

Valuation of Livestock in Farms

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Submitted: 10.07.2021 | Accepted: 06.12.2021

Abstract

Purpose: The aim of this article is to assess the possibility of applying the industry livestock valuation index as proposed by Karolina Pasula during the public defense of the doctoral dissertation “Directions and conditions for the standardization of accounting in agricultural enterprises” as an alternative method of valuation, taking into account sources of information and risk assessment on a farm.

Methodology: The research process was divided into three main stages: (1) examining the possibility of applying the industry indicator for measuring biological assets proposed by K. Pasula for the valuation of livestock, i.e. pigs, as exemplified by a selected farm whose undertakings are known to the authors; (2) repeating the study from stage 1 on the valuation of dairy cattle as exemplified by the farm the activities of which are known to the authors; (3) on the basis of the conclusions of stage 1 and stage 2 studies, possible modification of the industry indicator for measuring biological assets, conducting research on a larger group of farms breeding livestock.

Findings & value added: The conducted research confirmed the possibility of applying the analyzed ratio in the practice of entities that do not keep accounting books. The obtained results are characterized by high cognitive value as a measure of biological assets in relation to pigs. The valuation based on the industry measurement index in farms takes into account the risk which, as shown in the research, is an important factor influencing the value from the valuation.

Keywords: farm, livestock, measurement and valuation of livestock, information management in agriculture.

JEL: M41, Q14, G15

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Suggested Citation: Kica, P., & Szczypa, P. (2021). Valuation of livestock in farms. *Problemy Zarządzania (Management Issues)*, 19(4), 118–130. <https://doi.org/10.7172/1644-9584.94.8>.

Wycena inwentarza żywego w gospodarstwach rolnych

Streszczenie

Cel: w artykule dokonano oceny możliwości zastosowania branżowego wskaźnika pomiaru aktywów biologicznych zaproponowanego przez K. Pasuła w trakcie publicznej obrony rozprawy doktorskiej nt. „Kierunki i uwarunkowania standaryzacji rachunkowości przedsiębiorstw rolnych jako alternatywnej metody wyceny z uwzględnieniem źródeł informacji oraz identyfikacją ryzyka w gospodarstwie rolnym”. Celem zaproponowanego przez K. Pasuła branżowego wskaźnika pomiaru jest uwzględnienie w wycenie ryzyka według dokonanego pomiaru.

Metody: przy projektowaniu procesu badawczego autorzy szczególną uwagę zwrócili na taki dobór źródeł i metod badawczych, który pozwoli na eliminację możliwie największej liczby błędów, które mogłyby wystąpić. Proces badawczy został podzielony na trzy główne etapy: (1) zbadanie możliwości aplikacji branżowego wskaźnika pomiaru aktywów biologicznych zaproponowanego przez K. Pasuła do wyceny inwentarza żywego, którym będzie trzoda chlewna na przykładzie wybranego gospodarstwa rolnego; (2) powtórzenie badania z etapu 1 w zakresie wyceny bydła mlecznego na przykładzie gospodarstwa rolnego, którego działalność znają autorzy; (3) na podstawie wniosków z badań etapu 1 i 2, ewentualnej modyfikacji branżowego wskaźnika pomiaru aktywów biologicznych przeprowadzenie badań na większej grupie gospodarstw rolnych prowadzących hodowlę zwierząt.

Wyniki i wartość dodana: wahania cen oraz ryzyko katastrofy naturalnej to rodzaje ryzyka o największym wpływie na wartość trzody chlewnej zarówno na moment pozyskania badanych aktywów, jak i na dzień ich wyceny. Uśrednione ryzyko na poziomie 45% znacząco koryguje wycenę ustaloną w koszcie historycznym. Wycena w oparciu o branżowy wskaźnik pomiaru w gospodarstwach rolnych, uwzględnia ryzyko, które jak pokazano w badaniach jest istotnym czynnikiem kształtującym wartość z wyceny. Przeprowadzone badania potwierdziły możliwość zastosowania analizowanego wskaźnika w praktyce jednostek nieprowadzących ksiąg rachunkowych. Otrzymane wyniki charakteryzują się dużą wartością poznawczą jako miara aktywów biologicznych w odniesieniu do trzody chlewnej.

Słowa kluczowe: gospodarstwo rolne, trzoda chlewna, aktywa biologiczne, pomiar i wycena aktywów biologicznych.

