
Measuring and Valuation of Biological Assets: A Research Study

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Abstract:

Purpose: The aim of the article is to identify the factors influencing the choice of measurement and valuation of biological assets of two selected voivodships in Poland.

Design/Methodology/Approach: To achieve this goal, a survey was carried out in the Dolnośląskie and Wielkopolskie voivodships in the period from January 2018 to January 2020. The survey consisted of the following parts: part I - record and short description of agricultural production (10 questions), part II - identification of macroeconomic factors influencing the valuation of biological assets (2 questions), part III - assessment of available methods of biological assets valuation (14 questions). As a result of the survey, the next number of responses was obtained: 100 questionnaires from Lower Silesia voivodeship, 100 questionnaires from Wielkopolska voivodeship.

Findings: The most important macroeconomic factors include, fuel and electricity prices, weather factors. These factors were significant regardless of the organizational and legal form or the generated revenues. On the other hand, the microeconomic factors that have the greatest impact on the choice of the method of measurement and valuation of biological assets include the financial result in companies keeping accounting records in the form of full accounting, the risk of agricultural activity in any organizational and legal form, as well as any other type of economic records.

Practical Implications: The article identifies factors influencing the choice of methods for the valuation of biological assets in farms run in Poland in two selected voivodeships. These studies form the basis for further research related to the development of a method for the valuation of biological assets.

Originality/Value: The results of the survey and theoretical considerations contained in the article complement the existing research in accounting, including agricultural accounting.

Keywords: Biological assets, valuation, agricultural accounting.

JEL classification: M40, M41, M42.

Paper Type: Research study.

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1. Introduction

Accounting is a system whose main goal is to measure the results of economic activity, therefore "accounting is a universal and flexible information and control system reflecting the achievements and potential of economic units" (Micherda, 2013). The process of accounting evaluation results from the need to adapt this system to the specificity of the entity's activity, which cannot always be placed in the traditional accounting system. This applies in particular to agricultural activities.

Therefore, in the opinion of many theoreticians and practitioners, the usefulness of accounting in running a farm, both for internal and external needs, is very important (Bernacki, 2006). Measurement of the results of agricultural activity should be treated as an innate feature of accounting, which already took place in antiquity, when the first meticulous accounting entries were made when harvesting crops, on clay tablets (Czerwińska-Kayzer *et al.*, 2011; Wyszowska, 2006). It is therefore correct to say that accounting should be treated as "a system for measuring economic value multiplied in the management process" (Micherda, 2013). On the other hand, the measurement of economic value is conditioned by the "legal system of the state, the state of the economy and the accounting system" (Micherda, 2005).

The issues related to measurement and valuation have been discussed in international and national balance sheet law. In international regulations, agricultural activity is included in the International Accounting Standard 41 Agriculture. The above-mentioned standard has been in force since 2003 and defines the method of accounting records, principles of presentation in the financial statements and the scope of disclosed financial information and data (IAS 41 Agriculture, 2007) in relation to agricultural activity. According to Bernacki (2006), IAS 41 adopts new terms that have not been used so far in Poland, such as biological assets. However, it does not use the professional nomenclature and grouping of assets that have been developed by agricultural accounting and agricultural economics and organization, these provisions become imprecise and ambiguous (Czerwińska-Kayzer *et al.*, 2011).

In accordance with the International Accounting Standard for Agriculture (IAS 41), responsibility for selecting a method to measure biological assets has been assigned to management. Management, in the role of management, should be knowledgeable about issues related to the measurement of fair value. Additionally, management of the entity should be able to select the technique of the proposed fair value measurement with the assumptions of the current regulations of the balance sheet law. The provisions of IAS 41 emphasize that management must "consider the management of biological transformation of animals and plants (biological assets) for the purpose of selling, producing agricultural produce or creating additional biological assets" (Lukyanova and Shklirova, 2014).

Regulations of international law (IAS41) emphasize that the selection of the method of biological assets valuation should take into account the current economic situation (Kiziukiewicz, 2009). It should be emphasized that IAS 41 makes a fundamental assumption that the fair value of a biological asset can be determined, and this assumption can only be rebutted, on initial recognition. An entity that has once measured a biological asset at fair value should continue to measure it at fair value until it is sold (Bodzianny *et al.*, 2006; Boga, 2012).

