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Will the amendments to the IAS 16 and IAS 41 influence the value of biological assets?

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Abstract: The aim of the paper is the evaluation of the impact of the new amendments to the IAS 16 and IAS 41 – Agriculture: Bearer Plants on the financial reporting in agriculture. The paper is based on the comparison of the current treatments for biological assets in a form of bearer plants measurement using the IFRS13 methodology and the treatments of the amendments to the IAS 16 and IAS 41. Statistical data regarding the selected bearer plant were used for the quantification. The orchard of fruit trees was considered as a suitable representative of bearer plants. As it is clear from the results of the research, the measurement at fair value using the DCF method is based on the estimation which requires a relatively large source of input data for this estimation over the useful life of bearer plants. On the other hand, the effect on the value of the assets could be controversial and the effect on the profit or loss during the useful life could be volatile. Although the objective of the fair value measurement is to achieve a true and fair view, in this case, the fulfilment of this objective is at least controversial, since the biological assets in the form of bearer plants cannot be separately traded.

Keywords: agriculture, bearer assets, IAS 41, measurement of agricultural assets, plants

Agriculture has been associated with the production of essential food. Agricultural activities include farming, forestry, dairy, fruit cultivation, poultry or bee keeping. It covers a large scale of activities which join labour, land, animals, plants, solar energy to provide food and raw materials. Industries such as the processing of fruit, vegetables and rice husking get their raw material mainly from agriculture.

Despite of the significant role of agriculture in the global economy, the accounting standard setters such as the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) have paid only a little attention to accounting for agricultural production processes. The FASB had not issued any special standard for agriculture prior to the Accounting Standards Codification. The International Accounting Standards Committee (IASC), the predecessor of the IASB, added the agricultural issue to its agenda in 1994. According to the Board, the main reasons were the increasing needs for the outside capital, and the increasing number of cross-border listings, and the commercionalisation of the agricultural activity. The final IAS 41 – Agriculture was issued in December 2000. The model of fair value for agricultural assets and production measurement was introduced in this standard. It was a significant change to the prior way of measurement based on the historical cost basis.

The fair value measurement, in comparison to the historical cost model, reflects the biological transformation process and the increase in value during the production cycle due to the special biologic character of transformation. The IAS 41 defines biological transformation as a process which comprises the process of growth, degeneration, production, and procreation that causes qualitative and quantitative changes in biological assets or the production of agricultural produce. The biological assets represent living animals or plants. The agricultural produce represents the products harvested of these assets,

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such as milk, wool, meat, fruits or cereals. There are significant differences in the nature of the individual biological assets and their produce. The single way to measure and present all kinds of biological assets seems not to be appropriate. This idea was also confirmed by the amendments to the IAS 16 and IAS 41 – Bearer plants published by the IASB in 2013. These amendments change the financial reporting for bearer plants, such as fruit trees, grape vines, rubber trees and oil palms.

The paper is based on the conclusions of the previous study carried out by Bohušová et al. (2012) and deals with the impact of the new amendments to the IAS 16 and IAS 41 – Agriculture: Bearer Plants on financial reporting in agriculture. According to this amendment, plants, which are used only for growing produce, are treated as a property, plants and equipment. The amendment is effective for the annual period beginning on or after 1th of January 2016, the earlier application is permitted. Due to the fact that there are not any experiences with the application of this amendment, only a limited amount of researches was carried out on this issue (Damian et al. 2014; Hinke and Stárová 2014; Kouřilová and Sedláček 2014; Gonçalves and Lopes 2015; Silva et al. 2015). The aim of the paper is the quantification of the possible effects of different ways of measurement on the bearer plants reporting and the performance of the business entity during the useful life of these assets.

MATERIAL AND METHODS

In the context of the IFRS 13 – Fair value measurement, which was published in 2011, some of the treatments of the IAS 41 – Agriculture became unsuitable for practical application. In particular, the fair value measurement of biological assets in a form of combined assets (orchards, vines, bamboo, sugarcane) when applying §25 IAS 41 could be in conflict with the basic financial reporting principles, especially with the true and fair view of biological asset due to application of "the highest and the best use" for the raw land measurement. For this reason, the authors focused on the comparison of the impact of the IAS 41 application in its original form in the context of the IFRS 13 and the newly issued Amendments to the IAS 16 and IAS 41. The authors use the above mentioned approaches to the bearer plants measurement for the quantification of the impact on the affected financial statements items.

