

Sugarcane Fair Value Estimation Models: An Accounting Information Compliance Study

Modelos de Estimação do Valor Justo de Cana-de-Açúcar: Um Estudo de Conformidade da Informação Contábil

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ABSTRACT

The literature on biological assets reveals a difficulty in estimating fair value in the absence of an active market, which can reduce the reliability of the accounting information. This scenario of uncertainty was used as a catalyst for the change in CPC 29, focused on bearer plants. However, some biological assets without an active market and with a shorter life cycle are still measured at fair value, using the same valuation models. The objective of this work is to study the models used by sugar mills to measure sugarcane, and to verify whether they are following the standard when accounting for and evidencing sugarcane in their financial statements. It also intends to verify if the assumptions used to calculate the fair value of biological assets are comparable between mills, and if the measurement information is in the explanatory notes. To achieve this objective, the research analyzed 13 financial statements of companies from the sugar and ethanol sector, checking the assumptions used to calculate the fair value. The results indicate that the number of assumptions used in the discounted cash flow models is different among companies, which can compromise the comparability of the information, since there is no uniformity in the number of assumptions disclosed.

The three most widely disclosed assumptions are: total recoverable sugar (ATR), estimated production, and discount rate. We conclude that disclosure is low even restricting the analysis to the sugar and ethanol sector, which opens the opportunity for discussion regarding more specific guidelines from the regulator to measure biological assets

Keywords: biological asset; fair value; sugarcane.

ABSTRACT

A literatura de ativos biológicos nos revela uma dificuldade em estimar o valor justo na ausência de mercado ativo, o que pode reduzir a confiabilidade da informação contábil. Esse cenário de incerteza foi usado como catalisador para alteração no CPC 29, voltada para as plantas portadoras. Contudo, alguns ativos biológicos sem mercado ativo e, com ciclo de vida menor, ainda são mensurados a valor justo, por meio dos mesmos modelos de avaliação. O objetivo desse trabalho é estudar os modelos usados pelas usinas sucroalcooleiras para mensuração da cana-de-açúcar, e verificar se estão seguindo a norma ao contabilizar e evidenciar a cana em suas demonstrações contábeis. Ainda se pretende verificar se, as premissas utilizadas para o cálculo do valor justo dos ativos biológicos são comparáveis entre usinas, e se, as informações da mensuração estão nas notas explicativas. Para atingir este objetivo, a pesquisa analisou 13 demonstrações financeiras de empresas do setor sucroalcooleiro, verificando as premissas utilizadas para cálculo do valor justo. Os resultados indicam que a quantidade de premissas utilizadas nos modelos de fluxo de caixa descontado é diferente entre empresas, o que pode comprometer a comparabilidade da informação, já que não há uniformidade na quantidade de premissas evidenciadas. As três premissas mais divulgadas são: açúcar total recuperável (ATR), produção estimada e taxa de desconto. Conclui-se que a divulgação é baixa, mesmo restringindo a análise para o setor Sucroalcooleiro, o que abre a oportunidade de discussão a respeito de orientações mais específicas do regulador para mensurar os ativos biológicos

Palavras-chave: ativo biológico; valor justo; cana-de-açúcar.

1 INTRODUCTION

Brazil is a major world agribusiness power, with a high volume of exports. According to the Federation of Industries of the State of São Paulo (FIESP), exports from this sector amounted to 96 billion in 2017. Brazilian agribusiness is relevant to the country's economy, its share of the Gross Domestic Product (GDP) was 23.5% in 2017, according to data from the Confederation of Agriculture and Livestock of Brazil (CNA - 2017).

One of the main sectors of agribusiness in Brazil is sugar and alcohol, derived from sugarcane. In addition to the large and growing domestic market for these products, Brazil has a large share of the international market, as it is the world's largest exporter of sugar and the world's second largest producer of ethanol, according to the Department of Research and Economic Studies (DEPEC, 2017).

With the advent of international accounting standards for biological assets and agricultural products, countries exporting agricultural products and their derivatives had to adapt these standards to their markets if they wished to increase ease and confidence in negotiations with the international community, and Brazil was no different (Rech, Pereira & Cunha, 2006). The international standard dealing with biological assets and agricultural products is IAS 41, and in Brazil, the equivalent standard is CPC 29, published in September 2009. This standard resulted in a change in the measurement of biological assets and agricultural products from historical cost to fair value; for example, sugarcane is now measured at fair value.

However, there is uncertainty in estimating fair value for some biological assets and agricultural products in formation, including standing sugarcane ii, justifying further studies on the application of discounted cash flow models to estimate fair value. Some research questions the estimation of fair value for biological assets (Booth & Walker, 2003; Eckel, Fortin & Fisher, 2003; Dvorakova, 2006; Herbohn, 2006; Pires & Rodrigues, 2008; Williams & Wilmshurst, 2009; Fisher, Mortensen & Webber, 2010; Argilés, GarciaBlandon & Monllau, 2011; Rech & Pereira, 2012; Silva, Nardi & Ribeiro, 2015) due to the difficulty in estimating fair value in the absence of an active marketiii, for example, due to the use of unobservable data, in addition to the low disclosure of the requirements of CPC 29.