1. Introduction

Animal breeding is one of the oldest areas of economic activity in the world, along with the cultivation of plants. This does not translate, however, into the universality of scientific research with respect to accounting dedicated to agriculture. Additionally, among the entities dealing with animal breeding, one can distinguish those keeping books of accounts (agricultural enterprises) and those that are exempt from the above obligation, referred to as farms. Because of the limited access to financial data, agricultural entrepreneurs became the subject of the study in this paper. Farms face similar problems as agricultural enterprises with respect to decision-making; however, they do not have access to current and periodic information provided by the accounting system. We have decided to investigate the possibility of applying one of the recently presented industry indicators for valuating livestock in the practice of a farm dealing with livestock breeding. It is widely acknowledged that the basis for effective management is the knowledge of the value of the subject of interest, which, in case of livestock farms, is the value of livestock. The

research was divided into three stages and this study concerns farms breeding pigs. The second stage will be dedicated to farms dealing with dairy cattle breeding, and the third stage will be in-depth research.

The paper contains an analysis of an indicator of the valuation of livestock proposed by K. Pasula (Pasula, 2021). The concept of the industry-specific ratio of livestock was developed as a response to the assessment of the methods and parameters of the valuation of livestock that have been used so far. The study has been divided into stages and the first stage concerns farms dealing with pig breeding. The essence of the industry-specific indicator for valuating livestock boils down to the use of valuation methods based on historical cost, taking into account the risk inherent in agricultural activity. The industry index for valuation of the livestock has been broken down in accordance with the botany of livestock (Pasula, 2020). For livestock, the above-mentioned ratio was formulated as follows:

$$\text{IRRV} = \text{HV} \times (1+R)$$

where:

IRRV – industry index for valuation of livestock

HV – herd value = (purchase price of the herd of livestock + production costs of the herd of livestock),

R – risk in agricultural activity specializing in livestock production (individual types of risk assigned a value from 0 to 1 / number of risk types).

The proposed ratio corrects the valuation according to the historical cost with the risk. Most generally, the risk in agricultural activity can be understood as uncertainty as to the occurrence of undesirable phenomena and their scale. Another definition of risk with respect to the activities of farms defines them as the uncertainty of the implementation of a project or a production or service activity, characterized as agricultural, or the uncertainty of the occurrence of adverse events (including the consequences of their implementation or occurrence) under certain conditions, taking into account the specific character of agricultural production (Wajszczuk, Wawrzynowicz, & Baum, 2010). The concept of an industry indicator for measuring biological assets has been tested by K. Pasula in the practice of agricultural enterprises. They are economic entities that have information from the accounting system. Against this background, the authors intend to check whether the above-mentioned concept of the sector index is verifiable in practice in agricultural holdings, i.e. units that do not keep accounting books.

The above factors indicate that it is advisable to check the applicability of the industry-specific ratio for the valuation of livestock developed by K. Pasula in the practice of a farm dealing with pig and dairy cattle breeding.

Previously, this indicator was tested only in agricultural enterprises. The article presents research hypotheses:

1. The agricultural holding has the information necessary to determine the value of the industry index for the valuation of livestock.
2. Risk is an important determinant of pig production.
3. The industry index (IRRV), through the risk it contains, is more adequately used in the valuation of livestock.

2. Material and Methods

When developing the research process, the authors paid particular attention to the selection of sources and the research methods that would allow for the elimination of the greatest possible number of errors that could occur (Kaczmarczyk, 2011). The research process was divided into three main stages: (1) examining the possibility of applying the industry indicator for measuring biological assets proposed by K. Pasula for the valuation of livestock, i.e. pigs, as exemplified by a selected farm whose undertakings are known to the authors; (2) repeating the study from stage 1 on the valuation of dairy cattle at the farm the activities of which are known to the authors; (3) on the basis of the conclusions of the stage 1 and stage 2 studies, a possible modification of the industry indicator for measuring biological assets, conducting research on a larger group of farms breeding livestock. This scope of this paper encompasses the first stage of the research for the purposes of which the analyzed sources and the research methods adopted have been presented in Figure 1.