The theoretical part of the paper is based on the comparison of the current treatments for biological assets in the form of bearer plants (orchards, vineyards) measurement using the IFRS 13 methodology and the treatments of the amendments to the IAS 16 and IAS 41. The IFRS 13 requires the use of "the highest and the best use" principle for the non-financial assets measurement. The principle is based on "*the use of a non-financial asset by market participants that would maximize the value of the asset or the group of assets and liabilities (e.g. a business) within which the asset would be used"(IFRS 13).* In the case that the highest and best use of land is different than the current use, the residual value approach according to §25 IAS 41 is not appropriate because the fair value of a biological asset could be very low or nil (the land could be used as a building land). The income approach based on the discounted cash flows could be used as an alternative way to the residual value approach.

The aim of the research is the quantification of an impact of the ways of the bearer plants measurements after the recognition on the financial statements items. Statistical data regarding the selected bearer plant were used for the quantification of the impact on the affected financial statements items. The orchard of fruit trees was considered as the most suitable representative of bearer plants. Due to the climate conditions of the Czech Republic, the apple trees were selected for the processing (apple trees are the most widespread fruit trees and their yields are less affected by the weather changes in comparison to apricots or peaches). For the research purposes, the authors assume that the orchard is located in the Central Bohemian region and the land can be optionally used for the construction purposes. It is obvious that the paragraph 25 of IAS 41 could not be applied for measurement purposes.

The data in a form of the Situational and forward-looking report – Fruit (Situační a výhledová zpráva – Ovoce) and the reports concerning the cost efficiency presented by the Institute of Agricultural Economics and Information were employed. The data cover the period 1994–2014. Subsidies received are not taken into account in the comparison due to the fact that subsidies related to the bearer assets are reported as deferred revenue according to the IAS 20 – Accounting for Government Grants.

Information relating to fruit-growing from the horticultural and economical point of view was synthetized for the quantification purposes. All the information

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was related to one hectare of apple orchard with the average production and the expected useful life of 12 years. The useful life of intensive planting of apple trees is 10–15 years in average (Kudová 2006; Lokoš et al. 2013,).

The time series of twenty one years (1994–2014) was taken into account to consider the biological character of production and to quantify the influence of climatic conditions and price effects in predicting the production and cash flows for each year of the useful life. The costs and revenues were adjusted to get the present value at the measurement date to eliminate the effects of inflation in each period. To quantify the discounted cash flows, the time value of money according to the IFRS 13 was considered. The discount rate is represented by the rate on the risk-free monetary assets that have maturity dates or durations that coincide with the period covered by the cash flows and pose neither uncertainty in timing nor risk of default to the holder (i.e. a risk-free interest rate).

Risk and uncertainty in the biological assets fair value determination were taken into consideration. The expected present value of the cash flows technique – method 1 (EPV1) according to the IFRS 13 B25 was employed. Present values of the possible cash flows serve as the basis of the group cash flow, which is the probability weighted average of all possible future cash flows. The resulting estimate corresponds to the expected value that is statistically the weighted average of the possible values of the discrete random variables and the corresponding probabilities are used as weights. Due to the fact that all possible cash flows are probability-weighted, the resulting expected cash flow is not dependent on the occurrence of any particular event (unlike the cash flows used in the discount rate adjustment technique according to the IFRS 13 B 23).

The fair value was estimated for all years of the biological assets useful life using moving values (minimum, median, and maximum) for the estimated series of 12 years. The minimum value of the corresponding time series was employed for the pessimistic estimation of cash flows, the maximum value was employed for the optimistic estimation of cash flows, and the median of the appropriate time series was employed for the realistic estimation. The appropriate probabilities were assigned to the particular options.

The fair value for each year is calculated based on the discounted cash flow expressed by the following formula:

$$DCF_j = \begin{pmatrix} \sum_{j=1}^{12} \frac{CF_j}{(1+i)^{j-1}} \\ \sum_{j=2}^{12} \frac{CF_j}{(1+i)^{j-2}} \\ \vdots \\ \sum_{j=11}^{12} \frac{CF_j}{(1+i)^{j-11}} \\ \frac{CF_{12}}{(1+i)^{j-12}} \end{pmatrix}$$

where:

j = useful life of bearer plant

I = interest rate

CF_j = moving minimum, median, maximum of period from j to $j + 9$

DCF_{min} = discounted cash flow – pessimistic option – in year j

DCF_{med} = discounted cash flow – realistic option – in year j

DCF_{max} = discounted cash flow – optimistic option – in year j

The probability is taken into account in the fair value calculation. The probabilities of 20% of the pessimistic scenario (p_1), 60% of the realistic scenario (p_2) and 20% of the optimistic scenario (p_3) are estimated. The probability of the individual scenarios is based on the empirical estimation and the management´s approach to risk estimation (neutral approach to risk). The long-term changes in yields due to the changes in climate and other factors are considered.

$$FV\,(j) = p_1.DCF_{jmin} + p_2.DCF_{jmed} + p_3.DCF_{jmax}$$

The impacts on the financial statements (assets value, effect on profit or loss) were determined using the methodological approach for the biological assets measurement and reporting according to the IAS 41.

