarnowska 2014], but still utilizing available assets to a greater degree than this happens in specified countries of Western Europe. The comfort of work and the scale of operations are not mentioned here.

Tractors, used commonly on farms, are one of the basic machines, with a very wide range of applications: cultivation, fertilization, seeding, internal transport. Their use, in comparison with specialized (i.e. combine-harvester) or complementary machines (used mainly for transport and handling), is relatively extensive [Muzalewski 2008]. Is worth focusing on this group of fixed assets and checking whether the resource of tractors is matched to the actual demand for them and in this way if it determines the degree of their technical use.

The indicative method of rational farm equipment in tractors will be helpful in the assessment, depending on the area of agricultural land [Muzalewski 2008]. Necessary data to calculate the average area of UAA in Polish and Dolnośląskie Voivodeship farm were summarized in Tab. 1, on the basis of the results of the last census. These values were used to determine *ratios of tractors' power saturation* (normative power of a tractor on 1 ha UAA and the normative power of a tractor in a farm), and to compare this normative size with the actual (according to CAC 2010) average power of tractors per 1 ha and 1 farm in these aggregations.

Table 1. Assessment of equipment on the average farm in Poland and Dolnośląskie Voivodeship in tractors in 2010

Specification	Units	Poland	Dolnośląskie Voivodeship
Number of farms	thous. farms	2278	107
Utilized Agricultural Area (UAA)	thous. ha	15534	960
Average UAA in farm	ha	6.82	8.94
Number of tractors	thous. pcs.	1471	59
Total ^a power of tractors	thous. kW	50913	2689
Average tractor's power per 1 ha UAA	kW/ha UR	3.28	2.80
Average tractor's power per 1 farm	kW/farm	22.35	25.06
Normative^b tractor's power per 1 ha UAA	kW/ha UR	6.39	5.79
Normative ^b tractor's power per 1 farm	kW/farm	43.57	51.76
The degree of saturation of UAA power of tractors	%	51.33	48.36
The degree of saturation of farms power of tractors	%	51.30	48.42

^a The sum of the products of the number of tractors in the power range and power of the central compartment according to the CAC 2010. ^b Calculated by indicative method used by agricultural advisors from Agency for Restructuring and Modernisation of Agriculture (ARMA) to assess applications for funding the purchase of tractors. The basis for the calculations was the UAA in statistical farm according to results CAC 2010.

Calculations of normative tractor's power (ratios of tractors' power saturation) were performed using the normative values from the upgrade to Muzalewski's expertise (extract in Tab. 2) according to the following formulas [Update... 2014]:

$$W_X = \frac{(W_1 - W_2)}{(A_2 - A_1)} \times (A_2 - A_X) + W_2, \quad W_Y = A_X \times W_X,$$

where: W_X – wanted index value for the area A_X ,
 W_Y – wanted index value for the farm with the area A_X ,
 A_X – acreage of UAA owned by the applicant (here demonstrated in the CAC 2010 the average UAA in fa arm),
 A_1 – A_X closest lower value of the area,
 A_2 – A_X closest greater value of the area,
 W_1 – index value corresponding to area A_1 ,
 W_2 – index value corresponding to area A_2 .

Table 2. Indicators of equipment of farms with tractors depending on the acreage of UAA

Farm area in ha UAA (A_1, A_2)	Index of farm saturation by power of tractors	
	kW/ha UAA (W_1, W_2)	kW/farm
5	7.35	37
7.5	6.03	45
10	5.62	56

Source: [Update... 2014].

The calculations have shown that in an average farm in Poland in total, and even more in Dolnośląskie Voivodeship, there is a shortage of tractors' power. According to normative indicators, in Poland for every hectare of UAA in statistical farm there should be 6.39 kW of tractor's power and in 2010 it was only 3.28 kW. Power shortage reaches almost 49%. In Dolnośląskie Voivodeship an even greater deficit of tractors' power was observed, although the average area of UAA on the farm was about 2.12 ha higher. As it is known, with each hectare of area, the power demand of the tractor engine per unit of area, at a reasonable furnishing of this equipment, decreases [Update... 2014]. In the voivodeship the shortages of this power reached nearly 52% in 2010. However, it should be noted that the calculations assumed the use of machines only in each farm, excluding, for example, neighborly help.