The reliability and verifiability of measuring the fair value of biological assets can be influenced by the presence or absence of an active market for the asset being evaluated, which implies greater or lesser subjectivity (Silva, Nardi & Ribeiro, 2015). The absence of an active market requires other techniques for evaluating the asset, which can reduce the reliability of the information (Rech & Pereira 2012), which is heavily criticized.

This scenario of uncertainty was used as a catalyst for a change in IAS 41, aimed at bearer plants. This subgroup of plants left the scope of IAS 41 and became part of the assets of IAS 16 or CPC 27 - fixed assets, returning to historical cost as the basis for measurement. Despite this, the agricultural product still receives the treatment of CPC 29, with the appropriate recognition of gains or losses from variations in fair value in the result for the period (Nakao *et al.* 2017). The agricultural

product of sugarcane is known as standing cane and can take 12 to 18 months to form. During this period, it is measured at fair value, but there is no specific market for sugarcane, and its measurement contains a lot of unobservable data, resulting in a high degree of subjectivity in the application of criteria and assumptions for its evaluation.

Thus, the literature indicates that there is room to discuss the usefulness of accounting information for biological assets. However, this work is restricted to one type of biological asset so as not to risk comparing biological assets that have different characteristics and are evaluated in different ways, which could result in unclear or insufficient evidence. In this way, new studies on the accounting of sugarcane could improve comparability without detracting from the reliability of the information. For example, Cavalheiro *et al.* (2019) used a multidisciplinary approach involving economic, accounting, and agronomic aspects to measure sugarcane. The authors used agrometeorological modeling to measure sugarcane, improving the quality of the information.

That said, the aim of this work is to study the models used by sugar and alcohol mills to measure standing cane (an agricultural product under development) and sugarcane (a bearer plant), and to verify whether they are following the standard when accounting for and disclosing cane in their financial statements. It should be noted that standing sugarcane is measured at fair value, while sugarcane is measured at historical cost. The study also aims to verify whether the assumptions used to calculate fair value are comparable among the mills and whether the measurement information is included in the explanatory notes. From this, they can identify the most and least disclosed points in order to reflect and suggest improvements in the disclosure of information on biological assets. As a result, the work could be useful for companies to be aware of the assumptions most commonly used in measuring the fair value of sugarcane so that the use of assumptions can be standardized among mills. This would be useful for investors, as the reliability and comparability of the information could increase.

2 THEORETICAL FRAMEWORK

2.1 Biological Assets According to CPC 29

CPC 29 aims to establish the accounting treatment and disclosure of biological assets and agricultural products. Biological assets are living beings - plants or animals - that provide agricultural products or become the product after undergoing the necessary biological transformations, such as the mango tree that provides the mango and a tree cut down to sell its wood. In addition to providing examples of what a biological asset is, an agricultural product and products resulting from post-harvest processing, CPC 29 emphasizes the difference between bearer and non-bearer plants. Bearer plants are those that provide agricultural products, such as mango trees, and have a remote possibility of being sold as agricultural products. Non-bearer plants are those that, after transformation, correspond to the agricultural

product itself. In addition, they end with the harvest, such as wheat and beans, or are more likely to be sold as a commodity once the agricultural product has been supplied. Biological assets and agricultural products can also be classified as mature or immature. The former are those in harvestable condition, while the others are still undergoing the biological changes necessary for their harvest. The measurement of the value of these biological assets and agricultural products is by the fair value method, except for bearer plants.

The scope of CPC 29 covers biological assets, except bearer plants, agricultural production at the point of harvest, and government grants. It does not apply to land related to agricultural activities, government grants and assistance related to bearer plants, or intangible assets related to agricultural activities. CPC 29 should be applied to agricultural production at the point of harvest, and after that, CPC 16—Inventory should be applied, or another more appropriate pronouncement. In addition, products resulting from the industrial processing of agricultural produce, such as sugar and alcohol, are not dealt with by CPC 29, even if the entity has undertaken the process from planting the biological asset until its harvest and processing.

However, CPC 29 also provides guidance on the recognition and measurement of biological assets or agricultural products, emphasizing that the entity should only recognize and measure when: i) it controls the biological asset as a result of past events; ii) it is probable that future benefits from this asset will go to the entity; iii) its fair value or cost can be

measured reliably. In addition, CPC 29 emphasizes the methods established by CPC 46 for measuring fair value if the parameters are reliable.