Using treatments of Amendments to the IAS 16 and IAS 41, the biological asset in the form of bearer plants (apple-trees orchard) was measured at the cost (using the quantification of costs based on the procedures for setting up orchards according to the norms for the agricultural and food production (The standards for agricultural and food production – Normativy pro zemědělskou a potravinářskou výrobu). The standard belt planting in the number of 1125 pcs of dwarf trees per hectare was considered. The estimated cost of seedlings is 105 CZK/pc (based on the survey), the estimated cost per one hectare represents CZK 450 000 (Kavka 2004), seedlings including. Linear depreciation is expected in the average useful life of 12 years (it is expected that the disposal costs of

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the orchard and revenues obtained from the sale of timber will be at the same level).

Based on the results of this study, the conclusions concerning the new reporting methodology of bearer plants are formulated and arguments concerning the appropriateness of the methodology are presented.

Possible ways to the biological assets measurement

The specific nature of biological assets and biological transformation connected with agricultural production has not been taken into account by the most of the existing accounting systems. There was neither any special treatment concerning agriculture in the US GAAP, nor in the IAS for a long time. According to Herborn and Herborn (2006), pronouncements on agricultural accounting have been developed in an ad hoc fashion on a country-by-country basis.

According to Marsh and Fisher (2013), the 1980 farm crisis prompted the American Institute of Certified Public Accountants (AICPA) to develop the Statement of Position (SOP) 85-3 (AICPA 1985) guidance for accounting by agricultural producers and cooperatives for the inventory and product delivery. It became the Accounting Statement Codification (ASC) Topic 905 Agriculture in 2009. A similar basis of agriculture reporting is in Canada. Guidelines for reporting of agricultural activities were developed by the CICA in 1986. According to Herbohn and Herbohn (2006), both systems advocated the historical cost (LCM) as an appropriate assets measurement basis except in rare circumstances where realizable value may be considered as an alternative. Despite the fact that before 1998, a variety of measurement methods were used for biological assets, the most common was the historical cost method (Herbohn et al. 1998; Dowling, Godfrey 2001). Historical costs were the dominant measurement basis for their easier application than other measurement ways of biological assets.

The first significant departure from the historical cost measurement in agriculture is evident in the Australian financial reporting. The fair value measurement was considered as an alternative to the historical costs. The Australian Accounting standard concerning the biological nature of agricultural activity, the AASB 1037 Self-generating and regenerating assets (SGARAs), was published in August 1998. This standard requires measurement of all kinds of the SGARAs at their net market value at each reporting date. The net market value is defined in para 10 of this standard as the amount which could be expected to be received from the disposal of an asset in an active and liquid market after deducting costs expected to be incurred in realizing the proceeds of such a disposal. The net market value represents the concept of the fair value less costs to sell. Especially in the case of biological assets which do not have any liquid market such as orchards, vineyards, the determination of fair value could be considered very difficult.

The IASC (predecessor of IASB) was inspired by the AASB 1037 in the development of the IAS 41 – Agriculture. Both standards require biological assets to be measured at the fair market value less selling costs (referred as net realizable value and in the AASB 1037 as net market value) with any changes in value over an accounting period included in income statement as a gain or loss. Due to this way of loss and gain reporting, Dowling and Godfrey (2001), Barth (2004), Herbohn and Herbohn (2006), stressed the possible manipulation of financial statements. Liang and Wen (2007), Ronen (2008) pointed out the subjectivity of the reported earnings under this standard. Also, Penttinen et al. (2004) consider the fair valuation as a mean of reporting of unrealistic fluctuations in net profit of forest enterprises. On the other hand, according to Argilés et al. (2011), the nature of agriculture makes the historical-based valuation of biological assets difficult because of the effect of procreation, growth, death and other typical problems of agricultural activities such as joint-cost situations.

The differences in the agricultural activities such as trees plantation, cultivation of plants, viticulture, raising livestock, forestry, annual or perennial cropping, and fish farming are so high, that any generalization of treatments for agricultural reporting is not quite suitable. Despite this fact, the IAS 41 had used only one way of the valuation method (fair value measurement) for all biological assets. According to the IAS 41 Agriculture, all biological assets had to be measured at the fair value less estimated cost to sale at the initial recognition and at the subsequent reporting date.

