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Impact of Amendments to IAS 16 and IAS 41 on the Economic-Financial Position of Brazilian Sugar-Energy Companies

ABSTRACT

Objective: To identify the impact of the amendments to IAS 16 and IAS 41 on the economic and financial position of Brazilian sugar-energy companies, in the transition period from 2015 to 2017.

Method: In a sample of 64 companies, the inverse of the Gray Comparability index was used to measure the impact and the paired Wilcoxon test to identify the significance.

Originality/Relevance: This new accounting policy divided the plant and production into two assets with different measurement models. In the process of accounting for sugarcane crops, the sugarcane ratoon, considered a bearer plant, is now measured at historical cost and classified as fixed assets while standing cane continues to be measured by fair value but reported in current assets.

Results: Retrospective accounting adjustments significantly impacted most of the variables analyzed. They improved current liquidity and asset turnover and negatively impacted third-party capital participation, fixed assets, general liquidity, and return on equity. The debt composition, quick liquidity, net margin, return on investments, and the operating cycle remained relatively stable.

Theoretical/Methodological contributions: The study shows that the amendments to IAS 16 and IAS 41 imply the loss of comparability of accounting numbers and economic-financial indicators concerning previous periods. Besides, considering the peculiarities of sugarcane crops, the study provides evidence that contributes to discussions on measuring the fair value of standing cane.

Keywords: Biological Assets; Bearer Plants; Comparability; Sugarcane.

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1 INTRODUCTION

Bearer plants are classified in biological production assets, such as fruit trees or sugarcane ratoons. These plants are kept for production, have remote chances of being sold (except in the condition of scrap), support growth, and sustain regular crops of consumable biological assets or agricultural products, such as the fruit of the orange tree or the standing sugarcane in the field (International Accounting Standard - IAS 41 – Agriculture).

Due to the bearer plants' particular characteristics, a discussion arises about which method would be the most suitable for its measurement. The existence of an active market favors the measurement of biological assets at fair value, but, due to questions about the existence of an active market for biological production assets, some studies (see Bozzolan, Laghi & Mattei, 2016; Damian, Manoiu, Bonaci & Strouhal, 2014; Huffman, 2018) concluded that it is inappropriate to measure bearer plants at fair value.

On this topic, the International Accounting Standards Board (IASB) interviewed, in 2011, several interested parties in the accounting numbers generated by the measurement of bearer plants. Those interviewed by the IASB argued that bearer plants have similar characteristics of machines and equipment, as they are maintained to produce and with a remote possibility of sales, resulting in the absence of an active market and making measuring fair value costly and complex. Also, respondents claimed that bearer plants measured at fair value reflect greater volatility in earnings and, for this reason, investors, analysts, and other stakeholders eliminate the effects of changes in the fair value of such assets to analyze earnings or loss reported by companies (International Financial Reporting Standards - IFRS Foundation, 2014).

Such reasons convinced the IASB to change the requirements for accounting of bearer plants, as it was agreed that the measurement of these biological assets at fair value did not portray the companies' actual economic and financial situation, besides not directly influencing their future cash flows. Thus, in July 2014, the agency issued amendments to IAS 16 - Property, Plant and Equipment and IAS 41, changing the accounting treatment applied to bearer plants.

The amendments divided plant and production into two assets, with different measurement models. With this new configuration, as of January 2016, bearer plants are subject to the requirements of IAS 16 and accounted for at historical cost as other fixed assets, while consumable biological assets, which are born and grow in these bearer plants, started to be shown in current assets, but maintaining the measurement at fair value (IAS 41). Such amendments gained space in discussions about the measurement of bearer plants and aroused interest in the development of studies around the world (Bohušová & Svoboda; 2017a, 2017b; Huffman, 2018; Penha, Nascimento, Batista & Sales, 2018; Queluz, Silva & Nardi, 2019; Svoboda & Bohušová, 2017).

In this regard, how biological assets are measured affects companies' financial position and performance in the agricultural sector (Bohušová & Svoboda, 2017a). Thus, the new measurement criteria for bearer plants can impact companies' liquidity, capital structure, and profitability indicators, especially those that exploit sugarcane (Oliveira, Silva, Prado & Barbosa, 2018). However, there is no consensus among accounting professionals on the impacts of IAS 41 on the sugar-energy sector (Cavalheiro, Gimenes & Binotto, 2018).

Because of the above, this study seeks to answer the following question: what is the impact of the amendments to IAS 16 and IAS 41 on companies' economic and financial position in the Brazilian sugar-energy sector? Therefore, considering that the analysis of a company's economic-financial performance must be based on quality and comparable information in a historical series, the objective of this study is to identify the impact of the

amendments to IAS 16 and IAS 41 on the economic-financial position of Brazilian sugar-energy companies, in the transition period from 2015 to 2017. For such, the accounting balances potentially affected by the new practice of accounting for bearer plants were analyzed, along with the effects on the comparability of the leading economic-financial indicators of the sugar-energy companies.

Sugarcane is an essential biological asset for agribusiness. The agricultural product harvested from this rural activity is used as a raw material in sugar and ethanol production, and its by-products being used in the cogeneration of electricity. According to the Brazilian Sugarcane Industry Association (UNICA, 2019), the sugar-energy chain's gross amount in the 2018/2019 harvest is equivalent to 2% of the Brazilian Gross Domestic Product (GDP). According to the organization, Brazil is the largest producer and exporter of sugar (about 20% of global production and 45% of the world market) and the second-largest producer and exporter of ethanol, and the electricity generated by the sector supplies approximately 11 million households in the country.