Presented analysis has just a formal-statistic character and serves mainly comparative purposes (Dolnośląskie Voivodeship against the country in total). It refers to the average size farm for each group. It does not include the division into area groups of farms, despite the fact that the demand for tractors' power and their

utilization shows a clear dependence on the area of farms [Kapela, Czarnocki 2011; Liljedahl et al. 2012]. In literature an analysis of agricultural machines utilization can be encountered, taking into account, generally and subjectively selected relatively large farms (above average surface UAA from Tab. 1), which have their own technical means of production [Hunt 2008; Wójcicki 2013] or farms selected for the direction of the production [Kuboń, Kurzawski 2013]. Here all farms are taken into account.

With such high deficiencies in the equipment in the machine, as demonstrated by the example of tractors, it is worth considering the aforementioned solutions to improve agricultural mechanization in Poland, including Dolnośląskie Voivodeship. It emphasizes the importance of the so-called behavioral factors in making the decision to purchase fixed assets by Polish farmers. It turns out very often that they attach more importance to having their own property of high value than efficiently using its components [Goraj, Mańko 2009].

Conducted in 2013, own studies have shown that the agricultural machinery used in Dolnośląskie Voivodeship farms were owned in 92.3% by their users. Only 7.1% of respondents used machines belonging to the group of farmers, and 38.3% borrowed their equipment neighbors. Nevertheless, 73.0% of farmers believed that their agricultural machinery were well used. Research confirms the commitment of farmers to their own equipment and at the same time uncritical approach to the rationality of management of means of labor. This concerned relatively large farms (average area of 36.7 ha).

4. Rationality in management of current assets

The general principle of rational management of current assets is striving to increase its share in the structure of assets. This is conducive to better use of the potential of a property (operating leverage), improves the liquidity of the entire assets due to the high flexibility of current assets [Singh 2008]. It gives greater opportunity of adapting asset resources to the situation of the entity. Current assets, involving capital in the short term, are burdened with lower risk [Kiziukiewicz 1993; Bieniasz, Gołaś 2008].

There should be remembered the specifics of agricultural activity, which is characterized by long production cycles, seasonal production, strong commitment of capital in fixed assets (which reduces liquidity), low profitability of production and little ability to change the direction of production [Zawadzka et al. 2013; Godfray et al. 2010]. It all makes that the share of current assets in total assets is relatively low (Fig. 2).

The study of commercial farms carried out under the Polish FADN has shown that farmers in Dolnośląskie Voivodeship used current assets more rationally than the average representatives of this profession in Poland. The share of current assets in total assets was in an average commercial farm in Dolnośląskie Voivodeship from 5 to 12 percentage points higher than in an adequate farm in the country as a whole. In addition, since 2009 this index has shown an improvement in both analyzed

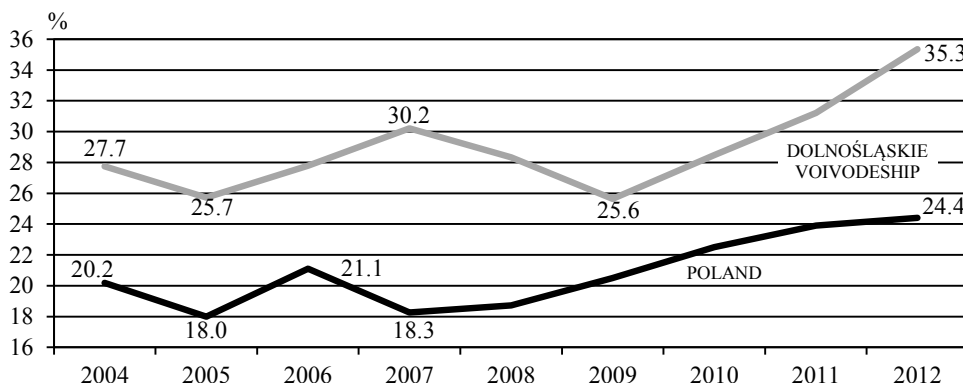


Figure 2. The share of current assets in total assets (excluding land) in a commercial farm by Polish FADN (average results for the sample)

Source: own calculation based on [Wyniki Standardowe... 2014; FADN 2016].

collectivities. This shows a greater commitment to the agricultural production of current assets, which leads to greater intensity of production, and thereby it is conducive to better use of fixed assets.