Since the AASB 1037 and IAS 41 treatments have been effective, many studies concerning the suitability of the fair value measurement for all biological assets and cost connected with this application were carried out (Agrilés and Slof 2001; Booth and Walker 2003; Elad 2004; Foo 2006; Herbohn and Herbohn 2006; Thurrun Bakir 2010). The following problems were revealed by the above mentioned studies:

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(1) Difficulty in the fair value of the bearer biological assets determination due to the absence of the liquid market.
(2) Cost connected to the determination of the fair value.
(3) Possible earning manipulation due to the different and subjective approach to the fair value determination.

A conclusion of the majority of studies carried out on this issue was that the IAS 41 Agriculture was considered to be revised. The method of the biological assets measurement was identified as the most significant subject of revision. Damian et al. (2013) considered a single accounting treatment for both bearer and consumable biological assets as inappropriate, especially the fair value measurement for the mature bearer biological assets which are no longer undergoing the biological transformation. This triggered the opinion that this operation is rather similar to that of manufacturing and should therefore be accounted for like property, plant and equipment, under the IAS 16, thereby permitting use of a cost model.

The conclusion of the above mentioned studies and the criticism of the practical application of the fair value measurement for all kinds of biological assets resulted in the inclusion of a limited scope project concerning the biological assets measurement to the IASB's 2011Agenda Consultation. The prevailing opinion on some kinds of mature bearer biological plants (fruit trees, oil palms or rubber trees) considers them very similar to other long-term tangible assets such as property, plant and equipment. The main reason is that these assets are matured, and they are the means for production of agricultural produce over several reporting periods until they are scrapped at the end of their useful lives.

Moreover, in May 2011, the IFRS 13 Fair value measurement was published. The aim of the IFRS 13 is the increase of consistency and comparability in the fair value measurement through a fair value hierarchy. According to the KPMG (2011), the IFRS 13 does not establish any new requirements for when the fair value is required but provides a single source of guidelines on how the fair value should be determined. Despite the fact, that the IFRS 13 should reduce the subjectivity in its determination, the fair value determination remains an area of judgement when prices in an active market are not available. The issue of the determination of the fair value of non-financial assets is based on the perspectives of market participants of their highest and best use.

The new guidelines for the fair value determination in the IFRS 13 also initiated the strong support for the limited scope project concerning the biological assets measurement termination. In the IAS 41, it was possible to use the residual method for the biological assets that are physically attached to the land measurement, if the biological assets have not a separate market but an active market does exist for the combined assets as a group (paragraph 25 of the IAS 41). The fair value measurement guidelines in the IAS 41 were replaced by the IFRS 13 ones. Despite the fact that the guidelines of the IAS 41 are almost consistent with the IFRS 13 guidelines, as it is proved by the KPMG (2011) comparison, some problems could arise.

Due to the new approaches to the fair value measurement in the IFRS 13, a great obstacle in the fair value of combined biological assets determination had arisen. It was the reason why, at the May 2012 meeting, the IASB decided to give priority to developing a proposal of an amendment to the IAS 41 for the bearer biological assets. According to the conclusions of the IFRS submitters (2013), the use of the fair value measurement of land in accord with the IFRS 13 Fair value measurement used for the combined biological assets valuation could lead to a very low or nil fair value of the bearer biological assets attached to land in case that the highest and best use of the land is different from its current use. Based on the IFRS Interpretation Committee Meeting in March 2013, the IASB decided to develop a cost-based model for the bearer biological assets valuation.

The Exposure Draft (ED) *Agriculture: Bearer Plants* was published in June 2013. The significant issues on bearer assets were subjects to comments. The main issues were: the scope of the amendments, the accounting for bearer plants before maturity and accounting for bearer assets after maturity and the fair value disclosure for bearer plants.

This ED Amendment to the IAS 16 was intended to define bearer plants and to extend the scope of the IAS 16 to bearer plants, but not to the produce of these plants. Bearer plants were defined as a class of biological assets that, once mature, are held by an entity solely to grow produce over their productive life. Mature bearer plants no longer undergo any significant biological transformation. The measurement of bearer plants at the recognition was based on the same way as other self-constructed assets reported according to the IAS 16.The measurement after recognition allowed the use of cost or the revaluation model. Based on responses to the ED, the IASB tentatively decided

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Table 1. Comparison of approaches to bearer plants reporting