The sugar-energy sector occupies a strategic position among Brazilian agribusiness sectors, with emphasis on socioeconomic, technological, and production aspects, which has attracted the attention of national and international investors (Siqueira, Shikida & Cardoso, 2017). In addition, the sector has been stimulated by the National Biofuels Policy (RenovaBio), which grants Decarbonization Credits (CBIOs) to sugar-energy companies as these entities improve efficiency in the production of biofuels while preserving the environment. CBIOs are bonds that can be traded in the financial market, which has aroused investors' interest (Grassi & Pereira, 2019). Thus, it is necessary to obtain evidence of the impact of the new accounting standards for bearer plants on sugar-energy companies, seeking to minimize the credit risk on investors and creditors in the sector.

This study contributes to the debate on the measurement methods of bearer plants by demonstrating that the amendments to IAS 16 and IAS 41 impacted the accounting balances analyzed, which implies the loss of comparability of accounting numbers and economic-financial indicators in historical analysis. Besides, considering the particularities inherent to sugarcane crops, the study contributes to the discussions on measuring the fair value of standing sugarcane.

This study is organized into six sections, including this introduction. In the second section, the theoretical approach is exposed. The method is outlined in the third section. The study results are presented in the fourth section, and they are analyzed and discussed in the fifth section. In the sixth, final considerations and suggestions for future research are presented.

2 THEORETICAL APPROACH

This framework highlights the theoretical-empirical discussion of biological assets and studies on the measurement of bearer plants.

Due to the constant biological transformations and the assumption of an active market's existence, the biological asset must be measured at fair value less costs to sell. The fair value is obtained at a price paid in selling an asset in an unforced transaction between knowledgeable market participants on the measurement date. If the fair value cannot be reliably measured, the biological asset must be measured at historical cost less accumulated depreciation and impairment losses (IAS 41).

The historical cost as the valuation has its advantages sustained in the reliability ensured through the ability to verify the accounting records that are based on past events, which facilitates the verification process. However, this method loses informational capacity

over time since it does not recognize the biological transformation process inherent in biological assets (Rech & Pereira, 2012).

It is vital to note that, before the adoption of IAS 41, all biological assets were measured using the cost method. This method records the financial sacrifice for the acquisition or construction of an asset. However, since 2003 in some European countries and since 2010 in Brazil, IAS 41 inserted the fair value measurement model for biological assets, establishing a new way of accounting for these assets, emphasizing the primacy of substance over form.

The change from a rule-based accounting system to a principle-based accounting system is one of the main benefits brought by IASB standards, as it recognizes the primacy of accounting substance over legal form, in which the principle of true and fair view stands out against accounting standards (Iudícibus & Martins, 2015). Thus, fair value is considered more than a measurement method; it is an approach of accounting practice that portrays the economic way of measuring capital, which manifests the principle of economic substance over the legal form when reporting the reality of a given economic phenomenon (Demaria & Dufour, 2007).

IAS 41 was issued to standardize accounting practices applied in the agricultural sector and improve the comparability of financial statements (Aryanto, 2011). There was a rebuttable assumption that fair value could be determined for all agricultural assets (Elad, 2004). However, the literature points out that IAS 41 did not produce the expected effects and, still, discussions about the advantages and disadvantages of measuring fair value versus historical cost are frequent in academia. For example, Elad and Herbohn (2011) warned that a comprehensive adoption of IAS 41 with the use of fair value and a significant departure from measurement at historical cost would cause a series of practical and theoretical problems that would affect its widespread adoption.

The lack of consensus on the measurement at the fair value of bearer plants has led to theoretical and practical discussions. Aryanto (2011) claims that recognizing gains or losses from bearer plants can lead to misleading information because the revenue associated with these assets will never be achieved. In this regard, Huffman (2018) concludes that the earnings resulting from the measurement of bearer plants at fair value are significantly less relevant.

These and other theoretical and empirical discussions generated a consensus that the measurement of bearer plants at fair value did not portray companies' actual economic and financial situation. Hence, in July 2014, the IASB issued amendments to IAS 16 and IAS 41, changing the accounting policy applied to the bearer plants.

These amendments' primary emphasis was to consider the distinction between consumable assets and bearer assets, notably bearer plants. This distinction approximates how these assets generate value for the company. While consumable biological assets can be traded on the market, biological bearer assets are held for use and not for sale (Huffman, 2018).

Such amendments have reduced subjectivity in the bearer plants measurement (Svoboda & Bohušová, 2017). They are positive, for the proposed measurement model considers the differences between consumable and bearer biological assets, reflecting the true and fair view of agricultural assets, which simplifies applying rules in practice (Bohušová & Svoboda, 2017b).

In Brazil, companies that exploit sugarcane were primarily responsible for the reclassifications and restatements of the effects of the new accounting rules for bearer plants (Penha *et al.*, 2018). After adopting this new accounting policy, companies that have sugar cane fields reduced the volatility of the result, which can contribute to earnings estimates by

market analysts and benefit external users in the decision-making process (Queluz *et al.*, 2019).