Poland, in terms of the degree of involvement of capital in current assets, does not differ much from the EU average. In 2008, the average share of current assets in total assets (generalized to the entire population of commercial farms in the field of observation of FADN) amounted to 19.7% in the EU-27 and 17.4% in Poland. It is estimated that during the economic crisis, it was the participation of high, generating, but at the same time, moderate benefits and risks [Ryś-Jurek 2012].

4.1. Material current assets

Further using of FADN research was compared to the structure of current assets in an average commercial private farm from the area of Dolnośląskie Voivodeship against an adequate farm in the country. In standard results of these studies, there are three groups of current assets, in the composition of which there are [Spis aktywów... 2013]:

1. Non-breeding livestock (production): animals for slaughter or producing milk, eggs etc.

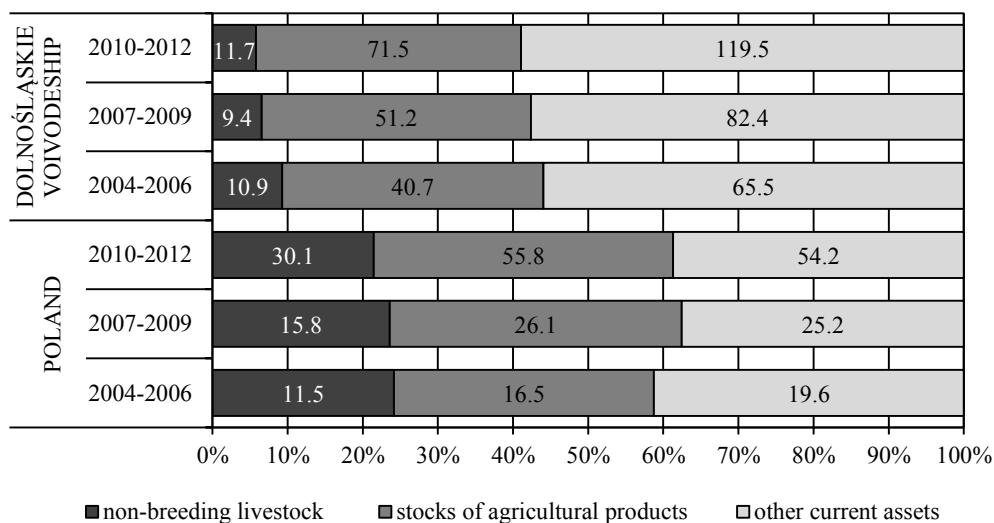
2. Stocks of agricultural products:

- inventories of own products – potential commodities (cereals, potatoes, seeds, vegetables, fruit, nursery stock, wool, eggs, honey, animal skin, etc.) and not commodity (hay, silage, fodder roots, straw, manure, etc.),
- supplies of materials for operating activities (seeds, fertilizers, pesticides, animal feed, veterinary drugs, disinfectants, cleaning agents, motor fuels, spare parts for machinery and construction materials exclusively for operating the farm, etc.),
- crop production in progress,

3. Other current assets: advances for construction in progress, the future supply of materials and services; receivables for sold animals, products, services, received grants and compensation; funds.

Basically, it can be assumed, that the material current assets are the first two of these groups, while the last group involves cash current assets (more detail in section 4.2).

The results of the FADN for the years 2004-2012 (presented in three-year periods in Fig. 3) show that the non-breeding livestock had the lowest and declining share in the structure of current assets of the average commercial farm in Poland in total and in Dolnośląskie Voivodeship. While in the voivodeship, this share in the period of 2010-2012 accounted for only 5.8% of current assets, in Poland an average was 21.5%, despite a significant increase in the value of the asset group in the country. The declining share of non-breeding livestock in current assets in Dolnośląskie Voivodeship confirms the previously described regularities of changes in the agriculture of this administrative unit.



NOTE: The figures given in the chart refer to the value of assets in thous. zł, posts – illustrate their structure in%

Figure 3. The value of current assets (in thous. zł) and their structure in commercial farm (in%) according to the Polish FADN (average results for the sample)

Source: own calculation based on [Wyniki Standardowe... 2014; FADN 2016].