On the other hand, the main reason for changes in the fair value of biological assets are most often fluctuations in the markets in which they operate. This assumption is consistent with the fair value hierarchy described in the US SFAS 157, which was published in September 2006 by the US Accounting Standards Committee (SFAS, 157). The US committee issued SFAS 157 Fair Value Calculations (SFAS, 157), the main the assumption was the principle that fair value should be based on assumptions made by market participants.

This Standard establishes a fair value hierarchy that was adapted to a later issued International Financial Reporting Standard 13 Fair Value (IFRS 13). Determining the fair value has generated a lot of attention since the publication of FASB 157 (Maines and Wahlen, 2006; Owusu-Ansah and Yeoh, 2006; Christensen and Nikolaev, 2008; Müller *et al.*, 2010; Pengt, 2008). Fair value (FV) is defined as the price that would be received to sell or transfer to a liability in an orderly transaction between market participants at the measurement date and is considered to be more appropriate and reliable than historical cost (Bahal *et al.*, 2008). Its implementation proved problematic due to its complex and controversial nature (Taplin *et al.*, 2014). However, there is a significant divergence between the historical cost valuation model and the fair value of farms.

Due to the lack of clear guidelines, an attempt was made to identify factors influencing the choice of measurement and valuation of biological assets on the example of two selected provinces in Poland.

2. Research Review

The scientific community has been divided into two groups due to the use of fair value as a method of measuring and valuating assets in the balance sheet of farms. Fair value critical scientists argue that its usefulness has not been fully demonstrated and that fair value measurement is more manipulated by management, reduces the accuracy of investment decisions, is unreliable, may cause greater volatility, generates misleading reporting information (Watts, 2003; 2006; Ball, 2006; Rayman, 2007; Ronen, 2008; Liang and Wen, 2007; Plantin and Sapa, 2008; Bosch *et al.*, 2012). Conversely, fair value advocates argue that it represents a quantum leap in financial statement improvement as it entails less valuation volatility, improves the accuracy of management decisions by business management, provides stronger signals of financial distress, provides more relevant information and promotes

transparency of reporting information (Bleck and Liu, 2007; Gigler *et al.*, 2007; Barlev and Haddad, 2003; Bosh *et al.*, 2012). The use of fair value in the measurement of biological assets gives a much more dynamic picture of the economic entity and therefore much more useful and reliable in making financial and economic decisions. Currently, static bases of measurement, such as historical cost, which do not adapt to the evolutionary characteristics of biological assets, are being eliminated (Mesen Figueroa, 2007). The fair value use introduces a higher degree of complexity in the preparation of the financial information because it forces the entity to use advanced measurement techniques.

Therefore, they should reflect, both in the balance sheet and in the profit and loss account, the quantitative and qualitative changes presented by the assets in question. Also, this continuous recording of changes in the value of biological assets has a significant impact on the financial condition, results of operations and cash flow of agricultural entities. (Mesen Figueroa, 2007). According to Barth and Landsman (1995), the use of fair value in perfect and complete markets allows to reflect all information relevant to the value that is built in an economic entity (Bosh *et al.*, 2012). Under more realistic market conditions, however, management's discretion in measuring fair value may undermine the economic substance that is apparent from the reports in the financial statements. IAS 41 recommends using fair value for all biological assets in agriculture, but most authors are critical of its use in agriculture.

Penttinen *et al.* (2004) argue that a fair valuation would cause unrealistic fluctuations in the net profit of forestry enterprises (Bosh *et al.*, 2012). Herbohn and Herbohn (2006) emphasize the increased volatility of factors influencing the valuation, manipulation and subjectivity of economic benefits generated in the application of the IAS 41 standard. Dowling and Godfrey (2001), on the other hand, provide data on preferences in applying historical cost over fair value for a sample of farms, where companies choose the first valuation model (Bosh *et al.*, 2012).