Nevertheless, it is important to warn that this new standard still allows the measurement at a fair value of the consumable biological assets that grow from the bearer plants, and this can increase the complexity and subjectivity of the measurement, not eliminating the volatility in earnings (Bozzolan *et al.*, 2016). For example, there is still a lack of consensus among accounting professionals working in the Brazilian sugar-energy sector on the impacts of IAS 41. Accountants, defenders of fair value, emphasize the predictive value when sugarcane is measured by the Discounted Cash Flow (DCF). At the same time, critics claim that the calculation of fair value is complex and surrounded by judgments, results in less reliability, does not increase information capacity and relevance for decision-making and is generally not used by investors. Thus, more conservative accounting professionals believe that it is better to use the cost method to measure sugarcane (Cavalheiro *et al.*, 2018).

Regarding the uncertainties in the bearer plants measurement, further clarification is needed before relying on the benefits of measuring biological assets at fair value (Damian *et al.*, 2014). Along these lines, in order to review the criterion for measuring standing sugarcane at fair value, further discussions on the subject are necessary (Silva & Nardi, 2019).

Thus, considering that how biological assets are measured affects the financial position and performance of companies in the agricultural sector (Bohušová & Svoboda, 2017a; Oliveira *et al.*, 2018), the new accounting policy applied to the bearer plants may have caused significant changes in the accounting balances retrospectively adjusted in the initial adoption. Therefore, this research's hypothesis is the following: the amendments to IAS 16 and IAS 41 significantly impacted Brazilian sugar-energy companies' economic and financial position in the transition period from 2015 to 2017.

3 METHOD

Following the research objective, this study is exploratory-descriptive. It is an applied, *ex post facto*, quantitative, cross-sectional study, for it analyzes the financial statements closed in the transition period from 2015 to 2017. This period comprises the phase of adoption of the amendments to IAS 16 and IAS 41.

In Brazil, the change in the measurement of bearer plants was implemented for annual periods beginning on or after January 1, 2016. Following IAS 8 - Accounting Policies Changes in Accounting Estimates and Errors, this accounting policy change must be applied retrospectively to the fiscal year immediately before the adoption period and reported comparatively.

The research population comprises companies that operate in the Brazilian sugar-energy sector that have sugarcane crops. These companies were identified on the websites CanaNova.com <https://www.novacana.com/usinas_brasil>, Brazilian Sugarcane Industry Association (UNICA) <https://www.unica.com.br/sobre-a-unica/associadas/>, Union of Bioenergy Producers (UDOP) <https://www.udop.com.br/index.php?item=associadas_relacao>, and *Imprensa Oficial do Governo do Estado de São Paulo* (Official Press of the Government of São Paulo) <https://www.imprensaoficial.com.br/>.

The data were collected in January 2020. The financial statements and explanatory notes of 82 companies were obtained: 65 from São Paulo, 7 from Paraná, 5 from Minas Gerais, 3 from Goiás, and 2 from Mato Grosso do Sul. Of these, 16 companies made the data available for free access on their respective websites; other 58 companies released their financial statements through the *Imprensa Oficial do Governo do Estado de São Paulo*. After

sending an e-mail with a letter to present the research, accompanied by contact via telephone to those responsible for the financial statements, five companies sent the data by e-mail, and three others provided access with login and password to download the data on the investor relations webpage. The selection criteria for the final sample are shown in Table 1.

Table 1
Selection criteria of the research sample

Criteria	SP	PR	MG	GO	MS	Total
Initial Observation	**65**	**7**	**5**	**3**	**2**	**82**
(-) Balances in Biological Assets not reported	12	1				13
(-) Change in the measurement criteria of bearer plants not retrospectively presented	4				1	5
(=) Final Sample	**49**	**6**	**5**	**3**	**1**	**64**
Publicly held	**3**		**1**			**4**
Privately held	**46**	**6**	**4**	**3**	**1**	**60**

Note: São Paulo (SP); Paraná (PR); Minas Gerais (MG); Goiás (GO); Mato Grosso do Sul (MS).

From the initial observations obtained, documentary research was carried out, in which searches were carried out on the financial statements and explanatory notes for the keywords '*ativo biológico*', '*cana-de-açúcar*', '*planta portadora*', 'bearer plants', 'CPC 29,' 'CPC 27', 'IAS 41', and 'IAS 16'. The data were manually tabulated and categorized, which made it possible to standardize the analyzed variables.

Seventeen entities carried out retrospective presentations of information on measurement of bearer plants and consumable biological assets on December 31, 2016 (restated December 31, 2015), 41 on March 31, 2017 (restated March 31, 2016), five on April 30, 2017 (restated April 30, 2016), and one on December 31, 2017 (restated December 31, 2016). The restated fiscal year was used as a basis for comparison with the accounting figures initially reported. The effects of the retrospective presentation were demonstrated in analytical tables in the explanatory notes of these companies, emphasizing the original values, the adjustments, and the values restated in the balance sheet and the income statement. Thus, the amendments to IAS 16 and IAS 41 may have impacted some accounting items related to measuring and reporting the sugarcane ratoon and standing sugarcane.