An important position in the structure of current assets was played by stocks of agricultural products. Their share in Poland increased on average from 34.6% to 39.8%. In Dolnośląskie Voivodeship it fluctuated between 34.8-35.8%, the highest level (35.8%) reached in the middle period (2007-2009). Long production cycles in

agriculture determine the role of inventories in current assets. As it can be seen, their share changed very little, because they represent an important position in maintaining current production. High inventory is characteristic of Polish agriculture. In the surveyed by Szafraniec-Siluta [2011] agricultural enterprises that asset also averaged about 35% of current assets.

When analyzing this group of the means of production it is worth paying attention to their increasing value. The rate of change in the Polish commercial farms was especially high in the last audited period (213.7% in 2010-2012/2007-2009 against 158.7% in the period 2007-2009/2004-2006). In Dolnośląskie Voivodeship, there were no such high dynamics of the value of inventories (from 139.5% to 125.9%), although statistical commercial farm froze in inventories more capital than an adequate average farm in the country. Can it be concluded on the basis of these analyzes that farmers from Dolnośląskie Voivodeship act less rationally than the corresponding professional group in the country in total? This is neither confirmed by already discussed participation rate of inventory in the structure of current assets, nor by conducted own research in the field.

In 2012, farmers asked in the survey about the use, beyond the industrial one, of own material current assets, declared (in % of farms):

- 71.9% used their own seeds,
- 28.6% used their own natural and organic fertilizers,
- 33.5% gave their own feed.

These groups of objects of labor represent stocks of operating activities. Certified seed should be purchased at least once per four years in order to maintain the right to receive direct payments. Thus the maximum share of farms applying their own seed material should be 75%. It amounted to nearly 72%, so farmers from Dolnośląskie Voivodeship in the vast majority of cases show a rational approach to the management of seeds. Due to the low number of livestock in Dolnośląskie Voivodeship relatively small percentage of respondents used their own fertilizers and feed. In the case of industrial fertilizers, a significant increase in their consumption was observed in the voivodeship (doubling in the period from 1999 to 2012) (BDL) probably caused by, among others, insufficient quantity of own natural and organic fertilizers. It is therefore difficult to speak of wasteful use of objects of labor in this group in the context of the progress of chemical in agriculture.

Evaluation of resource use can also be made in terms of wasting possessed current assets. Surveyed farmers were asked a question: Have there been cases of non-use fully owned seed, feed, fertilizer during the last five years on the farm? It turned out that in 83.5% of surveyed farms these objects of labor were fully used. However, it is worrying that a large group of farmers admitted that accidents of wasting inventories of production materials had taken place.

4.2. Cash current assets

Cash and cash equivalents represent a very important position in the structure of current assets (Figure 3 – other current assets). In Poland, their share decreased from 41.3% (2004-2006) to 37.5% (2007-2009). Thanks to EU subsidies, the quantity of money farmers could spend increased, among others, on the purchase of materials for production. It was noted that the share of inventories in the structure of current assets grew at the expense of smaller participation of cash.

Such patterns have not been observed in commercial farms of Dolnośląskie Voivodeship. The share of other current assets (equated here with cash) was the highest in the structure of total current assets and increased steadily from 56.0% (2004-2006) to 58.9% (2010-2012). Their quantity also significantly increased: from 65.5 thous. zł in the first survey period to 119.5 thous. zł in the last one (i.e. at 82.4%). This reflects greater liquidity of the average commercial farm in Dolnośląskie Voivodeship in comparison with an adequate one in Poland. *Indicator of cash flow*¹ confirms this liquidity, which in 2004 amounted to 64.9 thous. zł in Dolnośląskie Voivodeship (for comparison, 36.3 thous. zł in Poland) to increase to 179.7 thous. zł in 2012 (130.1 thous. zł in Poland) [Wyniki Standardowe... 2014; FADN 2016]. According to Franc-Dąbrowska [2013] too much weight should not be attached to the value of standard liquidity indicators in agriculture, because the basic requirement of agricultural producers is a flexible purchase of raw materials for production and punctuality in settling current liabilities.

