Influence of organizational complexity on the measurement of the biological assets of the public listed companies of B3

Influencia de la complejidad organizacional en la medición de los activos biológicos de las compañías abiertas listadas de B3

Influência da complexidade organizacional na mensuração dos ativos biológicos das companhias abertas listadas da B3

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Abstract

Purpose: The research This work aimed to analyze the influence of organizational complexity on the measurement of biological assets in the public companies listed in B3.

Methodology: To do so, a descriptive, documental and quantitative research was carried out by means of a document, with data obtained through the Economática® database and also in the electronic site of B3. The sample consisted of a set of all the companies listed in B3, however, the sample refers only to the companies that have disclosed biological assets of short or long term in their statements in the balance sheet.

Results: The results show that there is an influence of the organizational complexity for the measurement of the biological assets. The multiple regression model explains that 54% of the changes in the measurement records of the companies' total biological assets can be explained by the variable Log_At total according to the predictive model: ($Y = 0.654X_i + 0.281x - 0.115 x_i + e_i$). It was verified that, although regarding the form of measurement of the biological assets, the companies of the sample revealed that 72% carry out the valuation of these based on the criteria of the discounted cash flow.

Contributions of the Study: Considering the normative nature of CPC 29 and its impacts on the criteria of evaluations of biological assets and agricultural products, the research produced a predictive model capable of explaining and clarifying that aspects of organizational complexity influence the classification of the criterion of measurement of total biological assets and the predictive model can be very useful to produce information for decision making on the aspects investigated, besides offering an additional theoretical contribution for the advancement of studies related to the identification of the organizational complexity and the criteria of measurement of the biological assets.

Keywords: Biological assets. Measurement. Organizational complexity.

Resumen

Objetivo: La investigación Este trabajo objetivó analizar verificar la influencia de la complejidad organizacional en la medición de los activos biológicos en las compañías abiertas listadas en la B3.

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Metodología: Para ello, se realizó una investigación descriptiva, documental y cuantitativa, por medio documental, con datos obtenidos por medio de la base de datos Economática® y también en el correo electrónico de B3. La muestra fue constituida por un conjunto de todas las empresas listadas en la B3, sin embargo muestra se refiere sólo a las compañías empresas abiertas que evidenciaron activos biológicos a corto o largo plazo en sus demostraciones en el balance general.

Resultados: Los resultados evidencian que ha influido la complejidad organizacional para la medición de los activos biológicos. El modelo de regresión múltiple, explica que el 54%, de las variaciones en los registros de medición de los activos biológicos totales de las empresas, pueden ser explicados a través de la variable Log_ At total de acuerdo con el modelo predictivo: ($Y = 0,654X_i + 0,281x_i - 0,115 x_i + e_i$). Se verificó si, aunque la forma de medición de los activos biológicos las empresas de la muestra revelaron que el 72% realiza la valoración de éstos con base en los criterios del flujo de caja descontado.

Contribuciones del Estudio: Considerando el carácter normativo del CPC 29 y sus impactos provocados en los criterios de evaluación de los activos biológicos y de los productos agrícolas, la investigación ha producido un modelo predictivo capaz de explicar y aclarar que los aspectos de la complejidad organizacional, ejercen influencia en la forma del clasificación del criterio de medición de los valores los activos biológicos totales pudiendo el modelo predictivo ser muy útil para producir informaciones para la toma de decisión sobre los aspectos investigados, además de ofrecer una contribución adicional teórica para el avance de estudios relacionados con la identificación de la complejidad organizacional y de los criterios de medición de los activos biológicos.

Palabras claves: Activos biológicos. Medición. Complejidad organizacional.

Resumo

Objetivo: A pesquisa objetivou verificar a influência da complexidade organizacional na mensuração dos ativos biológicos das companhias abertas listadas na B3.

Metodologia: Para tal, realizou-se pesquisa descritiva, documental e quantitativa, com dados obtidos por meio da base de dados Economática e também no sítio eletrônico da B3. A amostra foi constituída por um conjunto de companhias abertas que evidenciaram ativos biológicos de curto ou longo prazo no balanço patrimonial.

Resultados: Os resultados evidenciam que há influência da complexidade organizacional para a mensuração dos ativos biológicos. O modelo de regressão múltipla, explica que 54%, das variações nos registros de mensuração dos ativos biológicos totais das empresas, podem ser explicados através da variável Log_ At total de acordo com o modelo preditivo: ($Y= 0,654X_i + 0,281x_i - 0,115x_i + e_i$). Verificou se, ainda que quanto a forma de mensuração dos ativos biológicos as empresas da amostra revelaram que 72% realizam a valoração destes com base nos critérios do fluxo de caixa descontado.

Contribuições do Estudo: Considerando o caráter normativo do CPC 29 e seus impactos provocados nos critérios de avaliações dos ativos biológicos e dos produtos agrícolas, a pesquisa produziu um modelo preditivo capaz de explicar e esclarecer que os aspectos da

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complexidade organizacional, exercem influência na forma de classificação do critério de mensuração dos ativos biológicos totais podendo este modelo ser muito útil para produzir informações para tomada de decisão sobre os aspectos investigados, além de oferecer uma contribuição adicional teórica para o avanço de estudos relacionados a identificação da complexidade organizacional e dos critérios de mensuração dos ativos biológicos.