The comparability of accounting numbers and economic-financial indicators was tested using Gray's index of comparability (GIC), developed by Gray (1980). This index was applied to assess the comparability of accounting principles generally accepted in Brazil and the United States (Lemes & Nogueira, 2008). The inverse of the GIC was used in Brazil during the process of convergence to international accounting standards to identify the impacts on the accounting figures resulting from the first phase of transition to the IFRS standard (Santos & Calixto, 2010) and identifying the impacts of the change from the local standard to accounting practices from the full adoption of IAS/IFRS (Prado & Lemes, 2016).

Gray's methodology has been used to support comparisons between the international standard and local standards in several countries worldwide (Santos & Calixto, 2010). Following Santos and Calixto (2010) and Prado and Lemes (2016), the GCI was adapted to the research objective, according to Equation 1.

$$ICI = 1 + \left(\frac{V_{restated} - V_{original}}{V_{original}}\right) \quad (1)$$

Where:
ICI = Inverse Comparability Index (ICI) in the transition.

$V_{original}$ = Variable calculated following IAS 41, before changes in the measurement rules for bearer plants.

$V_{restated}$ = Variable calculated following the amendments to IAS 16 and IAS 41, after changes in the measurement rules for bearer plants.

ICI values equal to 1 indicate that the adoption of the new standard did not impact the value of the variable analyzed in the retrospective presentation of the financial statements, thus not affecting comparability. Results of the equation of values other than 1 denote that there was a loss of comparability. Values greater than 1 indicate an increase in the variable after accounting adjustments compared to the accounting standard used before the amendments to IAS 16 and IAS 41. Values calculated less than 1 indicate a decrease in the value of the variable.

To better understand the accounting balances' behavior, ten economic and financial indicators were calculated for each company (Table 2) based on the information disclosed before and after adopting the new accounting policy applied to the bearer plants. These indicators are generally used in studies that assess the impacts of changes from local standards to the IFRS standard in the transition period (Prado & Lemes, 2016) and, therefore, were selected to achieve the objective proposed by the study.

Table 2

Economic and financial indicators used in the analysis

Group / Interpretation	Indicator	Composition
Capital Structure (The less, the better)	Third-Party Capital Participation (TPC)	$\frac{TPC}{E}$
	Debt Composition (DC)	$\frac{CLiab}{TPC}$
	Fixed Assets of Equity (FAE)	$\frac{FAE + Inv + Int}{E}$
Liquidity (The higher, the better)	General Liquidity (GL)	$\frac{CA + NCA}{CLiab + NCLiab}$
	Current Liquidity (CL)	$\frac{CA}{CLiab}$
	Quick Liquidity (QL)	$\frac{Aval + QCCA}{CLiab}$
Profitability (The higher, the better)	Net Margin (NM)	$\frac{NEL}{NI}$
	Asset Turnover (AT)	$\frac{NI}{TA}$
	Return on Equity (ROE)	$\frac{NEL}{E}$
	Return on Investment (ROI)	$\frac{NEL}{TA}$

Source: Adapted from Matarazzo (2011) and Prado and Lemes (2016).
Note: Total Asset (TA); Availability (Aval); Quick Cash Convertibility Assets (QCCA); Current Asset (CA), Non-current assets (NCA); Investments (Inv); Fixed Asset of Equity (FAE); Intangible (Int); Current Liabilities (CLiab); Non-current Liabilities (NCL); Third-party Capital (TPC); Equity or unsecured liability (E); Net Income (NI); and Net Earnings or Loss (NEL).

Besides, Oliveira *et al.* (2018) recommend studying the impact of changes in the rules applied to bearer plants in the operational cycle of sugar-energy companies. For Dechow and Dichev (2002), the company's Operating Cycle (OCYCLE) is calculated based on Equation 2.

$$OCYCLE = \left(\left(\frac{360}{\left(\frac{Sales_t}{Accounts\ receivable\ mid} \right)} \right) + \left(\frac{360}{\left(\frac{CPS_t}{Average\ inventory} \right)} \right) \right) \quad (2)$$

Where $Sales_t$ are represented by net revenue from operations in period *t*; the CPS_t is the costs of products sold in period *t*; the $Accounts\ receivable\ mid$ are obtained by averaging short-term accounts receivable from period *t*-1 and period *t*; and the $Average\ inventory$ is calculated by the average of the inventories of period *t*-1 and period *t*.

For preliminary analysis of the data, descriptive statistics (frequency, mean, median, standard deviation, minimum and maximum) were calculated. Then, the Shapiro-Wilk test was performed, in which the variables of interest were not normally distributed. Thus, following the methodology used by Prado and Lemes (2016), the paired non-parametric Wilcoxon test was applied to identify whether the differences in the variables are statistically relevant. The tests were performed using the Free Statistical Software R (R Development Core Team), version 3.3.1.

4 RESULTS

In this section, the results of the study are presented. Initially, Table 3 shows the ICI of the analyzed accounting items. Due to the asymmetry of the data and the high variability of the variables studied, it was decided to analyze these rubrics' behavior by the median and standard deviation. Given that, the accounting balances that suffered the most significant variations between the companies analyzed, with a high standard deviation of the ICI, were deferred tax assets (11.66), net deferred taxes (8.85), and variation in the fair value of biological assets (5.08). It means that the accounting balances with dispersed ICI do not follow a pattern in the analyzed sample.