Since covering Polish farmers by instruments of the Common Agricultural Policy of the EU, they can benefit from the system of subsidies and power their farms with additional sources of funds. Previously (from 1994) farmers used soft loans as the main instruments of support. Owing to them they could finance both investment activity, and current farm activity [Czerwińska-Kayzer 2002]. However, the scale of this assistance was much lower than today, and applied to preferential loans, in principle, only to the most enterprising farmers. Direct payments are a common instrument. They are used by the majority of farmers who meet certain conditions (mainly maintaining the land in good agricultural condition).² The payments play a crucial role in supporting farm incomes, including farmers' households [Sadowski, Antczak 2012; Poczta 2008].

Conducted in 2013, own research showed that in 14.0% of farms the current activity was financed only from their own funds, and in the next 75.2% this activity

¹ It is calculated in the methodology of the FADN as follows: sales of products + other income + sales of animals – total costs – the cost of purchasing animals + balance of subsidies and taxes related to operating activities + balance of subsidies and taxes on investments. It demonstrates the ability of a farm to self-finance its activities and create savings in operating activities [Wyniki Standardowe... 2014].

² According to ARMA in 2012, the number of beneficiaries of direct payments reached 1.36 million, i.e. 64.8% of those eligible in the database of agricultural producers [Sprawozdanie... 2013].

was assisted additionally with EU grants. Farmers' households were maintained in 74.7% of cases only from their own funds, but a large group of farmers (20.6%) used the funds from EU subsidies for this purpose.

The research also shows that the share of subsidies in farm income increases with its surface [Marks-Bielska, Babuchowska 2009; Zhu, Lansink 2010]. However, according to Wąs [2004] maintaining farm incomes at a high level in the long term will depend on the use of funds received and the economic situation in agriculture.

It is important to skillfully manage additional financial resources, but first it is vital to get them. In 2012, farmers from Dolnośląskie Voivodeship submitted in ARMA 56.5 thous. applications for direct payments, i.e. 4.2% of applications submitted in the country in total. The amount of the single area payment (without other titles from a pool of direct payments) amounted to nearly 74 million zł, i.e. 7.7% of the funds allocated in Poland in total for this purpose. The RDP 2007-2013 for farmers in the region sent a total of 1,926 million zł. (4.7% of the national quota). With support under the measure 112 – *Setting up of young farmers* 728 people benefited, and the amount of paid funds reached 50.7 million zł, i.e. 3.2% of the beneficiaries and funds the country in total. However, taking into account the effectiveness of farmers from Dolnośląskie Voivodeship in applying for this help, we can see that 24.3% of the applications were rejected and the amount of subsidies, which initially was sought, was depleted by 23.0%.

Another important direction of funds distribution was action 121 – *Modernisation of agricultural holdings*. In Dolnośląskie Voivodeship 1,395 people benefited from it and the amount of funds paid to them reached 258 million zł., which accounted for 8.3% and 13.9% respectively in the country in total. The proportion of the rejected applications in Dolnośląskie Voivodeship stood at 20.8%, and the amount of outstanding payments reached 22.6% of the requested amount [*Sprawozdanie...* 2013]. According to Zwalińska [2009] the support structure of Dolnośląskie Voivodeship agriculture for 2004-2006 period was as follows:

- 35% were investments in infrastructure,
- 32% of direct transfers,
- 32% of the area subsidies,
- 1% support training and consulting.

In the context of the warnings formulated by Wąs, the high share of development investment in infrastructure should be assessed positively. However, there are too few of them. The number and amount of the requests made by farmers in Dolnośląskie Voivodeship are insufficient against the country. The evidence of this is a low share of voivodeship's amount in the national aid received from the RDP. However, positively can be evaluated the quality of submissions, all of which were rejected at the fifth application. It is believed that the high level of use of EU funds is largely due to the staff of agricultural advisory centers [Kania 2008].

5. The reasons for under-utilization of capital resources in farms in Dolnośląskie Voivodeship in the light of empirical research

Conducted in the article analyzes revealed that farmers in Dolnośląskie Voivodeship had less resource of capital production factors in agriculture than an adequate average professional group in Poland. Moreover, they exploited fixed assets less efficiently against the background of the country. At the same time they managed current assets more rationally, although a large group of farmers admitted to wasting part of the mean of labor.