PriceWaterCoopers (2009) examined 18 forest companies using fair value through discounted cash flow and 4 at market value, while 7 using historical cost valuation in a sample of 19 farms (some of which use multiple methods) from different countries (Bosh *et al.*, 2012). Elad (2004; 2007) concludes that IAS 41 is a significant deviation from historical cost and argues that fair value ignores the social and environmental relations of production that underlie market exchange, legitimizing unfair socio-economic relations (Bosh *et al.*, 2012).

However, Argilés and Slof (2003) advocate fair value measurement of biological assets as this avoids the complexity of calculating their costs for most small family farms operating in this sector. Elad (2004) points out that where there is no active market for biological assets, simplicity is not an advantage to fair value (Bosh *et al.*, 2012). Bosh *et al.* (2012) conducted a comparative study of the difficulties in preparing and cost-effective agricultural accounting using fair value and historical cost to measure biological assets, where significant conclusions were drawn, fair

value was found to be more favorable than historical cost for accounting preparation and encourages better assessment entities operating in the sector. Fair value is easier to put into practice, produces fewer errors, is more understandable and encourages better business appraisal. Given the characteristics of the operators in the sector, historical cost conveys a less accurate understanding of the real situation of the farm. It is associated with an increased risk of making suboptimal decisions. Beyond this discussion, no previous studies have shown significant empirical evidence about the appropriateness of any of the valuation methods for the agricultural sector (Bosh *et al.*, 2012). Tomkins and Grove (1983) comment on the need for research to learn about the natural environment in which accounting is created, and about the behavior and interactions of market participants involved.

3. Research Methodology

In order to achieve the goal of the article, a survey was conducted in the Dolnośląskie and Wielkopolskie voivodships in the period from January 2018 to January 2020. The selection of the research sample was a deliberate selection. The survey consisted of the following parts: part I - record and short description of agricultural production (10 questions), part II - identification of macroeconomic factors influencing the valuation of biological assets (2 questions), part III - assessment of available methods of biological assets valuation (14 questions). As a result of the survey, the next number of responses was obtained: 100 questionnaires from Lower Silesia voivodships, 100 questionnaires from Wielkopolska voivodships. All questionnaires were statistically analyzed. Based on the analysis, conclusions were drawn.

4. Results

The questionnaire was addressed to the owners of farms located in the Wielkopolskie voivodeship and Dolnośląskie voivodeship, where both voivodeships are located in Poland. The type of activity in the studied sample is presented in Figure 1.

Figure 1. Type of agricultural activity [%]

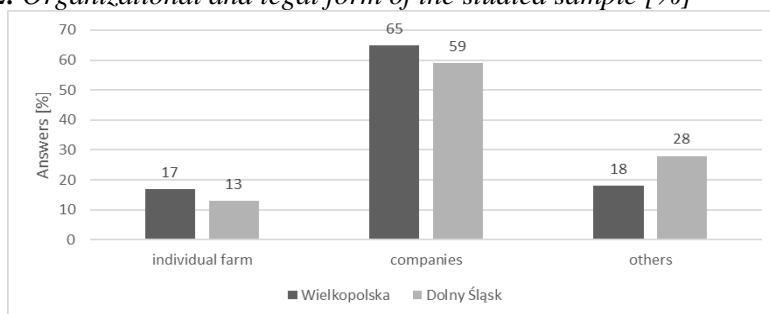


Source: Own.

The largest share in the study was held by farms running only plant production, where 55% of the sample was tested in Dolnośląskie voivodeship, and 48% in Wielkopolska. Subsequently, farms conducting mixed activity, in Wielkopolska they constituted 43% and in Lower Silesia 11%. The last group of respondents conducted agricultural activity solely related to livestock production, 34% in Lower Silesia and 9% in Wielkopolska, respectively.

Entities of various organizational and legal forms participated in the study: individual farms, commercial companies and others. Figure 2 presents the organizational and legal form of the researched farms. The largest group was the group of companies in the Wielkopolska voivodeship - 65%, and 59% were companies located in the Lower Silesian Voivodeship. The second group was made up of the "other" group, in which cooperatives were examined, among others, 18% of them in the Wielkopolskie voivodship and 28% in Lower Silesia voivodship. The last examined group was the group of individual farms, 17% of which were surveyed in the Wielkopolskie voivodship and 13% in Lower Silesia voivodship.