	Current approach	New approach
Definition	There were not any special definitions of consumable assets and bearer plants	Living plant that: is used in the production or supply of agricultural produce; is expected to bear produce for more than one period; and has a remote likelihood of being sold as agricultural produce, except for incidental scrap sales (1 IAS 16.6 and IAS 41)
Subject of measurement at recognition	Bearer plants are measured together with any agricultural produce attached	Bearer plants are measured separately from any agricultural produce attached
Measurement basis	Fair value less costs to sell	Bearer plants: cost, accumulated until maturity Produce of Bearer plants: Fair value less cost to sell
Measurement after recognition	Measured together with the agricultural produce until the point of harvest (i.e., one unit of account until the point of harvest) Measured at the end of each reporting period at fair value less costs to sell, with changes recognized in profit or loss	Cost, less any subsequent accumulated depreciation and impairment, with changes recognized in profit or loss Or Fair value at each revaluation date, less any subsequent accumulated depreciation and impairment. Revaluation adjustments (and impairment, to the extent it reverses previous revaluation increases) recognized in other comprehensive income; all other changes recognized in profit or loss

Source: Own processing based on the IAS 41 and the Amendments to IAS 16 and IAS 41

that the scope of the IAS 16 should be extended only to bearer plants, not to livestock. Accounting for the bearer plants produce is done in the fair value through profit or loss. The IASB does not add any guidance on application of the IAS 16 to bearer plants in the Amendment to the IAS 16 Bearer Plants.

The final Amendments Agriculture: Bearer Plants (Amendments to IAS 16 and IAS 41) were issued on 30 June 2014, and it is effective from January, 1st, 2016. The main differences in comparison to the current approach are the subject of the Table 1. The first study concerning the impact of these amendments was made by the Singapore listed planation companies (Golde Agri, Wilmar International, First Resources, Indofood Agri) and the conclusions were presented by Fang (2015). The estimated effect to financial statements upon the adoption of these amendments is a decrease of the biological assets and deferred tax liabilities and the corresponding decrease in equity.

RESULTS

Initial recognition of biological assets under the IAS 41 and its impact on profit or loss

Biological assets are measured at the fair value less the estimated cost to sell for the initial recognition. Under the IAS 41, biological assets shall be measured at its cost only on the recognition for biological assets for which market-determined prices or value are not available and alternative estimates of fair value are unreliable. According to Bohušová et al. (2012), the purchase costs of biological asset is often higher than their fair value less cost to sell, the transaction expenses create a loss. In case when the biological assets used for biological transformation are purchased, there arises the profit or loss from the revaluation of the fair value decreased by the estimated sell costs.

Measurement after recognition

According to the IAS 41, changes in the fair value of biological assets due the biological transformation and price changes are reported from period to period as gains or losses. The majority of changes is not caused by the activity of an enterprise and therefore its realization is not always completely probable (the influence of unfavourable weather conditions, the change in market conditions).

In accordance with the IAS 41, there are two main groups of biological assets: consumable biological assets, which are harvested as agricultural produce, and bearer biological assets which are biological assets other than consumable biological assets. Assets in this group are not agricultural produce, but they are self-regenerating.

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According to Dvořáková (2006), the measurement of bearer assets in the fair value less costs to sell and the recognition of differences in the changes of fair value less cost to sell in profit or loss could lead to misleading information. This is due to the fact that the revenue associated with these assets will never be earned and realized. The measurement at the fair value comprises the influence of the biological transformation and price changes as well. The reporting of all price influences in case of agricultural assets in accordance with the IAS41 in profit or loss statement before their realization is considered to be inconsistent.

The practical application of the standard is connected with many obstacles and its full application is practically impossible. This is supported with the conclusions of Elad and Herbohn (2011), who mention, that there is a number of modified applications differing in the individual countries (the application is significantly influenced by the national GAAPs). The practical application of the fair value measurement of agricultural assets with no existing active market is connected with the minimal requirements on the input information. On the contrary, the fair value measurement of agricultural assets in the process of biological transformation is connected with the risk, whether the process will be successfully finished or not.

Possible application of amendments to the IAS 16 bearer plants

Assuming the substance of the biological transformation in the case of bearer assets, in a form of fruity plants, there are similar cycles in which are in the early stages spent costs without obtaining any associated benefits in the form of the biological production (fruits, wine grapes, etc.). This phase could be considered similar to the self-construction of fixed assets. The question is, whether the information on the fair value of this asset is useful for the users of financial statements, and whether it is suitable to show an increase or decrease in this value in the income statement. The next questions are the level of the incidental expenses spent on finding this information, the way of the determination of fair value in the case of assets for which no market exists (fruit trees, vineyards, sugarcane, bamboo, etc.).

The determination of the fair value of fruity plant is greatly influenced by the fact that for fruity plants in the growth phase, there is no active market, they are connected with the place where they are grown and it is not possible to move them during the period of fertility and trade them separately from the relevant land. Before the IFRS 13 was published, there was the residual value approach to the fair value of bearer plants determination (IAS 41–25). The residual value approach cannot be used anymore and the fair value measurement should be based on the income approach (the discounted cash flows). The application of this approach seems to be very costly and time demanding and the effect of this measurement seems to be very low.