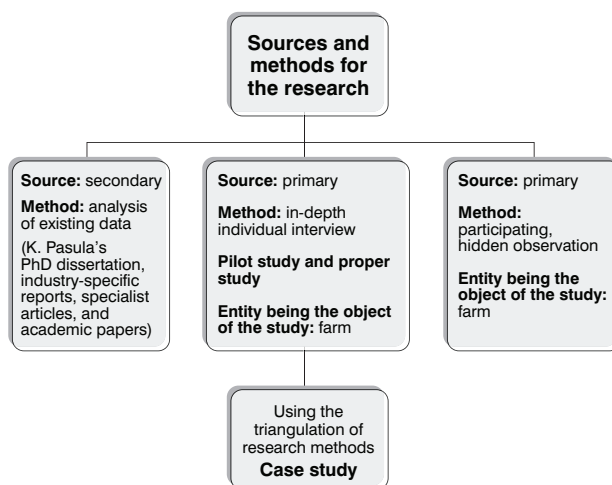


Fig. 1. Sources and methods for the research. Source: Own study.

The primary form of case study was an in-depth interview with the farm owner. As part of secondary sources, an in-depth analysis of literature materials was carried out which included:

- The methodology was consulted with K. Pasula (Pasula, 2021);
- compact items, scientific and expert journals concerning valuation in accounting, agricultural accounting, including, inter alia: *The Impact of Managerial Discretion on Fair Value Information in the Australian Agricultural Sector* (He, Wright, & Evans, 2021), *Livestock's Contribution to Poverty Alleviation: How to Measure It* (Alary, Corniaux, & Gautier, 2011), *Fair Value of Biological Assets: An Interdisciplinary Methodological Proposal* (Cavaheiro, Gimenes, Binotto, & Fietz, 2019), *Records and Valuation of Biological Assets in Accordance With IFRS – Discussion Article* (Fish, 2014);
- industry-specific reports: *Greater Poland Chamber of Agriculture* (Chamber of Agriculture, 2021), *A Large Decrease in the Number of Pigs* (Kryger, 2021), *Livestock production calculation* (Agricultural Advisory Center, 2021).

Based on the analysis of secondary sources, the authors decided to select research methods and techniques. The methodology and scope of the research have been determined by way of implementation of the adopted goal and the possibility of answering the research questions and verifying the hypotheses. In order to obtain the most reliable conclusions, the information obtained from the analysis of secondary data was confronted with the experience of the authors from the implicit observations of the analyzed farm. In addition, an individual interview was conducted with the owner of the above-mentioned farm, which made it possible to specify the types of risk and its level. The material selected allowed for carrying out a case study.

The research covered a commercial farm (Jóźwiak & Kagan, 2008) located in the Kuyavian-Pomeranian Voivodeship. It deals with breeding pigs in a closed cycle, where the average annual sale of adult pigs is about 800 heads. Production takes place in a closed cycle, which determines the diversity of animal biological assets. The basic herd (fixed assets) includes sows and boars kept for reproductive purposes. On the other hand, the current herd (current assets) consists of piglets, weaners and fattening pigs. There is a constant biological transformation between these assets, which is additionally affected by the risk from the agricultural sector. With this type of production, the initial valuation and the balance sheet date are significantly influenced by biological change. The risk in the production of pigs in the tested farm was diagnosed based on the interview.

In order to facilitate the process of analyzing the data, which allowed them to be used to prepare a case study, a questionnaire was prepared with the issues that the authors observed during visits to the farm. Additionally, after the visits, a working note was prepared in order to better remember the information. The purpose of participant and implicit observation was to

identify all factors influencing the value of a pig, including the identification of types of risk.

As part of the conducted qualitative research, an in-depth individual interview was also used, which provides a detailed analysis of the issue under study and two-way communication. Thus, it is possible to analyze the actual decisions made by the farm owner (Kaar, 2007). A particular advantage is the fact that the respondent talks freely and in great detail about his experiences and observations related to pig farming. The scenario was a component of the study with the farm owner.

The intention of the authors was a deliberate selection of the examined entity. To value livestock at the selected pigs farm, the authors used their knowledge obtained through professional contacts and selected the most economically-aware farms, one of which was selected for the study.

3. Results

The study of the farm shows that production takes place in a closed cycle, which determines the diversity of animal biological assets. The basic herd (fixed assets) includes sows and boars for reproductive purposes. On the other hand, the current herd (current assets) consists of piglets, weaners and fattening pigs. There is a constant biological change between these assets, which is additionally affected by the risk from the agricultural sector. In order to properly measure the risk, an interview was conducted with the farm owner.

The results of the measurement are presented in the form of graphs, which, due to the seasonality, have been divided into six-month periods. For the first half of the year, the risk in the agricultural holding is presented in Figure 2.