2.2 Fair Value According to CPC 46

CPC 46 intends to define fair value and establish methods for measurement and disclosure that entities must comply with. The pronouncement defines fair value as the price that would be received for the sale of an asset or that would be paid for the transfer of a liability in an unforced transaction between market participants on the measurement date. (CPC, 2020). In other words, this type of measurement is based on the market and not on an entity-specific measurement, as assets and liabilities measured at fair value have specific markets, and this transaction represents a balance between sellers and buyers.

The standard establishes three levels of measurement in a hierarchical manner to increase the consistency and comparability of information. This happens because, depending on the asset or liability, there is observable and unobservable information in the market. If this asset is traded in a specific market, there may be observable information about the fair value of this asset; therefore, it falls into level 1. In the absence of observable information, assets can be measured at other levels of the fair value hierarchy, which may require some judgment and a certain degree of subjectivity. The three levels are briefly presented in Table 1:

Table1 – Fair Value Hierarchy

LEVEL 1	The information is observable because the prices are quoted in active markets for identical assets and liabilities; for example, the corn commodity market or coffee, which are agricultural products after harvest. The quoted market price is the most reliable information that should be used by the entity to measure fair value.
LEVEL 2	The information is observable, however, with prices quoted for similar assets and liabilities in active and non-active markets (Item 81, CPC 46). Interest rates, volatility, credit spreads, location, condition of the asset, and information corroborated by the market are used to measure fair value at this level (Items 82 and 83, CPC 46). In other words, it must be applied when there is no active market for the identical good.
LEVEL 3	The information is not observable, as there is no active market for either a similar asset or liability. For measurement at this level, unobservable data are used to measure fair value due to the absence of relevant observable information. However, the objective remains the same, as the assumptions at this level would be the same as those used by market participants to price assets and liabilities, including assumptions about risk. In other words, it should only be used in the absence of information that allows the use of other levels.

Source: CPC 46 (2020)

It is observed that at levels 2 and 3, there is greater subjectivity in measuring fair value, with level 3 being the most subjective, as it is subject to measurement errors. The measurement techniques used, such as discounted cash flow, require unobservable data that is defined by the entity, for example, the discount rate, information on plant productivity, and the cash flow time of the biological asset, among others.

In relation to standing sugarcane, the assumptions for measurement involve unobservable data, which constitutes a level 3 fair value measurement, the most subjective. The companies that grow sugarcane in Brazil belong to the sugar and alcohol sector, which

is the target of this study. In addition to the subjectivity intrinsic to level 3, the assumptions and method of calculating the value can change, which further increases the degree of subjectivity as each entity can develop its own assumptions, which makes information comparability difficult.

2.3 Research on Biological Assets

Many studies point to a decrease in the relevance and comparability of accounting information due to the subjectivity intrinsic to

the fair value of biological assets. This can result in the disclosure of non-real gains (Booth & Walker, 2003; Dvorakova, 2006; Williams & Wilmshurst, 2009; Fisher, Mortensen & Webber, 2010).

In the same context, Oliveira, Cruz and Pinheiro (2014) conducted research to find out what procedures were adopted to measure biological assets and agricultural products at fair value. The conclusions of the study showed great subjectivity in the measurement of biological assets and agricultural products, since, of the 14 companies, 50% used the discounted cash flow method to measure assets. Furthermore, they used different calculation models with different rates to estimate the fair value. According to the authors, as there is great subjectivity, companies reduce transparency in the disclosure of accounting information, which causes insecurity for users of the information. The authors suggest that regulatory bodies reevaluate the assumptions involving fair value calculations to increase the objectivity of measurements and, thus, reduce arbitrary techniques that can favor business results.

Still according to Oliveira, Cruz and Pinheiro (2014), accounting choices are expected to result in transparent, reliable, and relevant accounting statements, resulting in more reliable information for users. To do this, it is necessary to review some techniques for calculating the fair value conducted by companies, as considerable progress in these accounting practices is necessary.

In addition, Brizolla (2014) conducted research on the influence of economic-financial indicators on the evaluation of biological assets at fair value in publicly traded companies. The author concluded that the size of the company and the return on assets had a greater influence on the evaluation of biological assets: the larger the company, the better the disclosure of biological assets; however, when the asset return increases, the level of asset disclosure decreases. Regarding the return on equity and the percentage of biological assets, it was concluded that these indices do not have a significant influence on the disclosure of companies' biological assets.

Bastos and Dias (2015) researched the ways of measuring, recognizing, and disclosing biological assets in companies listed on B3, critically analyzing the methods used based on CPC 29. The authors analyzed 63 companies listed on B3 and identified that 8 companies recognized biological assets in their financial statements. Within these 8 companies, excluding the company Vale, which only disclosed its biological assets in the quarterly information, 100% of the companies presented information in the balance sheet, 71% in other statements, and 100% in explanatory notes.

The authors Brighenti and Leite (2015) observed the impact of the recognition of biological assets on the stock prices of Brazilian companies in the period 2010–2013. The information in companies' financial statements undergoes variations, which influence stockholders' opinions and, consequently, the stock price. They analyzed stock prices after 3 and 6 months of the release of financial reports and concluded that the stock price was not influenced by the recognition of biological assets. After 6 months, recognition does not have a significant influence on stock prices.