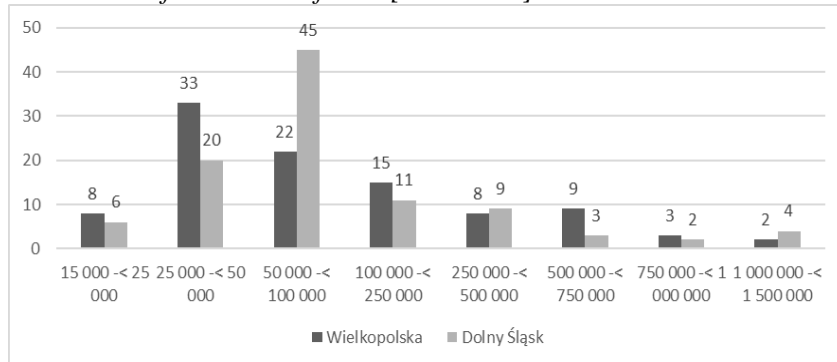
Figure 2. Organizational and legal form of the studied sample [%]



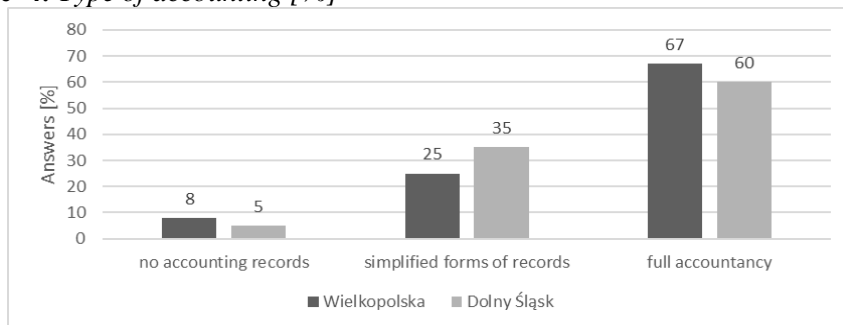
Source: Own.

The incomes obtained in 2017 in euro by the surveyed entities are presented in Figure 3. The most numerous group under study was the group that obtains revenues from agricultural activities in the range of EUR 25,000 to EUR 100,000 per year. In the Dolnośląskie voivodeship, 45% of the surveyed entities generated revenues in the range of EUR 50,000 to EUR 100,000. On the other hand, in the Wielkopolskie voivodship 33% generated revenues of between EUR 25,000 and 50,000. The smallest number of the group with the highest level of revenues is the group with revenues ranging from 750,000 to 1,000,000 and from 1,000,000 to 1,500,000 EUR. In the sample, they ranged from 2 to 4%.

The surveyed sample accounted for 67% of companies that keep records of business activity in the form of full accounting in the Wielkopolskie voivodship, and in the Dolnośląskie voivodship, 60% of the surveyed companies were. 35% of companies located in Lower Silesia voivodship kept records in the form of simplified forms of activity (Figure 4).

Figure 3. Income of researched farms [euro/2017]

Source: Own.

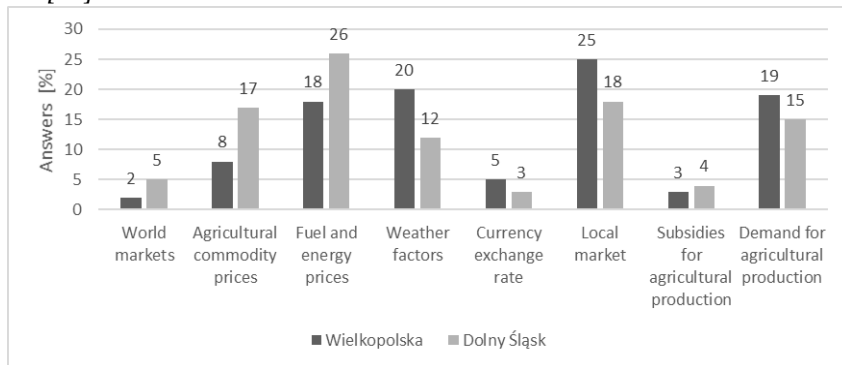
Figure 4. Type of accounting [%]

Source: Own.