The Wilcoxon test paired by company revealed that the amendments to IAS 16 and IAS 41 significantly impacted all the accounting balances analyzed, causing different effects in the transition period (Table 3). Retrospective accounting adjustments increased the median ICI of current assets (29%), fixed assets (47%), and deferred tax assets (12%). On the other hand, they reduced the median ICI of total assets (1%), non-current assets (12%), equity (3%), the variation in the fair value of biological assets (59%), operating earnings (9%), deferred tax liabilities (6%), and deferred taxes on the variation in the fair value of biological assets (64%).

According to the *p*-value of the Wilcoxon test paired by company, this set of changes reflected significant differences in almost all economic and financial indicators of the analyzed sugar and energy companies (Table 4). Due to the high ICI dispersion of some economic and financial indicators, the primary analysis was based on the median, although the mean and the standard deviation were also considered in presenting the results.

Except for the quick liquidity, which did not show a significant difference, Table 4 shows that the adjustments generated an increase in the ICI median of third-party capital participation (2%), fixed assets (44%), current liquidity (29%), and asset turnover (1%). In contrast, accounting adjustments reduced the ICI median of general liquidity (1%) and return on equity (6%). Although the Wilcoxon test paired by company revealed a statistically significant difference, the median shows that the debt composition, the operating cycle, the net margin, and the return on investments remained stable. There is a high standard deviation in the ICI of these last two indices, namely, fixed assets and return on equity.

Table 3
ICI of book balances impacted by amendments to IAS 16 and IAS 41

Rubric	n	Mean	Median	Standard Dev.	Minimum	Maximum	Shapiro-Wilk	Wilcoxon
TA	64	0.98	0.99	0.03	0.88	1.06	< 0.001***	< 0.001***
CA	64	1.46	1.29	0.52	0.86	3.56	< 0.001***	< 0.001***
NCA	64	0.90	0.88	0.12	0.65	1.55	< 0.001***	< 0.001***
FA	64	1.50	1.47	0.34	1.00	3.07	< 0.001***	< 0.001***
E	64	1.05	0.97	1.18	-1.87	9.51	< 0.001***	< 0.001***
VFVBA	54	0.27	0.41	5.08	-24.76	13.10	< 0.001***	0.037**
CPS	64	1.01	1.00	0.05	0.88	1.23	< 0.001***	0.017**
OP	64	0.82	0.91	0.54	-0.74	2.72	< 0.001***	0.009***
NEL	64	0.71	1.00	1.43	-7.08	3.67	< 0.001***	0.004***
DTA	29	3.56	1.12	11.66	0.85	64.12	< 0.001***	0.001***
DTL	32	0.94	0.94	0.58	0.17	3.84	< 0.001***	< 0.001***
DT	54	2.12	1.00	8.85	-11.15	64.12	< 0.001***	< 0.001***
DTVFVBA	25	0.22	0.36	1.22	-3.60	1.42	< 0.001***	< 0.001***
CFO	63	0.96	1.00	0.21	0.23	1.87	< 0.001***	0.065*

Note: Significance level (Sig): 10% (*), 5% (**), and 1% (***); Total Asset (TA); Current Asset (CA); Non-current Asset (NCA); Fixed Asset (FA); Equity or unsecured liability (E); Variation in the Fair Value of Biological Assets (VFVBA); Cost of Products Sold (CPS); Operating Earnings before financial income and expenses (OP); Net Earnings or Loss (NEL); Deferred Tax Asset (DTA); Deferred Tax Liability (DTL); Deferred Tax (DT); Deferred Tax on the Variation in the Fair Value of Biological Assets (DTVFVBA); and Cash Flow From Operations (CFO).

Table 4
ICI of economic and financial indicators

Indicators	n	Mean	Median	Standard Dev.	Minimum	Maximum	Shapiro-Wilk	Wilcoxon
TPC	64	0.97	1.02	0.84	-4.75	2.80	< 0.001***	0.006***
DB	64	1.01	1.00	0.01	0.98	1.05	0.002***	0.001***
FAE	64	1.44	1.53	1.26	-6.69	4.23	< 0.001***	< 0.001***
GL	64	0.99	0.99	0.05	0.91	1.28	0.065*	< 0.001***
CL	64	1.46	1.29	0.52	0.86	3.56	< 0.001***	< 0.001***
QL	64	0.99	1.00	0.07	0.48	1.03	< 0.001***	1.000 NS
NM	64	0.72	1.00	1.43	-7.08	3.67	< 0.001***	0.004***
AT	64	1.02	1.01	0.04	0.92	1.14	0.024**	0.002***
ROE	64	0.46	0.94	1.93	-9.66	3.72	< 0.001***	0.005***
ROI	64	0.72	1.00	1.48	-7.26	3.70	< 0.001***	0.003***
OCYCLE	64	0.98	1.00	0.08	0.42	1.13	< 0.001***	0.070*

Note: Significance level (Sig): 10% (*), 5% (**), and 1% (***); NS (not statistically significant); Third-party Capital Participation (TPC); Debt Composition (DC); Fixed Assets of Equity (FAE); General Liquidity (GL); Current Liquidity (CL); Quick Liquidity (QL); Net Margin (NM); Asset Turnover (AT); Return on Equity (ROE); Return on Investments (ROI); and Operating Cycle (OCYCLE).