Macedo, Campagnoni and Rover (2015) researched the level of CPC 29 compliance in Brazilian companies that have biological assets. It was found nineteen companies listed on B3 that recognize biological assets in the financial statements. The largest number of companies with biological assets was found in the food and beverage sector. It was observed that there was an increase of 17.68 percentage points in the level of compliance of companies with the CPC 29 pronouncement.

Finally, a study conducted in Australia provided empirical evidence on the relevance of fair value accounting, examining the predictive power of the fair value of biological assets for future cash flows. The research database was made with all agribusinesses listed in Australia. The results indicated that the fair value of biological assets, with or without an active market, does not provide incremental predictive power for future cash flows (Colly, Wright & Evans 2018).

The research in this section shows us that the disclosure of biological assets may not fully meet the demand of investors, who value neutral and quality information. In this sense, it is necessary to study theories that can explain the actions of managers, which can be guided by different incentives, often misaligned with quality accounting information and without bias.

2.4 Theory of the Firm

Michael C. Jensen and William H. Meckling (1976) developed the theory of the ownership of the firm structure, integrating elements from agency theory, property rights theory, and finance theory to explain conflicts of interest in relation to organizations and the costs of each participant in the corporate relationship.

The right to property helps explain how costs and rewards will be distributed among participants in any organization. Generally, the determination of rights is affected by signed contracts (both implicit and explicit), and the behavior of administrators will depend on the nature of these contracts.

In this context, Agency Theory is defined as a contract by which one or more people (principals) hire another person (agent) to make decisions within the organization. According to this theory, if the principal and agent are utility maximizers, there is a great possibility that the agent will not make decisions aimed at the interests of the principal. As a result, the principal can limit these divergences through incentives that aim to prevent irregularities on the part of the agent, which constitutes an agency cost.

On the other hand, the theory of the firm is more comprehensive, as there are a series of conflicts of interest inside and outside the company. The firm: is simply a form of legal fiction that serves as a connection point for contractual relationships and that is also characterized by the existence of divisible residual rights to the organization's assets and cash flows, which can be sold without the permission of other participants in the contract (Jensen & Meckling, 1976).

In this sense, we must take into consideration the consequences of these contractual relationships and how they are affected by decisions external to the organization. In this way, it makes no sense to define what is inside the firm or what is outside it; they are just complex relationships between the legal fiction (firm) and the owners of the work, the inputs of material and capital, and the consumers of the production.

This theory applies to publicly traded companies, whereby the owners hold a stake in the control of the company through shares and entrust the management of the organization to agents through contracts. Furthermore, this organization has other relationships, inside and outside, all permeated by contracts, such as with creditors, for example. Therefore, due to the conflicts that may arise from these relationships, agents may omit information or make decisions that conflict with the interests of the principals and other participants in this complex relationship.

2.5 Research Hypothesis

Many studies indicate that the subjectivity pertaining to fair value can highlight fictitious gains, reducing the relevance and comparability of information. Furthermore, the number of assumptions used in measuring the fair value of assets without an active market can further increase this subjectivity (Booth & Walker, 2003; Dvorakova, 2006; Williams & Wilmshurst, 2009; Fisher, Mortensen & Webber, 2010; Oliveira; Cruz & Pinheiro, 2014). The literature on biological assets also reveals low quality disclosure (Silva Figueira, Pereira, Ribeiro; 2013; Tortoli, Pires, Botelho, Rech; 2019), with the possibility of earnings management practices (Silva *et al.*, 2015). In this case, errors in judgment and the use of inaccurate assumptions may occur, resulting in unreliable accounting information.

Agency Theory can explain management actions that result in partial or biased information, as the decisions taken by the administrator may conflict with the interests of investors depending on the incentives defined, or not, by the contract. In the Brazilian case, the main conflict occurs between controlling and non-controlling shareholders due to the strong concentration of ownership and control (Nassif & Souza, 2013). Furthermore, in the absence of an active market, subjectivism can be used in measuring the fair value of biological assets to reach market estimates, as management can be pressured. This practice can be explained by Agency Theory, which predicts misaligned behavior between agent and principal. In this context, it is highlighted that accounting choices in measuring biological assets can be associated with the profile of the accounting professional (Cavalheiro, Gimenes, Binotto, 2019), that is, accounting practice can be influenced by the characteristics of the individual.

Furthermore, a study conducted by the risk rating agency S&P Global Ratings shows that there has been a worsening trend in the recovery of defaults by Brazilian companies since the year

2000, with emphasis on the sugar-energy sector. The sector's debt peak occurred in the 2015/16 harvest, compromising the financial health of the sugar-energy sector (NovaCana, 2018). The greater indebtedness of sugar and alcohol mills, combined with management incentives, can lead to the use of accounting practices to achieve a specific objective, such as meeting covenants or simply meeting analysts' expectations in relation to the company's performance.