On the other hand, in the Wielkopolskie voivodeship such companies were tested in the amount of 25% of the studied sample. The smallest group were companies that do not keep accounting records: 5% in Lower Silesia voivodeship and 8% in Wielkopolskie voivodeship.

The most important macroeconomic factors affecting the valuation of biological assets, according to the responses obtained in the Wielkopolskie voivodeship, include (Figure 5): local markets (25% of responses), weather conditions (20% of responses) and demand for agricultural production (19% of responses) and fuel and energy prices (18% of responses). The least important macroeconomic factors were: world markets (5% of responses), subsidies to agricultural production (3% of responses) and exchange rate differences (5% of responses). In the case of respondents from Lower Silesia, the greatest impact of macroeconomic factors (Figure 6) on the valuation of biological assets is primarily due to factors related to the price of fuels and energy (26% of responses), followed by the local market (18%) and agricultural commodity prices (17% of responses). The following macroeconomic factors such as currency exchange rate (3% of responses), subsidies to agricultural production (4% of responses) and world markets (5% of responses) had the lowest impact on the choice of the method of biological assets valuation.

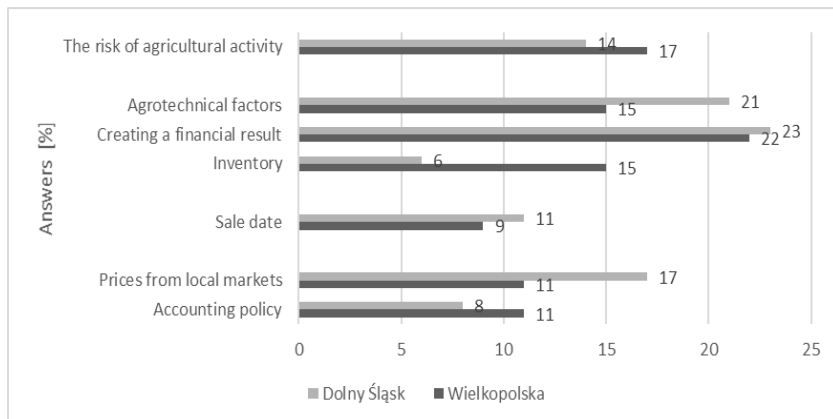
Figure 5. Macroeconomic factors influencing the choice of biological asset valuation [%]



Source: Own.

However, in the case of microeconomic factors that would have an impact on the valuation of biological assets among the respondents from the Greater Poland voivodeship, it was indicated that the following factors had the greatest impact: the willingness to create a financial result (22% of responses), risk of agricultural activity (17% of responses) and inventory (15% answers). On the other hand, the following factors have the lowest impact: accounting policy (11% of responses) and date of sale (9% of responses) (Figure 6).

Figure 6 Microeconomic factors influencing the choice of biological asset valuation [%]

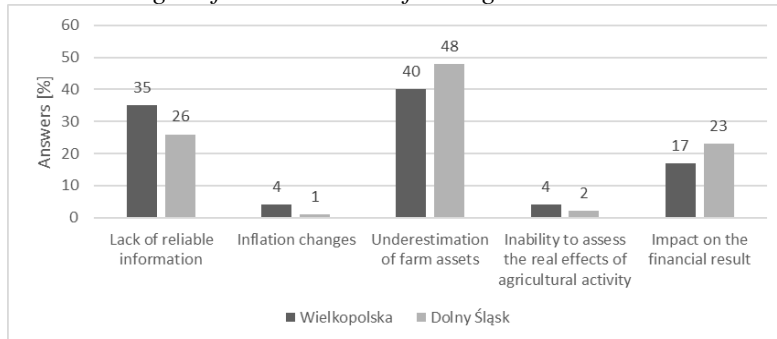


Source: Own.