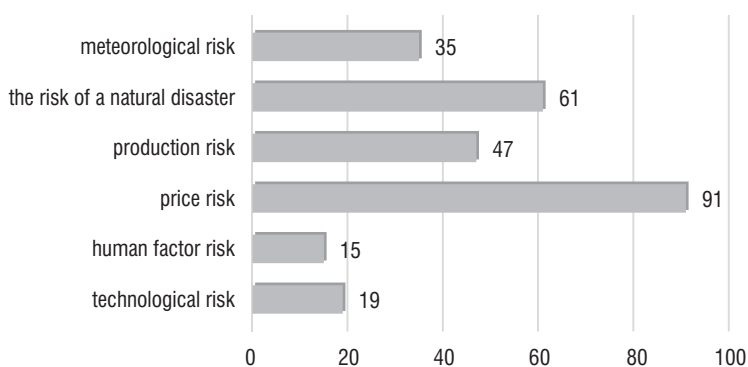


Fig. 2. The types of risk in the production of pigs on the farm in the first half of 2020. Source: Authors' own study based on the results obtained from an in-depth interview with the farm owner.

The value of the R factor – understood as the arithmetic mean of all diagnosed risks in a farm – is 45%. This parameter determines the extent to which the historical cost of livestock valuation is adjusted by industry risk.

At a later stage, the value of the herd should be determined based on the actual (historical) production cost. In the analyzed farm, a register of quantity and value of used production factors is kept. The calculation of pig breeding and the cost of its production for the first half of 2020 is presented in Table 1.

1st half-year									
Types of pigs	Qty	Feed (PLN)	Direct costs (PLN)	Indirect costs (PLN)	Total costs (PLN)	Herd costs (PLN)	Price (PLN)	The price of the herd (PLN)	The value of the herd (PLN)
	1	2	3	4	5	6	7	8	9
Sow from mating to 90 days gestation	7	283	50	15	348	2436	115	805	3241
Sow between 90 and 110 days pregnant	7	72	12	5	17	119	115	805	924
Sow from 111 days of gestation until birth	7	15	8	4	12	84	115	805	889
Sow with piglets	7	369	74	33	107	749	301	2107	2856
Sow from weaning to mating	7	15	50	3	53	371	115	805	1176
Weaned piglets	110	60	26	15	41	4510	225	24750	29290
Fattening pigs from 30 to 70 kg bw	105	130	20	8	28	2940	275	28875	31815
Fattening pigs from 70 kg bw for sale	95	140	20	5	25	2375	378	35910	38285
Total	345	1084	260	88	631	13584		94862	108446

Tab. 1. Calculation of pig breeding in the first half of 2020. Source: Author's own study based on the research.

The value of the pig herd for the first half of 2020 is PLN 108446, and the value of the herd with risk is PLN 48800,70. The industry-specific measurement ratio for the first half of the year is therefore PLN 157246,70.

For the second half of 2020, the distribution of risk factors for pig production was slightly different. Data from this period are presented in Figure 3.

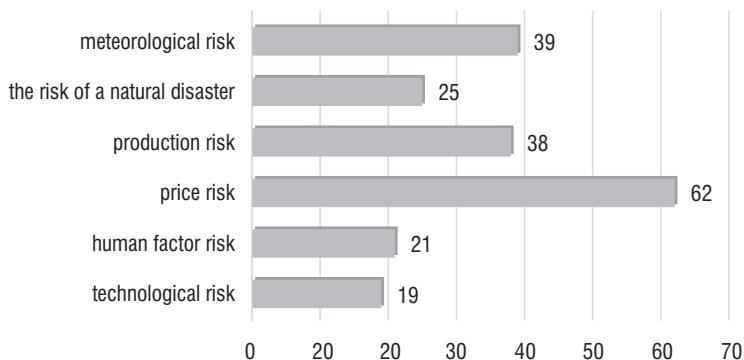


Fig. 3. Types of risk in the production of pigs on a farm in the second half of 2020. Source: Authors' own study based on the results obtained from the in-depth interview with the farm owner.

For the second half of 2020, the risk has been estimated at 34%. It is worth noting that this value changes, which is correlated with the seasonality of livestock production. The second factor influencing the risk assessment is the volatility of the market environment (a decrease in price risk). Table 2 presents the calculation of the production cost for the second half of 2020.