The result of the ICI median suggests that sugar-energy companies worsened in the participation of third-party capital and the fixed assets, while the debt composition remained stable. Regarding liquidity indicators, although the companies analyzed have shown stability in quick liquidity, the accounting adjustments made in the transition had a negative impact on general liquidity and a positive one on current liquidity.

When analyzing the impacts on the profitability indicators, except for the asset turnover, which improved, and the return on equity, which worsened, the ICI median showed that the analyzed companies presented stability in the net margin and return on investments. It

is noteworthy that these last two indicators were negatively impacted when analyzed by the ICI mean.

Besides, although the operating cycle has been stable by the median, the new measurement configuration of bearer plants impacted this indicator in the transition, at the level of significance of 10%, which can be noted by reducing the average of the ICI.

5 DISCUSSION

As a result of adopting the amendments to IAS 16 and IAS 41, sugarcane ratoons are now measured at cost less depreciation and impairment losses and shown as fixed assets under IAS 16. On the other hand, standing sugarcane continues to be measured at fair value less costs to sell but is now reported in current liquidity. The introduction of these amendments increased current and fixed assets but reduced non-current assets. In addition, as permitted by IAS 16 in the transition, the fair value of sugarcane crops, previously recorded in non-current assets, may have been used as a deemed cost, impacting fixed assets and equity by recognition of the equity valuation adjustment.

The fiscal effect of measuring biological assets at fair value is also a concern for opponents of IAS 41 in several jurisdictions (Elad & Herbohn, 2011). In this regard, retrospective adjustments reduced the balance of deferred taxes on the variation in fair value, which in turn increased deferred tax assets and reduced deferred tax liabilities. Although there was a reduction in the balance of the variation in the fair value of biological assets, the effect on net deferred taxes is inconclusive since the ICI of this accounting balance showed a high standard deviation and a stable median. These findings corroborate Cavalheiro *et al.* (2018), who identified that the impact on deferred income tax was considered by 40.63% of the accounting professionals interviewed in the sugarcane sector. The impact of measuring biological assets at fair value in deferred taxes was also evidenced by Rech, Pereira, and Oliveira (2008) in the livestock activity and by Einsweiller and Fischer (2013) in the pulp and paper companies.

The original report and the restated report indicated that the variation in the realized and unrealized fair value of biological assets is recognized in the companies' annual income. The difference is that, before, the variation in the fair value of sugarcane was recorded in non-current assets and, now, these reflexes are evidenced in current assets. The realized portion comes from the consumption of the portion of the fair value allocated to the harvested /sold cane, which impacts the cost of products sold, while the unrealized portion represents the unharvested cane (standing cane), which is reflected in the current assets. Although these adjustments do not directly affect the cash flow of the companies, the measurement of fair value after the new rule is allowed only for standing cane, which affects the variation in the fair value of biological assets and, consequently, the operating earnings and the cash flow from operations calculated using the indirect method.

Accounting professionals in the sugarcane sector also understand that the choice of methods, techniques, and methodologies impacts the variation in the fair value of biological assets, in the total value of these assets and equity (Cavalheiro *et al.*, 2018). Such results are also in line with those found by Queluz *et al.* (2019), in which they suggest that the reclassification of bearer plants in fixed assets impacted the variation in the fair value of biological assets.

In addition to the accounting adjustments resulting from changes in the measurement criteria of bearer plants, the accounting numbers of sugar-energy companies are subject to the subjective judgment of managers and financial statement preparers, which involve the assumptions for measuring fair value. It was found that the standing cane that grows from the

sugarcane ratoon continues to be measured at fair value, notably by the DCF, which represents the net present value of the projections of income and expenses for the next harvests. It suggests that sugarcane prices, quoted in active markets, are not available at the time of measurement or are not reliable for determining fair value, leading companies in the sector to maintain the use of the DCF.

The use of the DCF method to measure biological assets, in the absence of an active market, requires managers' discretion, which can influence the quality of accounting information (Silva, Nardi & Ribeiro, 2015) and increase the complexity and subjectivity of the process of measuring the fair value of products that grow in bearer plants (Bozzolan *et al*., 2016). Thus, due to the uncertainties inherent in sugarcane crops and the type of estimate, the transition may also have impacted the assumptions used to determine the fair value of standing cane, as determined by the DCF.

Sugarcane crops are subject to operational seasonality according to the vegetative and developmental cycles. Thus, a possible explanation for maintaining the use of DCF is that, at the time of the closing of the financial statements, a significant part of the sugarcane crops are in total biological transformation and, therefore, standing cane is considered immature for harvest, which suggests that there is no active market to determine fair value at this stage of maturity. However, to minimize the adverse effects of measurement, the fair value of biological assets, in the absence of an active market, Cavalheiro, Gimenes, Binotto, and Fietz (2019) propose that the measurement by the DCF should involve an interdisciplinary triangulation that comprises accounting, economical, and agronomical knowledge to obtain the present value of cash flows.

In a general analysis based on those aspects, except for the debt composition (which remained stable), the new accounting policy introduced by the amendments to IAS 16 and IAS 41 impacted the analyzed sugar and energy companies' capital structure. The results suggest that the reflexes on the indebtedness indicators result from the reduction of the net equity or the increase of the unsecured liabilities (the denominator in the composition of the TPC and FAE index), or even of the increase of the fixed assets (the numerator in the calculation of the FAE indicator). These results are similar to those obtained by Oliveira *et al*. (2018), who identified an increase in publicly held companies' FAE.