Conducted in 2013, own surveys had to determine, among others, the reasons for under-utilization of capital resources in Dolnośląskie Voivodeship agriculture. An examined representative sample of 282 farm managers were asked to select 3 following major responses (giving them a rank from 1 – most important reason, to 3 the least important) from the given cafeteria or to give their own. Ranks were as follows: 1st place – weight 1.5, 2nd place – weight 1.0, 3rd place – weight 0.5. The calculated share of individual answers in all indications to the concrete question (i.e. *simple share*), as well as calculated shares were weighted by rank (i.e. *weighted share*). This last procedure allowed clearly to identify the most significant answers, both, because of the frequency of their award and the validity for the respondent. According to the weighted share the ranked responses are given in Fig. 4. In addition, the statistical significance of indications of all variants of answers and their dependence were examined based on the four characteristic metrics, grouping them by:

- age: 1: 0-39 years, 2: 40 years and more;
- professional education (agricultural): 1. NO, 2. YES;
- area of farm: 1: 0-5 ha, 2: >5-10 ha, 3: >10-20 ha,
4: >20-50 ha, 5: >50-100 ha, 6: >100 ha;
- revenues from sales in 2012: 1: 0-10 thous. zł, 2: >10-50 thous. zł,
3: >50-100 thous. zł, 4: >100-200 thous. zł,
5: >200-500 thous. zł, 6: >500 thous. zł.

For this purpose, Pearson χ^2 (chi-square) compliance test was used according to statistics [Zar 1999, p. 462]:

$$\chi^2 = \sum_{i=1}^r \frac{(n_i - np_i)^2}{np_i},$$

- where: r – the number of classes (here variants of answer to a specific question),
 n_i – number of observations (here indications of variant) in the i class,
 n – the size of the entire sample,
 p_i – theoretical probability (expected) occurrence of n_i ($p_i = 1/r$),
 np_i – theoretical size.

Examining each statistical significance distribution of indications of particular variants of answers (feature X), depending on the features of the metric (feature Y) put two hypotheses:

H_0 : Characteristics of X and Y are independent,

H_1 : Characteristics of X and Y are dependent.

A critical collection of χ^2 test is right-handed, which is why we reject H_0 , when the calculated in STATISTICA 10 test probability value (*p value*) is lower than the assumed level of significance ($\alpha = 0.05$). Characteristics are significantly dependent, if the *p value* < 0.05 .

In addition, for each pair of dependent characteristics taper factor V-Cramer (V_C) was calculated, which measures the strength of the relationship between the non-measured variables (qualitative characteristics) according to the rule [Pułaska-Turyna 2011]:

$$V_C = +\sqrt{\frac{\chi^2}{n \cdot \min(w-1, k-1)}}, \quad V_C \in \langle 0, 1 \rangle,$$

where: χ^2 – chi-square statistic calculations as above for a pair of variables,

n – the size of the entire sample,

w – number of rows,

k – number of columns in the contingency table.

The strength of the relationship between the studied variables is defined as strong inter-dependence, when the value of V-Cramer exceeds 0.6.

The direction of the compound was measured by the ratio of Somers' d_{BA} according to formula [Siegel, Castellan 1988]:

$$d_{BA} = \frac{n_c - n_d}{t}, \quad d_{BA} \in \langle -1, 1 \rangle,$$

where: n_c – number of concordant responses,

n_d – number of discordant responses,

t – total of pairs.

According to the respondents most frequently, a reason to maintain the unused assets, were outdated buildings and/or machinery, which they thought were not suitable for use (Figure 4). Then, they informed that the maintenance costs of the resources were too high, so consequently they did not pay to renovate them, leaving everything as it was. Next, they complained that the production was unprofitable, so they did not have funds for investments or repairs.

The answers were coded according to their weighted share (Table 3). For each pair of variables (X and Y), *p value* of Pearson's χ^2 test (Table 4) was calculated as well as the strength (V_C) and direction (d_{BA}) of relationship between each pair of dependent variables (Table 5).