Subsequently, respondents from the Lower Silesia voivodship identified microeconomic factors that have a significant impact on the choice of biological assets valuation. Such factors include, among others: creating a financial result (23% of responses), agrotechnical factors (21% of responses) and prices from local markets (17% of responses).

On the other hand, the disadvantages of the valuation of biological assets in the historical cost (Figure 7) include two main factors, which are underestimation of the farm assets (48% of the answers were given in the Dolnośląskie voivodeship, and 40% in the Wielkopolska voivodeship). Inflation changes and inability to assess were not considered a disadvantage (4% of responses from respondents from Wielkopolska and 1-2% of responses from respondents from Lower Silesia).

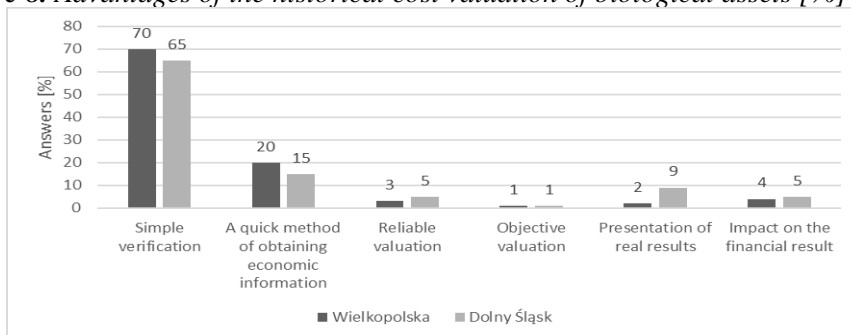
Figure 7. Disadvantages of the valuation of biological assets at historical cost [%]



Source: Own.

On the other hand, the advantages of the valuation of assets at historical cost (Figure 8) include the ease of its verification and such an answer was given by 70% of respondents in Wielkopolska and 65% of respondents in Lower Silesia. Subsequently, no significant advantages were recognized as: reliable valuation, presentation of real results or impact on financial results. Responses to the latter ranged from 1% to 5%.

Figure 8. Advantages of the historical cost valuation of biological assets [%]

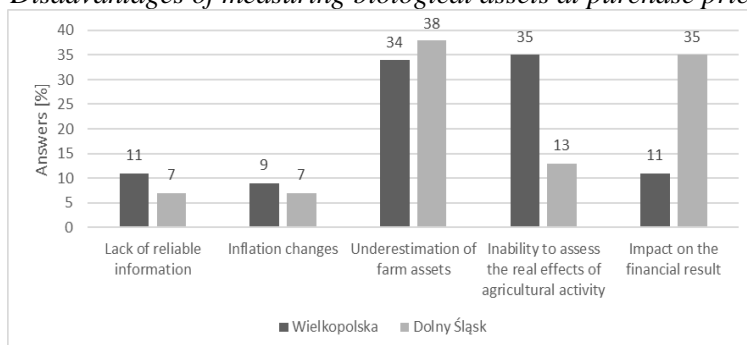


Source: Own.

In the case of the valuation of biological assets at the purchase price (Figure 9), the most important disadvantages were underestimation of farm assets by 38% of respondents from Lower Silesia and 34% from the Wielkopolska voivodeship. Another significant identified disadvantage was Inability to assess the real effects of

agricultural activity for 35% of respondents from the Wielkopolska voivodeship and the impact on the financial result for 35% of respondents from Lower Silesia.

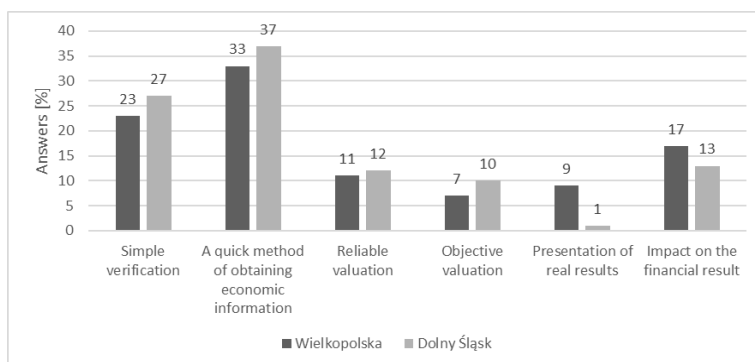
Figure 9. Disadvantages of measuring biological assets at purchase price [%]



Source: Own.