2nd half-year									
Types of pigs	Qty	Feed (PLN)	Direct costs (PLN)	Indirect costs (PLN)	Total costs (PLN)	Herd costs (PLN)	Price (PLN)	The price of the herd (PLN)	The value of the herd (PLN)
	1	2	3	4	5	6	7	8	9
Sow from mating to 90 days gestation	7	291	50	15	65	455	117.5	82,5	127.5
Sow between 90 and 110 days pregnant	7	74	12	5	17	119	117.5	82,5	941.5
Sow from 111 days of gestation until birth	7	16	8	4	12	84	117.5	82,5	90.5
Sow with piglets	7	380	74	33	107	749	311	2177	2926

Table cont.

2nd half-year									
Types of pigs	Qty	Feed (PLN)	Direct costs (PLN)	Indirect costs (PLN)	Total costs (PLN)	Herd costs (PLN)	Price (PLN)	The price of the herd (PLN)	The value of the herd (PLN)
	1	2	3	4	5	6	7	8	9
Sow from weaning to mating	7	16	50	3	53	371	117	819	1190
Weaned piglets	110	62	26	15	41	4510	226	24860	29370
Fattening pigs from 30 to 70 kg bw	105	133	20	8	28	2940	281	29505	32.45
Fattening pigs from 70 kg bw for sale	95	144	20	5	25	2375	282	26720	29165
Total					348	11603		86618.5	98221.5

Tab. 2. Calculation of the cost of pig breeding in the second half of 2020. Source: Own study based on the interview and industry reports.

The value of the pig herd for the second half of 2020 is PLN 98,221.50, and the value of the herd with risk is PLN 33,395.31. Therefore, the industry-specific measurement ratio for the second half of the year amounts to PLN 131,616.81.

On the basis of the research, it is possible to draw a working scheme for the valuation of pigs for the farm, taking into account the available sources of information.

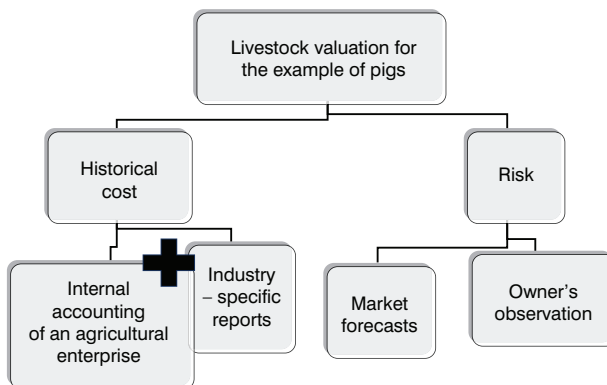


Fig. 4. Sources of information for the valuation of pigs on the farm. Source: Own study.

Information to be valued at historical (production) cost is generated on the farm. The status of an active VAT payer has a significant impact on collecting information. It forces you to keep records of sales and purchases from which the data for the valuation is derived. The types of risk and their significance are most often the result of the owner's observation supported by market forecasts.

In the farm being the object of our analysis, the risk amounted to an annual average of 39.5%, which significantly corrects the valuation according to the historical cost (Figure 5).

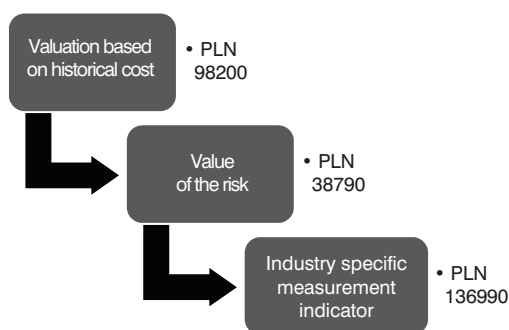


Fig. 5. Pig valuation taking into account the industry-specific indicator of measuring biological assets. Source: Own study.

In the farm being the object of our research, the introduction of the valuation of pigs according to the industry measurement index allowed for taking into account a significant risk in this type of production. Moreover, according to the authors, such a valuation reflects the value of farm assets more completely, paying attention, inter alia, to price volatility and the risk of a natural disaster.