In short, the possibility of errors in judgment and the use of imprecise assumptions, the possibility of managing results, the low quality of disclosure, and the sector's greater debt show some problems that may call into question the reliability of the disclosure of biological assets.

Hypothesis 1: accounting disclosure about the models used by sugar and alcohol mills to measure the fair value of sugarcane is not in accordance with CPC 29.

However, Da Paz, Nunes and Sales (2020) believe that measuring sugarcane in the sugar-energy industry in the state of São Paulo can bring more reliability.

Finally, the use of discounted cash flow may leave companies more susceptible to earnings management practices through discretionary accruals due to the unobservable data used for the calculation. Furthermore, evidence of a higher level of earnings management has been observed for companies that do not disclose the discount rate (Silva *et al.*, 2015). In this sense, the methods and assumptions used by organizations to estimate the fair value of biological assets could be investigated to assess the degree of comparability of the information disclosed.

Hypothesis 2: the assumptions disclosed in explanatory notes for calculating fair value are not comparable among mills. The desired comparability is coherent with the conceptual structure: "comparability is the qualitative characteristic that allows users to identify and understand similarities and differences between items" (Brasil, 2019, p. 12). The conceptual framework also clarifies that the reliability of an economic phenomenon depends on the comparability of accounting information. Bringing it to the sugar-energy sector, it can be understood that the accounting disclosure of sugarcane measurement methods could favor a comparative analysis by the various stakeholders.

3 METHODOLOGY

To achieve the objective, sugar and alcohol mills were selected and listed in two associations: Unica (União da Indústria de Cana-de-açúcar) and NovaCanav, totaling 235 mills to research the financial statements for the year 2016, released in 2017. These financial statements were researched at the entities' electronic addresses or requested by telephone and email. In the end, the research included a sample of 13 mills with complete financial statements, as shown in Table 1:

Table 2 - Number of Financial Statements received

	QUANTITY	REPRESENTATION
Mills selected from UNICA and NovaCana	235	100%
(-) Mills with Financial Statements without Explanatory Notes	29	12%
(-) Mills that buy sugarcane from third parties	19	8%
(-) Mills without Financial Statements	173	74%
(=) Full Disclosure	13	6%

Source: elaborated by the authors

In possession of the financial statements of the 13 mills, it was possible to conduct an analysis of the financial statements, such as collecting data relating to biological assets, total assets, profit, explanatory notes, and variations in the fair value of biological assets. In the explanatory notes, data was collected on the measurement type of sugarcane (bearing plant and agricultural product), as shown in Table 4, and the assumptions used by the entities to calculate the fair value of the standing sugarcane, as shown in Table 5.

From this, some items required by the fair value standard, CPC 46, were selected. It was also verified whether the mills highlighted these items in their explanatory notes (Table 6), with the intention of verifying whether there is a low level of information in the financial statements of the mills. In addition, we collected sugarcane standing values, including variations in the fair value of each mill, to compare

with assets and profit. A ranking of disclosure assumptions was also developed (table 5) to verify which mills have the best disclosure in terms of measuring the fair value of standing sugarcane, in addition to verifying the differences in terms of disclosure.

4 ANALYSIS OF RESULTS

4.1 Descriptive Statistics

Initially, an analysis of the main accounts was conducted to investigate the representativeness of investments in biological assets among the mills, as shown in Table 3:

Table 3 - Analysis of the Value of Biological Assets and their variations on Total Assets and Profit for the fiscal year of 2016

	BA VALUE - CURRENT IN MILLIONS	BA VALUE - NON-CURRENT ASSETS IN MILLIONS	FAIR VALUE VARIATION IN MILLIONS	TOTAL ASSETS IN MILLIONS	NET PROFIT IN MILLIONS	BA/ TOTAL ASSETS	VARIATION FAIR VALUE/ PROFIT
São Martinho	415,854	-	25,667	8.194	168,483	5%	15%
São Manoel Mill	89,735	-	7,250	1.998	70,143	4%	10%
Raízen	1.276	-	-	31.475	3.062	4%	-
Grupo Balbo	96,695	-	32,876	1.309	6,332	7%	519%
Odebrecht Agroindustrial	478,296	-	125,005	3.796	-1.391	13%	-9%
Biosev	530,540	-	-	4.887	-600,132	11%	-
Vale do Tijuco Mill – CMAA	68,663	-	16,237	949,173	-8,895	7%	-183%
Araporã Bioenergia	77,510	-	21,428	484,658	3,455	16%	620%
BP Biocombustíveis	-	913,110	-192,827	3.094	-128,742	30%	150%
Goiasa Mill - Grupo Construcap	127,429	-	31,159	829,605	158,722	15%	20%
Serranópolis Mill	-	24,464	-	123,002	16,985	20%	-