The main advantages of the valuation of biological assets at the purchase price (Figure 10) were considered by the respondents to be a simple method to verify the valuation and such an answer was given by 37% of respondents from the Dolnośląskie voivodeship and 33% from the Wielkopolskie voivodeship. Simple verification was considered another advantage of the valuation of biological assets at the purchase price. Simple verification was an advantage for 27% of respondents from Lower Silesia and 23% of respondents from Wielkopolska.

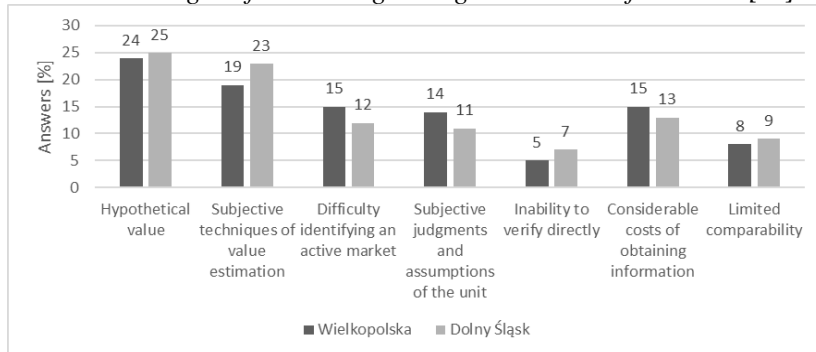
Figure 10. Advantages of the valuation of biological assets at the purchase price [%]



Source: Own.

The hypothetical value of biological assets at fair value was a disadvantage for 25% of respondents from Lower Silesia and 24% of respondents from Wielkopolska. On the other hand, subjective techniques for measuring biological assets at fair value are disadvantages for 23% of respondents from Lower Silesia and 19% of respondents from Wielkopolska (Figure 11).

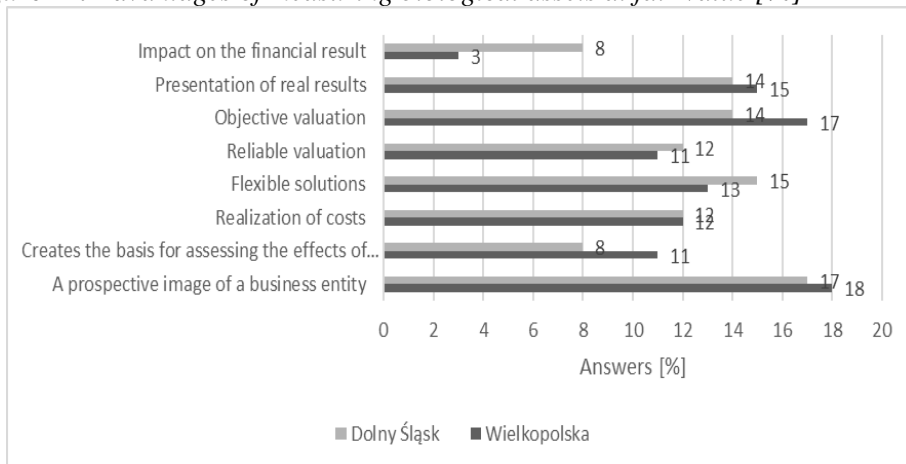
Figure 11. Disadvantages of measuring biological assets at fair value [%]



Source: Own.

On the other hand, the advantages of measuring biological assets at fair value (Figure 12) include, first of all, features such as objective valuation for 17% of respondents from Wielkopolska and 14% of respondents from Lower Silesia. Another advantage was the presentation of reliable results for 15% of respondents from Wielkopolska and 14% for respondents from Lower Silesia. Additionally, a significant advantage indicated by the respondents was a prospective image of a business entity (17% of responses from respondents from Lower Silesia and 18% of responses from respondents from Wielkopolska).