Palavras-chave: Ativos biológicos. Mensuração. Complexidade organizacional.

1 Introduction

The process of harmonizing accounting standards is a worldwide movement that has been part of the process of accounting evolution since the mid-1970s. However, in Brazil, it was only in 2005 that the Brazilian Accounting Pronouncements Committee (CPC) was formalized. The main purpose of the CPC is to interpret international standards in the Brazilian context and to harmonize them (IFRS in CPC) so that the responsible entities can standardize them and make them available to the market (Wanderley, Da Silva & Leal, 2012).

The convergence process had greater emphasis on the edition of Laws 11,638 / 07 and 11,941 / 09. These laws altered some devices that have already been consolidated in the national reality as the Law 6404/76. Thus, there has been an evolution of the S/A law and the broadening of horizons to interpretations, as well as providing constant benefits and challenges for accounting professionals and for companies and users of information.

In this convergence process, in 2009, CPC 29 Pronouncement was approved, which, through Resolution 596/2009, made it mandatory for all publicly-held companies, as of the year-end closing on December 31, 2010, to use the requirements laid down in CPC 29 (2009) , which brought innovations and challenges mainly in the methodology of accounting for biological assets and agricultural products. In the Brazilian context the agricultural sector is representative, being one of the largest producers and exporter of food in the world. In relation to the national GDP, these values are very representative for the economy, since each R$ 4.00 of GDP, almost R 0.92 comes from Agribusiness (CEPEA, 2015).

The evolution of society, the productive techniques and the means of communication and control have been turning the commercial activities increasingly complex. Such complexity is verified in large business groups through the number of segments in which the company operates. The trend is that larger companies, with a greater number of subsidiaries, as well as performances lenght in the market, greater profitability and indebtedness, are characterized as more complex ones (Silva, & Klann, 2016).

In addition, firms competing in a variety of industries, because of their activity in a complex information and operational environment, tend to disburse high monitoring costs in order to reduce informational asymmetry (Bushman, Chen, Engel, & Smith, 2004).

Researches like in Santos and Rodrigues (2007), Farias (2012), Cetorelli and Goldberg (2014), Silva and Klann (2016) and Farooqi, Harris and Ngo, (2014), on the complexity of companies, has sought to capture their characteristics through variables such as alternate management, financing options, liquidity policies and also management of results through the behavior of managers.

Organizational complexity is a standard measure verified by the sum of all the company's subsidiaries that meet criteria of property, as well as other measures (alternatives), to be evaluated also by the size and years of the company's performance, long-term debt, capital and profitability (Farias, 2012).

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In the context of Agribusiness, the evolution of the sector is characterized by CPC 29 - Biological Assets or Agricultural Products, under the same conditions as IAS 41 - Agriculture, which requires that all companies that exploit such assets must present in the financial statements, valuation by the fair value method. However, the norms suggest that complementary information is evidenced so that the external user can understand the information and carry out its projections based on these numbers (Rech, & Oliveira, 2011).

According to Zanin, Dallastra, Dallastra, Gubiani and Oenning (2012), CPC 29 aims to define the accounting treatment and disclosure rules for biological assets and agricultural products, which should be evaluated at their fair value. IAS 41 provides the definition of fair value, which is the value by which an asset can be exchanged, or a liability settled, between knowledgeable and willing parties in a transaction in which no relationship exists between them.

The Framework for the Preparation and Presentation of Financial Statements (IASB) presents basic concepts that must be used for a correct interpretation of the norms, among them this: fair value; the essence to the form; the spirit and the philosophy of norms; support to the information users and auditors.

However, Britto (2010) explains that by using the methodology of fair value (fair value) to measure biological assets when there is lack of an active market, is used too much subjectivity and other auxiliary methods of financial mathematics (DFC, NPV). Or, the accumulation of historical cost, which facilitates the practice of results management in evaluations of biological assets. This demonstrates the difficulties encountered by managers in complying with the international standards proposed in CPC 29 (2009), which compromises the IFRS objectives of improving the quality of accounting information.

Studies such as Theiss, Utzig, Varela and Beuren (2014), Rech and Oliveria (2011), Zanin et al. (1990), Martins, Machado and Callado (2014), Scherer, Munhoz and Roth (2014), have tried to compare the adoption of CPC 29 (2009) and its adherence, as well as the impacts on the use of fair value as a method of evaluating biological assets in the information evidenced by Agribusiness companies in the Brazilian context.

It has been observed as a research gap, for contributions to the area of accounting knowledge, that several previous studies sought to capture complexity characteristics, consolidating variables capable of characterizing and distinguishing a complex company from a non-complex one; and that complexity is part of the evolution of economies at the global level. Other studies sought to capture the impacts of the use of fair value in companies that have biological assets and agricultural products, however, this research has sought to verify how the characteristics of the complexity of the business groups, is able to influence the way of measuring, through the different criteria of value contempated on (CPC 29 (2009)) and, consequently, interfering with the quality of the accounting information disclosed.