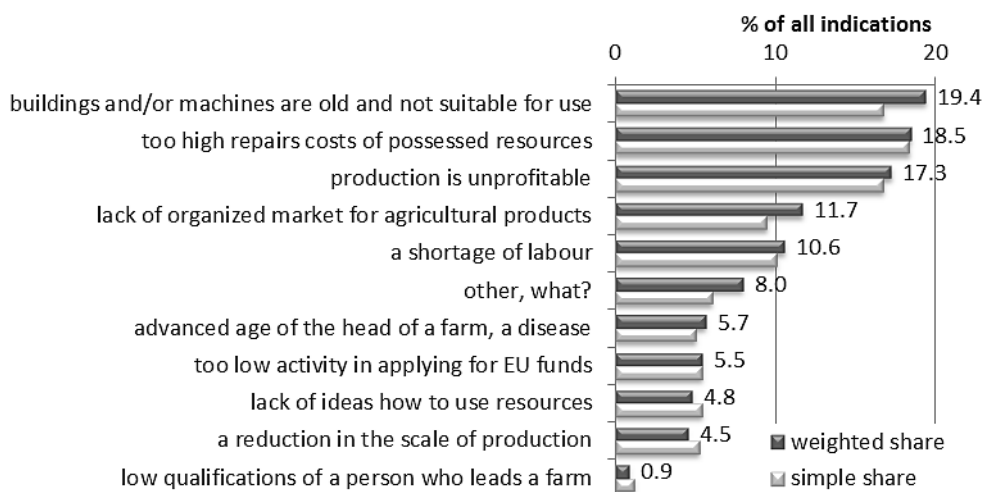


Figure 4. The causes of under-utilization of farms' assets in the opinion of the respondents from Dolnośląskie Voivodship (in % of all indications)

Source: own research.

Table 3. Causes codes of under-utilization of the farm assets according to survey

Code	Content
1.1	buildings and/or machines are old and not suitable for use
1.2	too high repairs costs of possessed resources
1.3	production is unprofitable
1.4	lack of organized market for agricultural products
1.5	a shortage of labour
1.6	other, what?
1.7	advanced age of the head of a farm, a disease
1.8	too low activity in applying for EU funds
1.9	lack of ideas how to use resources
1.10	a reduction in the scale of production
1.11	low qualifications of the person who leads a farm

Source: own study.

Table 4. The p value of χ^2 Pearson test defining the relationship between the causes of under-utilization of the assets in farms and their key metric characteristics

Features	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11
Age	0.011	0.035	0.517	0.872	0.877	0.110	0.567	0.924	0.581	0.817	0.806
Directional education	0.177	0.105	0.840	0.590	0.775	0.714	0.539	0.815	0.553	0.978	0.100
Area of farm	0.983	0.783	0.217	0.017	0.146	0.107	0.438	0.730	0.853	0.143	0.405
Annual revenues	0.340	0.028	0.711	0.268	0.918	0.010	0.252	0.042	0.279	0.341	0.624

NOTE: The response codes as in Tab. 3.

Source: own study based on terrain research, calculations in *STATISTICA 10*.

Table 5. Strength (V_C) and direction of relationship (d_{BA}) for pairs of dependent variables from Table 4

Pair of variables	<i>p</i> value	V_C	d_{BA}
Age ↔ 1.1	0.011	0.177	-0.165
Age ↔ 1.2	0.035	0.147	-0.135
Area ↔ 1.4	0.017	0.263	-0.066
Revenues ↔ 1.2	0.028	0.250	-0.072
Revenues ↔ 1.6	0.010	0.274	0.219
Revenues ↔ 1.8	0.042	0.240	0.150

NOTE: The response codes as in Table 3.

Source: own study based on terrain research, calculations in *STATISTICA 10*.

The already mentioned Pearson χ^2 compliance test was used to examine the relationship between all mentioned reasons of under-utilization of farms assets and their metric characteristics. This study shows a statistically significant relationship between:

1. Age of manager and:

- resp. 1.1 – young farmers more often than older consider outdated buildings by reason of their low use, the weak dependence ($V_C = 0.177$) has therefore the negative direction ($d_{BA} = -0.165$);
- resp. 1.2 – here similarly: young farmers more often than the elderly raise the issue of too high maintenance costs of resources, as the cause of their incomplete use, the weak dependence ($V_C = 0.147$), negative direction ($d_{BA} = -0.135$).