	BA VALUE - CURRENT IN MILLIONS	BA VALUE - NON-CURRENT ASSETS IN MILLIONS	FAIR VALUE VARIATION IN MILLIONS	TOTAL ASSETS IN MILLIONS	NET PROFIT IN MILLIONS	BA/ TOTAL ASSETS	VARIATION FAIR VALUE/ PROFIT
Sonora Mill	70,012	-	9,571	452,430	-8,634	15%	-111%
Paineiras Mill	2,576	5,927	0,661	357,202	2,223	1%	30%
Average	293,966	314,500	7,702	4.457	103,918	11%	106%
Standard Deviation	375,61	518,49	78,73	8442,13	983,44	0,079	2,605
Minimum	2,576	5,927	-192,827	123,002	-1.391	1%	-183%
Maximum	1276,321	913,11	125,005	31475,002	3.062	30%	620%

Source: Mills Financial Statements. BA = Biological Assets.

The representativeness of biological assets over the total assets of the plants in 2016 had an average of 11%. The representativeness of the variation in fair value over profit is high, with an average of 106% for the mills, with a lot of disparity due to the heterogeneity of the companies analyzed. This can be seen by the minimum and maximum values of total assets.

The effects caused by changes in fair value can be observed in some plants on this list. The Balbo group, CMAA Mill, Araporã, and Sonora had large variations in fair value, which may have influenced the results of these mills. Furthermore, two of them (Grupo Balbo and CMAA Mill) showed only four assumptions for calculating fair value out of a total of 15.

In these cases, the variation in fair value is so relevant that the result for the period can be influenced, i.e., increase the company's profitability. The literature on biological assets also comments on the

possibility of accounting practices being influenced by management incentives, resulting in lower quality of the financial statements (Oliveira, Cruz & Pinheiro, 2014; Silva, Nardi & Ribeiro 2015). In this sense, the information may lose credibility due to the subjectivity inherent in the measurement of biological assets at fair value. Furthermore, the limited number of assumptions disclosed regarding fair value may contribute to the low level of information, resulting in greater asymmetry of information.

Finally, debt and recent defaults in the sugar-energy sector (NovaCana, 2018) may cause more concerns for investors or creditors who have their resources invested in these plants.

4.2 Results Analysis

All mills, except Serranópolis, measured sugarcane at fair value. The sample summary is found in Table 4:

Table 4 – Type of measurement used by the mills

MILLS	BIOLOGICAL ASSETS – BEARER PLANTS	AGRICULTURAL PRODUCTS – STANDING SUGARCANE
São Martinho	Cost	Fair value
São Manoel Mill	Cost	Fair value
Raízen	Cost	Fair value
Grupo Balbo	Cost	Fair value
Odebrecht Agroindustrial	Cost	Fair value
Biosev	Cost	Fair value
Vale do Tijuco Mill - CMAA	Cost	Fair value
Araporã Bioenergia	Cost	Fair value
BP Biocombustíveis	Cost	Fair value
Goiasa Mill - Grupo Construcap	Cost	Fair value
Serranópolis Mill	Cost	Cost
Sonora Mill	Cost	Fair value
Paineiras Mill	Cost	Fair value

Note: The column "Biological Assets – Bearing Plant" refers to sugarcane ratoon.

Source: prepared by the author based on the financial statements of the 13 companies.

The bearer plants, present in the second column of Table 4, were accounted for based on historical costs, similar to a component of fixed assets. Still in Table 4, it is observed that standing sugarcane was accounted for at fair value, except for Serranópolis Mill, which accounted for it based on cost. The mill chose not to record its biological assets and agricultural products at fair value because it understood that reliable measurement procedures would require excessive costs and efforts, which is provided for in CPC 29, item 30: – there is an assumption that the fair value of biological assets can be measured reliably. However, this premise can be rejected if a biological asset is not quoted on an active market and the alternatives for measuring it are not clearly reliable. In such situations, the biological asset can be measured at cost, except for any accumulated depreciation and irrecoverable loss.

For the other mills, standing sugarcane is measured at fair value, but as there is no quotation on an active market for growing sugarcane, the companies apply level 3 of the fair value hierarchy, provided for in CPC 46. To this end, the mills can estimate this value based on unobservable data using assumptions, such as the discount rate.

Additionally, to verify whether the mills were calculating the fair value of sugarcane in accordance with CPC 46, some items of this standard were verified in the financial statements. First, it was checked whether the mills describe the evaluation techniques for calculating the value (item 91A), such as discounted cash flow. Consulting the explanatory notes for biological assets, it was verified whether the reconciliation of the initial and final balances of the fair value of biological assets, for the purposes of recognizing losses or gains, was evident (item 93E). It was also verified whether there was disclosure of purchases, sales, issuing, and settlements (item 93E), in addition to disclosure of the risks of biological assets (item 94).