Figure 12. Advantages of measuring biological assets at fair value [%]

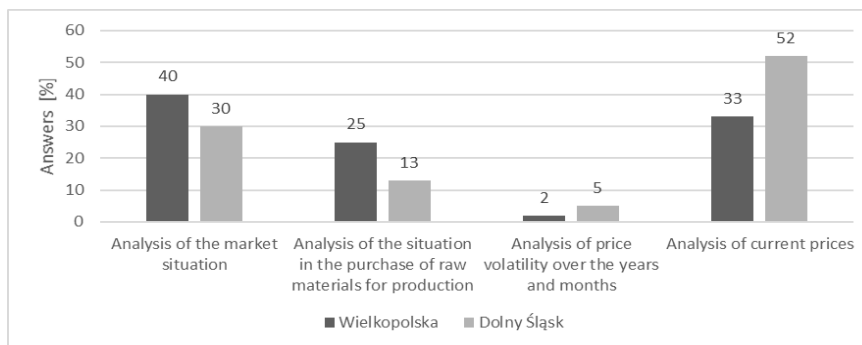


Source: Own.

As a result of the introduction of recommendations related to the introduction of fair value to the balance sheet law and the measurement of biological assets at fair value, the sources of obtaining information used for the measurement should be indicated (Figure 13). The main source of obtaining information used for the measurement at fair value was the analysis of current market prices, where over 52% of respondents from Lower Silesia indicated it as the main source of knowledge.

According to the respondents, the least important source was the analysis of price volatility over the years and months. Only 2% of respondents from Wielkopolska and 5% of respondents from Lower Silesia considered the answer important.

Figure 1. Sources of obtaining information used in the measurement of fair value [%]



Source: Own.

The last question was to determine what methods of measuring the value of biological assets have been used in the last three reporting years. Peacock respondents unanimously responded to this question that it was a historical cost method. Historical cost was used in 67% mainly by respondents from Wielkopolska and 57% from Lower Silesia. The second method of valuing assets used was the method of measuring biological assets in the fair value model. The least used method of valuation was related to the valuation at the current purchase price. In the last three years, it was used by 8% of respondents from Lower Silesia and 12% of respondents from Wielkopolska.

5. Summary

Most agricultural entities are not IFRS users. If this is the case, measuring biological assets and agricultural produce in accordance with IAS 41 implies a change in the approach to measurement. IAS 41 requires fair value less estimated costs to sell. A review of research related to the measurement and valuation of biological assets on farms revealed some discrepancies in the use of the fair value or historical cost model for the valuation of biological assets on farms and the division of scientists' views on this issue. The available studies focus on the attempt to answer the question of the validity of the use of fair value and historical cost in the measurement and valuation of biological assets. It should be noted that the choice of measurement and valuation method, with the possibility of applying the various measurement principles available, depends on the factors that affect the farm. The influence of these factors determines the choice of the method of measuring and valuing biological assets.

In the course of the survey, attempts were made to identify factors that affect the choice of measurement and valuation methods for biological assets. The most important ones include: fuel and electricity prices, weather factors. These factors were significant regardless of the organizational and legal form or the generated revenues. The microeconomic factors that have the greatest impact on the choice of the method of measurement and valuation of biological assets include: creating a financial result in companies that keep accounting records in the form of full accounting, the risk of agricultural activity in any organizational and legal form, as well as with any type of economic records.

On the other hand, the main factor that determined the choice of measuring and valuing biological assets at historical cost was the ease of verifying its value. The main disadvantages of this method are: the lack of reliable reporting information and the underestimation of farm assets. These responses were important for farms with full accounting and revenues in excess of € 100,000. In the case of valuation at fair value, the main disadvantages include, the subjectivity of the techniques for estimating its value and assessing the condition of the farm.

The article indicates that no research has been carried out on the factors influencing the choice of the method of measurement and valuation of biological assets, but only on the validity of the choice of the method of valuation at fair value or historical cost. This area requires further in-depth analysis.

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