On the other hand, similarly to fixed assets, where the life cycle and the accounting methodology could be divided to the procurement phase, the use phase and the phase of decommissioning, in case of bearer plants the life cycle could be divided to similar stages (a period of growth, the period of fertility and the gradual death and destruction).

Period of growth is similar to the phase of acquisition, in the case of fruit trees, it is a period from grow of the tree till the emergence of the economically important fertility. It is characterized by strong development of the vegetative parts – above and below ground (trunk, skeletal branches, roots), growth prevails fertility. This period differs in the length for different types of bearer plants (small fruits – 2–5 years, vineyards – 4 years, stone fruits 3–6 years, dwarf fruit trees– 3 years, 7–14 years for pears etc.). The cost incurred for bearer plants during this period is considered as parts of cost. The cost could include also provision for decommissioning (if it is significant). Especially, in the case of vines after the end of period of fertility it is necessary to remove the vineyard. High costs are incurred with the removal and benefit is nil.

The period of full fertility and growth is characterized by decreasing in the intensity of the vegetative parts growth. Fertility of bearer plants is almost regular. It is usually reached high-quality harvest. This stage is similar to use phase of fixed assets. During this stage, the bearer asset should be depreciated. The way of depreciation could be straight-line or could describe the course of fertility during the fertility period. The length of this period is dependent on the type of bearer plant, variety, climate etc. (10–15 years in average, maximum 20 years). The depreciable amount is depreciated during this period. The depreciable amount is dependent on the cost of bearer plants setting up and the residual value. The residual value includes value of timber gained of fruit trees (fuel or furniture industry).

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Many of the subsequent costs relating to the agricultural activity during the biological transformation process are incurred. They usually include planting, weeding, irrigation, or harvesting. The majority of these expenditures are reported as expenses in the period when incurred.

Comparison of fair value and historical cost measurement of bearer plants effects

The subject of the following part is the comparison of the impacts of different ways of the bearer plants measurement. The case of the most common fruit trees in the Czech horticulture is employed for the research. These are dessert apples – apple cultivars grown for eating raw as opposed to cooking or cider making.

Fair value measurement

The Table 2 shows the input data utilized for the fair value measurement of biological assets in the form of the apple orchard (1 ha) based on the discounted cash flows.

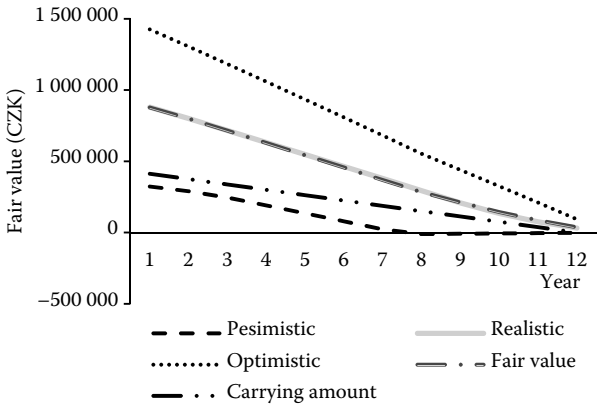

Figure 1. Estimation of fair value during the useful life

Source: authors' research based on the data of the Situační a výhledové zprávy – Ovoce, the ÚZEI information and the inflation information (http://www.kurzy.cz/makroekonomika/inflace/)

Input data were used for the fair values of biological assets during the useful life (apple orchard) estimation. Annual changes in the fair value during the useful life in the Table 3 served for the graphical presentation in the Figure 1.

Table 2. Input data for fair value of the bearer plants estimation

Year	Yield t/ha	Price CZK/t	Direct cost CZK/ha	Revenues CZK/ha	Profit CZK/ha	Inflation p.a. (%)	Profit converted
1	11.86	6 399	43 362	75 892	32 530	10.0	35 783
2	10.3	8 828	47 737	90 928	43 191	9.1	47 122
3	12.83	11 784	49 213	151 189	101 976	8.8	110 950
4	16.01	8 409	51 479	134 628	83 149	8.5	90 217
5	13.7	7 784	49 320	106 641	57 321	10.7	63 454
6	15.97	8 219	48 127	131 257	83 130	2.1	84 876
7	21.57	8 432	52 911	181 878	128 967	3.9	133 997
8	15.57	8 246	48 024	128 390	80 366	4.7	84 143
9	18.33	8 548	53 013	156 685	103 672	1.8	105 538
10	17.15	8 289	50 166	142 156	91 990	0.1	92 082
11	17.97	9 967	64 918	179 107	114 189	2.8	117 386
12	15.26	8 048	67 096	122 812	55 716	1.9	56 775
13	17.62	8 920	71 005	157 170	86 165	2.5	88 320
14	13.13	10 256	74 908	134 661	59 753	2.8	61 426
15	17.9	10 371	97 741	185 641	87 900	6.3	93 438
16	16.68	7 808	97 658	130 237	32 579	1.0	32 905
17	11.85	8 607	104 070	101 993	–2 077	1.5	–2 108
18	9.18	9 856	92 417	90 478	–1 939	1.9	–1 976
19	13.68	9 624	110 394	131 656	21 262	3.3	21 964
20	13.78	9 761	111 609	134 507	22 898	1.4	23 218
21	14.1	10 262	114 806	144 694	29 888	0.4	30 008