Item 93D of the standard shows whether the mills informed the assumptions used to calculate the value. However, when analyzing the checklist, we can see that each mill used a different number of assumptions; that is, this item shows the number of assumptions used, which can influence the comparison of the fair value of biological assets. The analyzed items of CPC 46 can be seen in Table 5.

Table 5 - Verification of items in the CPC 46

MILL	METHOD	91 A	93 D	93 E	93 E III	94
São Martinho	Discounted Cash Flow	Yes	Yes/9	Yes	Yes	Yes
Usina São Manoel	Discounted Cash Flow	Yes	Yes/5	Yes	Yes	Yes
Raízen	Discounted Cash Flow at present value	Yes	Yes/4	Yes	Não	Yes
Grupo Balbo	Future Discounted Cash Flow	Yes	Yes/4	Yes	Yes	No
Odebrecht Agroindústria	Discounted Cash Flow	Yes	Yes/5	Yes	Yes	Yes
Biosev	Discounted Cash Flow	Yes	Yes/5	Yes	Yes	Yes
Usina Vale do Tijuco - CMAA	Discounted Cash Flow	Yes	Yes/4	Yes	Yes	Yes
Araporã Bioenergia	Discounted Cash Flow	Yes	Yes/8	Yes	Yes	Yes
BP Biocombustíveis	Discounted Cash Flow	Yes	Yes/6	Yes	Yes	Yes
Usina Goiás - Grupo Construcap	Discounted Cash Flow	Yes	Yes/6	Yes	No	No
Serranópolis Mill	Discounted Cash Flow	Yes	No/0	Yes	No	Yes
Sonora Mill	Discounted Cash Flow	Yes	Yes/8	Yes	No	No
Paineiras Mill	Discounted Cash Flow	Yes	Yes/5	Yes	Yes	Yes

Note: The table was created to verify whether these CPC 46 items were met by the mills. Item 91A refers to a description of the Assessment Techniques and information used to develop the measurements. Item 93D contains the quantity of inputs (assumptions) used per mill, fair value/Quantity. Item 93E is the reconciliation of the initial and final balances of the fair value of BAs, recognizing gains and losses in results. Item 93E III refers to the disclosure of Purchases, Sales, issuing, and Settlements. Item 94 refers to the risks of Biological Assets.

All plants reported the measurement techniques used to calculate fair value, as established in item 91 of CPC 46, and the reconciliation of the initial and final balances of the biological assets account, as per item 93E of the standard.

Regarding item 93E III (reconciliation of initial and final balances) of Table 6, four mills—Raízen, Goiás Mill, Serranópolis, and Sonora—did not provide this information, and two of these mills (Sonora

and Usina Sonora) and the Baldo group did not disclose the risks of their biological assets.

In this case, most mills calculated the fair value of sugarcane following the standard's guidelines, and the only difference among them was the number of assumptions used for the calculation. These results allow the research hypothesis to be accepted, as the dissemination of sugarcane in the sugar and alcohol sector is low; few mills

disclose full explanatory notes. Furthermore, among the companies that publish explanatory notes, there is a difference in the number of assumptions used for the calculation, consistent with Bastos and Dias (2015).

To critically evaluate the application of fair value among companies, a survey of the assumptions considered in the calculation of fair value was conducted. With this survey, a checklist was developed,

which was later used to develop a ranking of premise disclosure. With this ranking, it was possible to identify the most used assumptions in measuring the fair value of biological assets.

This survey allows us to show whether the mills are using these assumptions in the same quantity and in a uniform manner, which contributes to the comparability of fair value measurement. The results are found in Table 6:

Tabela 6 – Ranking de premissas utilizadas no cálculo do valor justo da cana

ASSUMPTIONS	N° DE DISCLOSURE	%
TRS	12	92%
Estimated production	10	77%
Discount rate	10	77%
Value of kg of TRS	9	69%
Operational costs, cutting, loading and transportation of sugarcane	7	54%
Estimated harvest area	7	54%
Cash Inflow	3	23%
Sugarcane futures market price	3	23%
Future price of sugar and ethanol	3	23%
Cash outflows	3	23%
Cost for future cultural treatments	3	23%
Cost for sugarcane processing	2	15%
Lease costs and taxes levied on positive cash flow	2	15%
Cost of Land Rent	1	8%
Price per ton of sugarcane	1	8%

Note: Number of assumptions used by mills in measuring the fair value of sugarcane.

Source: Explanatory notes for the 13 mills with complete financial statements. Elaborated by the authors.

To calculate the fair value of sugarcane, it was verified that the TRS (Total Recoverable Sugar) of sugarcane was the most disclosed among these plants; a total of 92% of them demonstrated this premise. The TRS is important for measurement, as it shows the quality of the sugarcane, that is, the quantity of sugar or ethanol that will be produced. The higher the TRS, the greater the quantity of products produced for one ton of sugarcane. For this reason, most mills consider this premise in their calculations.