2. Area of farm and resp. 1.4 – among managers of farms to 50 hectares more often than among the ones leading larger units there were opinions about the lack of an organized market for agricultural commodities as a cause of the underutilization of private assets, therefore the negative direction ($d_{BA} = -0.066$) of this weak dependence ($V_C = 0.263$).

3. Annual revenues from the farm and:

- resp. 1.2 – too high costs of repairs proved to be more often a reason for not using assets in farms with relatively high income (50-200 thous. zł. per year) than in economically weaker, so the relationship is weak ($V_C = 0.250$) and negative ($d_{BA} = -0.072$);
- resp. 1.6 – more own reasons for the lack of full utilization of property were given by farmers who controlled more economically powerful units than by those who ran low income farms, because ($V_C = 0.274$) and ($d_{BA} = 0.219$);
- resp. 1.8 – the higher income was on a farm, the more likely it was thought that the reason for under-utilization of assets was too low activity in applying for EU funds, and thus the relationship was weak ($V_C = 0.240$), but positive ($d_{BA} = 0.150$).

Among other reasons farmers most frequently reported that their property was well used (6.0% of the weighted share). Then many reasons were cited by livestock and milk producers, who complained about the lack of slaughterhouses and dairies in Dolnośląskie Voivodeship and a bad economic situation on relevant markets. That was often connected with the limitation of this production and incomplete use of barns. There were also voices of lack of strength, lack of vision to manage assets or the seasonality of production, which made a partial non-use of assets.

To sum up this part of the analysis it can be observed from the answers that, most frequently indicated by the farmers themselves, resp. 1.2 turned out to be the most statistically significant and the one that depended on the age of farmers and revenues generated by units which were led by them. Too high maintenance costs proved to be paradoxically a bigger problem for young farmers and in farms with relatively high revenues. It is possible that farmers indicating this problem thought about expensive thorough repairs, which would allow to modernize their farms enough to meet European standards.

6. Conclusions

The capital is one of three classical factors of production increasingly important in agriculture. Skillful investment in the equity and creating its resource is very important on farms which have an increasingly valuable asset. No less important is the effective management of both fixed assets, as well as current assets.

In Poland shortcomings in the equipment of farms in assets can still be observed. Whereas the use of fixed assets is getting improved, the structure of capital resources is less favorable, because of low share of current assets, determining the dynamics of the production processes.

A slightly different picture of the described changes was observed in Dolnośląskie Voivodeship. The focus was on this voivodeship, because it was an interesting example of a Polish region privileged by natural resources, and poorly equipped in factors of labor and capital (also in qualitative terms). This makes that agricultural production in Dolnośląskie Voivodeship reaches a relatively low level. It turns out that favorable natural and soil conditions are not sufficient to obtain above-average yields in agriculture. Important, next to human factor, are very good facilities and efficient use of assets to build competitive advantage. As it turns out, it is not enough to proficiently manage current assets, because the efficient use of resources to a greater extent corresponds to fixed assets and managerial skills of those who manage them.

Agriculture in Dolnośląskie Voivodeship, like in all Western Poland, still struggles with the problem of outdated livestock and farm buildings, remembering the pre-war times. The first category loses its importance in the face of steadily declining livestock. No breeders make piggeries and stalls remain unused. Farmers need to purchase more fertilizers to achieve satisfactory yields. In the absence of

livestock they cannot use natural fertilizers, and also leave untapped resource of meadows and pastures.

The conducted statistical analysis confirmed that the biggest problem among farmers in Dolnośląskie Voivodeship is obsolescence of assets and lack of funds for repairs, even in farms which are relatively strong economically and led by young farmers. Polish agriculture is still underfunded against the countries in Western Europe. Funds derived from the EU, farmers primarily spend on materials. Investment in expensive equipment rather covers credits. Repairs or demolition of buildings are considered as a nonprofit operation. They are often abandoned and still decaying in villages of Dolnośląskie Voivodeship. It is not worth even recovering building materials, because the new technology used in the construction of livestock or farm buildings is based on metal structures. The way to improve the economic conditions is to bring together farmers in producer groups or machinery companies possessing shared assets. The research shows, however, farmers' low propensity to collective action arising from the times of the People's Republic of Poland. There is a need for replacement of generations, and the successes of such agricultural organizations, which could convince farmers to work together in an increasingly competitive European market.

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