In the analysis of liquidity indices, there was a relative stability in quick liquidity, since the composition of this indicator does not include accounting items significantly affected by retrospective adjustments. However, the negative impact on general liquidity is explained by reducing non-current assets (which compose the numerator of this indicator). In contrast, the improvement in current liquidity results from the incorporation of standing sugarcane balances in the group of biological assets, which increased current assets (the numerator of this index), corroborating the findings by Oliveira *et al*. (2018).

The impacts on profitability indicators are also aligned with those obtained by Oliveira *et al*. (2018), which suggest that the profitability indices were impacted by adjustments in the rubrics that comprise them, such as a decrease in the balance of total assets (denominator of AT and ROI), a reduction in earnings, or an increase in net loss (the numerator of NM, ROE, and ROI) and the decrease in equity (denominator of ROE).

In addition to the capital structure, liquidity, and profitability, the new standard of accounting for bearer plants produced varied effects on the operating cycle, which includes the period of purchase of raw materials, production, and industrialization of sugarcane and the receivable of sales of sugar, ethanol, and derivatives. At this point, such impacts were probably caused by adjustments in the costs of products sold and in the stocks of sugar, ethanol, and derivative products. While the latter may have undergone adjustments in the fair value of industrialized sugarcane, the former were affected by adjustments in the reasonable

costs of cane harvested and sold or consumed in the industrialization processes of plants and distilleries, as well as by adjustments in depreciation of the sugarcane ratoon.

In summary, retrospective accounting adjustments improved current liquidity and asset turnover and negatively impacted third-party capital participation, fixed assets, general liquidity, and return on equity. In addition, the debt composition, quick liquidity, net margin, return on investments, and the operating cycle remained relatively stable.

Given the above, these findings support the hypothesis that the amendments to IAS 16 and IAS 41 significantly impacted Brazilian sugar-energy companies' economic and financial position in the transition period from 2015 to 2017, which implies the loss of historical comparability of the indicators analyzed concerning previous periods.

6 FINAL CONSIDERATIONS

This study aimed to identify the impact of the amendments to IAS 16 and IAS 41 on Brazilian sugar-energy companies' economic-financial position in the transition period from 2015 to 2017. As a corollary, the accounting adjustments made in the transition significantly impacted the accounting balances analyzed and, consequently, affected the sugar-energy companies' economic-financial position.

Such impacts implied the loss of historical comparability of the economic and financial indicators analyzed concerning previous periods. This evidence confirms the hypothesis raised by the study and contributes to support the analysis of investors and creditors and the decision-making about future investments in the Brazilian sugar-energy sector, as well as credit risk reduction.

The study advances the debate on accounting practices applied in the agricultural sector that manage bearer plants and, therefore, contribute to Brazil's sugarcane sector, as it highlights the impacts of the amendments to IAS 16 and IAS 41 in a sample of both publicly held and privately held companies. This research also contributes to the literature on the impacts generated by adopting new accounting standards, warning that stakeholders must be aware of these situations not to make wrong decisions. In order to advance this theme, future research may analyze the impact of IFRS 16 on the indebtedness of sugar-energy companies, as it establishes a new standard for accounting for lease agreements as of January 1, 2019.

Considering the particularities of sugarcane crops, the study provides evidence that contributes to the discussions on measuring the fair value of standing sugarcane. The results show that, even with the separation of the bearer plants from the consumable biological assets, sugar and energy companies maintained the practice of measuring the fair value of standing cane by the DCF during the transition period.

The results shown here are limited to the sample and the period analyzed and cannot be generalized to the population. Considering the transversal characteristic of the methodology used, this study explored the impact on the comparability of economic and financial indicators. The tests used were paired, that is, each company is in control of itself. Thus, the company's accounting figures are compared according to the reporting in the previous standard and their restatement based on the new accounting practice implemented by the amendments to IAS 41 and IAS 16. From the findings presented here, future studies will be able to raise new hypotheses and move forward on this issue. For example, they may use econometric models to identify the determinants of the different impacts on the indicators in a longitudinal analysis or conduct direct research through a case study to identify the positive and negative effects of this new accounting practice in the sugar-energy sector.

Furthermore, considering that Brazilian sugarcane companies present different financial statement closing dates and, possibly, use different assumptions to calculate the DCF

in measuring the fair value of standing cane, future studies may identify the potential effect of adopting different accounting practices comparability of financial statements between companies, as well as the impact on the volatility of earnings in the sector. Besides, future research should investigate whether the renegotiation of debts, the reduction of operating costs, the use of new technologies, and the adhesion to RenovaBio influence these companies' economic and financial performance.