The TRS is calculated using data relating to precipitation, temperature, age of the sugarcane field, soil, varieties, and management. This calculation provides predictions of sugarcane productivity in ATR (Scarpari, 2002). The least disclosed assumptions were: lease costs and taxes levied on positive cash flow; land rental cost; and cost for future cultural treatments.

In Table 6, it can be seen that the low disclosure of assumptions may compromise the comparability of information, as there is no uniformity in the number of assumptions disclosed by the mills to calculate the fair value. In this case, it could be a more complex task for an analyst to replicate the model for calculating this value and even make comparisons among mills due to the different assumptions used. One of the consequences of the lack of comparability is the failure to present an economic phenomenon in a reliable manner, which can reduce the reliability of accounting information.

It is noteworthy that the conceptual structure allows the reporting entity to include additional information, as long as it is more useful for a specific set of users. In this case, analysts and other users who follow the sugar and alcohol sector could be better informed with clarifications about sugarcane valuation models. The low level of

disclosure found by this work shows the need for greater discussion regarding specific guidelines from the regulator for measuring biological assets. It can be speculated that agency problems influence decision-making regarding disclosures, causing a decrease in the comparability of information. Finally, sugarcane assessment can follow other methodologies involving economic, accounting, and agronomic aspects, such as Cavalheiro *et al.* (2019), who used agro-meteorological modeling to measure sugarcane, generating improvements in the quality of the information.

5 FINAL CONSIDERATIONS

Due to the importance of the sugar-alcohol sector and the difficulty in measuring the fair value of biological assets without an active market, this research aimed to study the models used by sugar-alcohol mills to calculate fair value and verify whether they are following the standard when accounting and disclosing standing sugarcane in their financial reports.

Of the total number of mills associated with Única and Nova-Cana, 13 mills were analyzed with complete financial statements, which account for standing sugarcane as a biological asset. Twelve mills accounted for sugarcane at fair value, and the Serranópolis Mill recorded it at historical cost, justifying it based on the standard.

The assumption most used by these mills to calculate fair value was the TRS (Total Recoverable Sugar), and there was a significant difference in the number of assumptions disclosed by each mill. The mill that used the most assumptions to calculate fair value was São Martinho, with a total of 9 out of 15 assumptions that could be disclosed.

These results suggest that the level of disclosure in the sector is low, since out of 235 mills it was only possible to analyze 13 complete financial statements. With the complete financial statements, it was

possible to investigate the difference in the number of assumptions made by each mill, which compromises the comparability of accounting information.

Furthermore, with the analysis conducted with the financial statements of the 13 mills, large variations in the fair value of sugarcane were observed in some of them. Considering that debt and defaults are growing in the sector (NovaCana 2018), that the cost of debt may be higher for companies that use fair value as a measurement method (Daily & Skaife, 2016), and that managers are driven by incentives (Jensen & Meckling, 1976), the subjectivity inherent to accounting can be used to influence the result in order to meet market and bank expectations.

In this case, there is evidence that biological assets, in this case sugarcane, can be used by plants to manage results and improve the company's numbers. Therefore, to increase the credibility of the information, the disclosure of the fair value of biological assets would be disclosed with fewer assumptions, using the subjectivity inherent to this calculation, reducing the quality of disclosure.

Furthermore, many mills only disclose explanatory notes to partners, which was a limitation to the research, as few mills responded to the requests sent. For future research, studies on uniform sugarcane calculation models are recommended, which would increase the comparability of information among companies in the sector.

However, there was no mention in the audit reports of any divergence in the measurement of the biological assets of the mills studied, which could corroborate the hypothesis raised by this article.

The research was conducted by analyzing the financial statements. For future work, other methods can be used, such as estimating the relevance of information in practical terms and studying the mathematical models used by the mills. Furthermore, a multiple-case study with interviews is suggested to explain the choice of certain assumptions when applying fair value to biological assets.

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¹ In 2001, IAS 41 Agriculture was issued, which corresponds to CPC 29 in Brazil, which provides accounting treatment for companies operating in the agricultural sector (Nakao *et al.* 2017).

² Sugarcane that will be harvested in one of the harvests; this is equivalent to a period of 12 to 18 months, depending on the planting time.

Emerson de Souza Moura / Ricardo Luiz Menezes da Silva / Paula Carolina Ciampaglia Nardi

ⁱⁱⁱ An active market is one in which all of the following conditions exist: (a) the items traded within the market are homogeneous; (b) buyers and sellers willing to negotiate can normally be found at any time; and (c) prices are available to the public (CPC 29, item 8).

^{iv} UNICA (Union of the Sugarcane Industry) is the entity that represents the main sugar, ethanol (fuel alcohol), and bioelectricity producing units in the Center-South region of Brazil, mainly in the state of São Paulo (UNICA, 2020).

^v Sugar-energy sector communication vehicle (NovaCana, 2020).