Source: own calculation based on the data of the Situační a výhledové zprávy – Ovoce, the ÚZEI information and the inflation information (http://www.kurzy.cz/makroekonomika/inflace/)

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Table 3. Fair value estimation according to the IAS 41 and IFRS 13

Year	Estimation			Fair value using the DCF	Change in FV
	pessimistic	realistic	optimistic		
0	323 139	880 205	1 425 815	877 914	0
1	290 229	800 585	1 304 737	799 344	–78 570
2	245 538	716 530	1 182 447	715 515	–83 829
3	190 651	631 635	1 058 935	628 898	–86 617
4	135 215	547 790	934 187	542 554	–86 343
5	79 224	465 804	808 192	456 966	–85 589
6	22 673	379 359	680 937	368 338	–88 628
7	–10 334	292 050	552 409	283 645	–84 693
8	–8 308	207 877	439 373	210 939	–72 706
9	–6 262	134 334	325 207	144 389	–66 550
10	–4 196	75 985	209 899	86 732	–57 657
11	–2 108	31 456	93 438	37 140	–49 592
12	0	0	0	0	–37 140

Source: own calculation based on the of the Situační a výhledové zprávy – Ovoce, the ÚZEI information and the inflation information (http://www.kurzy.cz/makroekonomika/inflace/)

Cost model application

The agro-technical standards (Kavka 2004) of the activities related to the apple orchard in the form of an intense band planting dwarf apple-trees are taken into account for the cost quantification. The supposed time to reach full fertility is three years. The individual activities are included in the Table 4.

The costs incurred during the starting period (first three years) are depreciated during the useful life of bearer plants. The methods describing the fertility evolution during the useful life could be employed to capture the fertility reduction during the useful life of the orchard. Due to the lack of input data for the development of non-linear models of fertility, the authors used the straight-line depreciation. The development of carrying amount impact on earnings in the form of depreciation is included in the Table 5 and Figure 2.

As it is evident from the tables and figures above, the fair value measurement of bearer plants can lead to their overestimation in the early years of the life. It is caused by the significant uncertainty in estimating the future cash flows of these assets. The assessment

Table 4. Historical cost measurement at recognition – cost connected to the orchard setting up incurred during the first three years (until the full fertility) – standard cultivation technology (tie 4 × 2.5 m, dwarf tree planting)

Activity	Work-related activities
Land preparation before planting	Compost or farmyard manure (FYM) fertilization (50 t per ha), store fertilizing (500 kg P_2O_5/ha, 650 kg K_2O/ha, 800 kg MgO/ha, 5 000 kg CaO/ha), deep ploughing, smoothing, basic laying out of the land
Planting seedlings	Pegging the area, digging pits, modification of roots and planting trees, tree guard installation, hammering stakes in and fixing trees to stakes
1. year treatment	Trees cut after planting, soil treatment-inter-row cultivation, herbicide application, nitrogen fertilization, protection against diseases and pests, seed blend green manure, incorporation of a mixed bag, sowing grass, summer trees cut
2. year treatment	Cut tree branches and cleaning after cutting, inter-row cultivation, herbicide application in the ranks, nitrogen fertilization, protection against diseases and pests, planting grass, grass mowing
3. year treatment	Cut tree branches and cleaning after cutting, inter-row cultivation, herbicide application in the ranks, nitrogen fertilization, protection against diseases and pests, planting grass, grass mowing
Orchard setting up – total	450 000 CZK

Source: Agro-technical standards of activities

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Table 5. Cost model – straight line depreciation

Year	Carrying amount	Depreciation
1	412 500	37 500
2	375 000	37 500
3	337 500	37 500
4	300 000	37 500
5	262 500	37 500
6	225 000	37 500
7	187 500	37 500
8	150 000	37 500
9	112 500	37 500
10	75 000	37 500
11	37 500	37 500
12	0	37 500