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Impacto das Emendas às IAS 16 e IAS 41 na Posição Econômico-financeira das Empresas Sucroenergéticas Brasileiras

RESUMO

***Objetivo**: Identificar o impacto das emendas às IAS 16 e IAS 41 na posição econômico-financeira das empresas sucroenergéticas brasileiras, no período de transição de 2015 a 2017.*

***Método:** Em uma amostra de 64 companhias, utilizou-se o inverso do índice de Comparabilidade de Gray para mensurar o impacto e o teste Wilcoxon pareado para identificar a significância.*

***Originalidade/Relevância:** Essa nova política contábil dividiu a planta e a produção em dois ativos, com diferentes modelos de mensuração. No processo de contabilização das lavouras de cana-de-açúcar, a soqueira da cana-de-açúcar, considerada uma planta portadora, passa a ser mensurada pelo custo histórico e classificada como imobilizado, enquanto que a cana em pé continua a ser mensurada pelo valor justo, mas reportada no ativo circulante.*

***Resultados:** Os ajustes contábeis retrospectivos impactaram significativamente a maioria das variáveis analisadas. Melhoraram a liquidez corrente e o giro do ativo, bem como impactaram negativamente a participação de capitais de terceiros, a imobilização do patrimônio líquido, a liquidez geral e o retorno sobre o patrimônio líquido. A composição do endividamento, a liquidez seca, a margem líquida, o retorno sobre investimentos e o ciclo operacional se mantiveram relativamente estáveis.*

***Contribuições teóricas/metodológicas**: O estudo demonstra que as emendas às IAS 16 e IAS 41 implicam a perda de comparabilidade dos números contábeis e dos indicadores econômico-financeiros em relação a períodos anteriores. Além disso, considerando as peculiaridades das lavouras de cana-de-açúcar, o estudo fornece evidências que contribuem com as discussões sobre a mensuração do valor justo da cana em pé.*

***Palavras-chave**: Ativos Biológicos; Plantas Portadoras; Comparabilidade; Cana-de-açúcar.*

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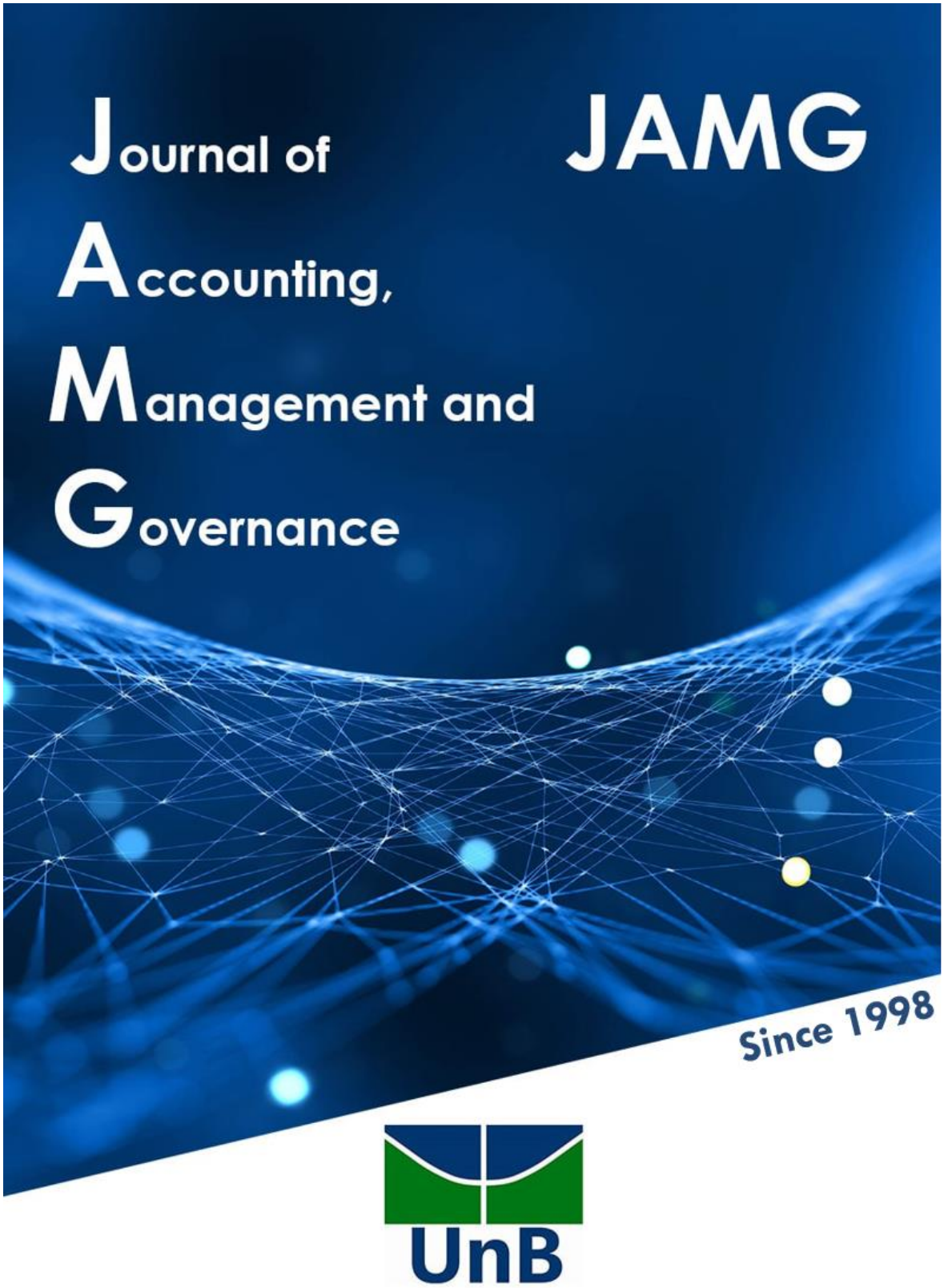
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