4. Discussion

The livestock as a component of the assets of the agricultural holding is sensitive to the risks identified and measured in the article previously (Figure 4). The second element influencing the valuation is biological change, which is specific only to livestock. In the farm being the subject of the research, the valuation at historical cost was confronted with the valuation based on the industry measurement index by K. Pasula. According to the authors and the owner of the farm, the valuation obtained as a result of the measurement is much more adequate. The method of risk assessment may raise doubts (He, Wright, & Evans, 2021) as it is a product of the owner's subjective feelings supported by forecasts. It should be noted that the presented results

are pilot studies; therefore, at this stage, it is not possible to eliminate all significant limitations. Only the third stage of the research will enable full conclusions and a broader look at the analyzed issues. One should fully agree with the conclusions made by S. Hońko (Hońko, 2013), who writes that: “Over the centuries, accounting has developed a methodology for measuring historical cost, registering actual transactions that lead to real changes in assets. It turned out that the economic value measured in this way was partially useless for users who expect not only information about the events that have occurred, but also about the current value of the assets and their ability to generate future benefits. Accounting is capable of providing such information, but the “price” for changing the temporal orientation of information about the economic benefits is increasing the importance of the estimates”. The practical application of the industry-specific ratio for measuring biological assets developed by K. Pasula undoubtedly requires the inclusion of estimated values, which is in line with the contemporary trends in the field of valuation in the accounting system.

Animal breeding is one of the oldest branches of the economy, and at the same time there is a significant deficit in accounting research. The regulations applicable in this area (IAS 41 Agriculture, KSR No. 12 “Agricultural activities”) include, for example, biological transformation and the valuation of livestock at historical cost (production) or fair value (based on active markets) less estimated selling costs. The authors decided to investigate an alternative method for the valuation of the livestock which was presented by K. Pasula (Pasula, 2021) in her dissertation. In this study, the industry measurement indicator was tested on a farm specialized in the production of pigs. The construction of the industry measurement indicator comes down to adjusting the historical cost for risk. In the farm being the subject of the study, the valuation based on the industry measurement index significantly differs from the valuation at historical cost. Therefore, it is worth using the industry-specific measurement index when making a valuation, both at the moment of recognition in the accounting books and at the balance sheet date. Biological assets require taking into account many aspects in the valuation due to their specificity. Biological change, susceptibility to diseases (for example ASF), large demand and supply fluctuations are just some of the stimulants of the valuation of pigs on farms. The possibility of valuation based on the industry measurement index (Pasula, 2021) should be verified on the basis of research on both farms and agricultural enterprises.

Taking into account the short period that has passed since the first public presentation of the analyzed indicator for the valuation of livestock, it is not possible to conduct a broad discussion in this regard, hence the earlier reference to the general theory of accounting as science and measurement and valuation. The issues of measurement and valuation of livestock are, in the authors’ opinion, one of the most difficult areas of accounting research.

There is research on the valuation of trees or, more broadly speaking, forest valuation, because no methods of valuation available in national or international regulations are possible to apply to reliably determine the value of stands for accounting books or balance sheets (Nemś, Sadowska, & Szczypa, 2018; Sadowska & Szczypa, 2018). Therefore, against this background, it should be concluded that the issue of livestock valuation, due to the solutions developed and recognized by accounting, enables effective research on alternative methods of valuation.

5. Conclusions

Based on the research, the following conclusions can be made:

1. In farms, companies that do not keep accounting books, the in-depth participant interview was the most important source of obtaining information for valuation based on the industry measurement index. The information from the interview should be supplemented with data on the evolution of prices of factors of production published by organizations associating agricultural producers.

2. Price fluctuations and the risk of a natural disaster are the risks with the greatest impact on the value of pigs, both at the time of acquiring the analyzed assets and at the date of their valuation. The average risk at the level of 45% significantly adjusts the valuation set at historical cost. The valuation based on the industry measurement index in farms takes into account the risk, which, as shown in the research, is an important factor influencing the value from the valuation.

3. Following overriding accounting principles, including the principle of prudent valuation, it should be stated that it is worth implementing an industry-specific measurement indicator in farms dealing with pig breeding. The conducted research confirmed the possibility of applying the analyzed ratio in the practice of entities that do not keep accounting books. The obtained results are characterized by high cognitive value as a measure of biological assets in relation to pigs.

The assumed hypothesis was verified positively. In view of the above, it is advisable to carry out the next stage of pilot research, consisting in carrying out analogous research procedures on the premises of a farm dealing with dairy cattle breeding. The results from this study will form the basis for an extended study. All the research conducted leads the authors to the conclusion that an important part of the development of accounting theory is the search for more and more perfect parameters and principles of valuation of key economic categories of economic units.

Acknowledgments

This research received no funds.

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