Source: Authors 'calculation based on the Agro-technical standards of activities

of assets as combined assets – trees connected with land – while respecting the IFRS 13 could lead to the reduction of the true and fair view, since the value of trees connected with the land could be very low or zero. This would significantly affect the amount of the cost of the entity over the useful life of bearer assets (the reduction in value of bearer plants could not be reported). Using a discounted cash flow approach using the income approach according to the IFRS 13 has resulted in a high volatility in the level of costs in the form of the reduction in the fair value of the bearer assets. It could be caused by many factors. These are the volatility of the fair value of the bearer assets produce due to the volatility in the market price, the volatility in the yield per hectare and the influence of climatic conditions (rainfall, spring frosts)

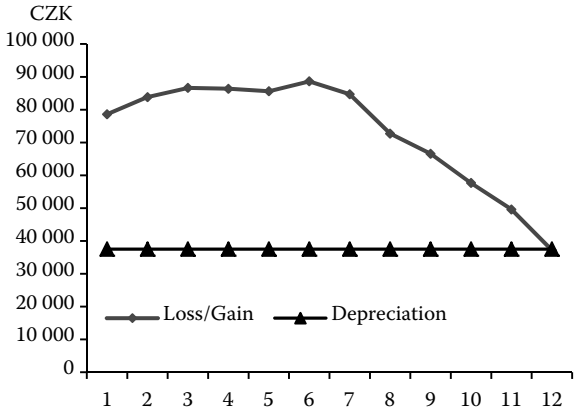

Figure 2. The impact on expenses using the fair value measurement and the cost model

Source: Authors' processing based on data in Tables 4 and 5

and the incidence of diseases and pests. These factors should be taken into account when estimating the fair value, but the reality may be quite different.

In contrast, the cost model takes into account the level of costs incurred by the entity on acquiring the relevant bearer plant and allows for the recognition of these costs over the useful life of the bearer plants. Due to the fact that the value of bearer plants after the useful life is supposed to be nil, the fair value measurement of bearer plants can be considered as enormously time consuming and inaccurate anyway. As it can be seen in the figure above, the fair and book value differ from each other mainly in the early stages of the useful life of bearer plants. The difference decreases at the end of the useful life (this also confirms the conclusions of the study Argilés and Slof (2001), which dealt with comparing of the fair value and the carrying amount of biological assets in Spain and concluded that the differences in biological assets reporting through various methods of valuation are not significantly different). These arguments are in favour of the use of the cost model of the bearer plants measurement. The authors appreciate the IASB activity in development of the Amendments to the IAS 16 and IAS 41 Bearer plants. According to these amendments, the bearer plants are treated as the property, plants and equipment and it is allowed to use the cost model in the measurement of bearer plants.

CONCLUSION

The potential impact of possible ways of biological assets measurement in the form of bearer plants was examined in the paper. The authors took into account laboriousness, demand on the input data for the measurement purposes and other specific knowledge demand.

As it is clear from the previous analyses, the measurement at the fair value using the DCF method is significantly based on the estimations of future cash flows and their probabilities and requires a relatively large source of input data for this estimation over the useful life of bearer plants. It is necessary to use the data for a relatively long period of time in relation to the useful life of bearer plants (twice the lifetime – for the purposes of the calculation of moving values) to take into account the nature of the production of biological assets and the climatic and weather conditions and to incorporate the most

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possible situations. On the other hand, the effect on the value of the assets could be controversial and the effect on profit or loss during the useful life could be volatile. Although the objective of the fair value measurement is to achieve a true and fair view, in this case, the fulfilment of this objective is at least controversial, since the biological assets in the form of bearer plants cannot be separately traded and thus the definition of fair value ("*the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date*") could not be fulfilled. The results of the authors show the estimated decrease in the book value of bearer plants, especially in the initial years of their useful lives. These results are in accord with the conclusion of the Singapore plantation companies (Fang 2015).

Reporting in accordance with the Amendments to the IAS 16 and IAS 41 allows the use of the cost model for bearer plants. The cost model application requires a detailed evidence of all costs incurred in connection with the orchard setting up until the fertility achieving. These costs are considered as the basis for the measurement of the bearer plants value the. These costs are reported as expenses during the useful life. In comparison with the fair value measurement, the cost model is less external data demanding. It is not burdened by a subjective assessment and estimation of probability. The depreciation of plants over the useful life shows the fair and true view on reality.

The conclusions of the authors positively evaluate the fact that the IASB considers the differences between bearer assets and consumable produce. The amendments to the IAS 16 and IAS 41 reflect this reality. The main aim of the amendments is the simplification of agricultural reporting and the decrease of the incidental cost of reporting. These amendments reflect the true and fair view on agricultural assets and also enable an easy practical application. The issue of agriculture assets measurement represented the main reason for the further research of the authors in the area of the agricultural reporting.

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