Thus, the research question that guides this study emerges: **what is the influence of organizational complexity on the measurement of biological assets in publicly-held companies listed in B3**. Therefore, the study aims to verify the influence of organizational complexity on the measurement of biological assets in publicly-held companies listed in B3.

The relevance of this study is justified by contributing to the development of research evidencing IFRS, more specifically, biological assets. In this research, the main concepts and how to measure biological assets will be discussed, a subject that is being debated due to the importance of agribusiness in Brazil and the difficulty of its measurement. The agribusiness sector that in the Brazilian context exerts a significant participation in the added value of the national GDP in the last 20 years. In that sense, in 2015, while the national economy in a

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general context shrank, the agricultural sector grew 1.8%, confirming the relevance of this segment to the country's economy and development (CEPEA, 2015).

The study is organized in five sections, including this introduction, followed by the theoretical framework for understanding the related topics, which addresses organizational complexity and biological assets, as well as related studies on the subject. The third section presents the methodological procedures used in the research development. In the fourth section, the analysis of the results is demonstrated and in the fifth section the final considerations of the study are presented.

2 Literature Review

The literature review presents the concepts that support the researched subject and serves as the basis for the analysis of the data collected, especially those applicable to the proposed theme.

2.1 Organizational complexity

In relation to organizational complexity, the literature establishes that older, larger and more complex companies require the adoption of better management practices (Asunción, Vasconcelos, De Luca, & Rebouças, 2014). According to Santos and Rodrigues (2007), complex companies are those that have activities, characteristics or organizational phenomena that contradict the paradigm of simplicity, characterized by the complexity of the business, the sector, organizational, geographical or cost structure.

In a seminal study, Fama and Jensen (1983) address issues related to and claim that an organization can be considered complex when it has a size between medium and large. In these cases, companies tend to employ a variety of executives and strategists, are publicly-owned, or have multiple partners, and the knowledge used to aid decisions is not easily transferable. According to Cetorelli and Goldberg (2014), these companies tend to present changed management strategies, financing options, liquidity policies, as well as decisions on different investments compared to less complex companies.

According to Demirkan, Radhakrishnan and Urcan (2012), "enterprise diversification" has been studied as "business complexity", especially in financial accounting, trying to show its effects, especially in the asymmetry of information. According to Farias (2012) and Bushman et al. (2004), the variables widely used to measure organizational complexity are: the number of subsidiaries, size, profitability and indebtedness.

The number of subsidiaries and profitability, according to Roth and O'donnell (1996), tend to be associated with greater results management, providing asymmetry of information between the subsidiaries and their headquarters, as well as greater administrative discretion. For Linck, Netter and Yang (2008), the complexity increases with the age of the company. Farias (2012) states that the age of the company represents the life cycle of the organization, its flexibility in the market and the control of organizational activities.

In addressing the organizational life cycle, Greiner (1998) presents the aspects related to "time of existence" and "size", which are considered essential, since they affect the organizational configuration throughout the company's lifetime. Therefore, this means that the age and size of the company are considered as influencing factors of the organizational characteristics, since through this process of evolution, the companies are becoming big and complex.

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Complex processes that involve the size of the company are considered as a measure of organizational complexity, by portraying the extent of the organization in terms of assets, which represents a high diversification of its assets and rights (Farias, 2012). For Coles, Daniel and Naveen (2008), large and diversified companies rely more on financing and can be seen as complex organizations, so long-term debt and concentration of third-party capital portray the financial complexity of the company, which can be complex in different dimensions such as scope of operations, size and degree of dependence on external capital.

Profitability, as explained by Cardinaels, Roodhooft and Warlop (2004), is a variable that informs the diversification of profit and production. Therefore, Farias (2012) also defines it as a measure of organizational complexity.

2.2 Biological assets

The Brazilian scenario, prior to the adoption of CPC 29 (2009), was guided in accordance with NBC T 10.44, which defined that "biological assets could be measured by their cost of training, in other words to include the costs of the operational cycle (Marion, 2010, p.19), in the measure of their formation, attributable directly or indirectly to the product. As was also possible to adopt market value, however, "this methodology was rejected by producers as it resulted in the need to anticipate income tax" (Marion, 2010, p.212).

With the harmonization of IFRS to national accounting standards, as of July 31, 2007, the CPC was already working to harmonize the draft of Technical Pronouncement CPC 29 - Biological Assets and Agricultural Products, prepared from International Accounting Standard 41 - Agriculture (IAS-41) issued by the IASB, which was maintained by the CPC until its approval by public hearing on August 7, 2009.

CPC 29 (2009)'s main objective is to establish the accounting treatment and disclosure requirements related to biological assets and agricultural products, and its mandatory application in the financial statements for the years ended as of December 31, 2010 and in the financial statements of December 31, 2009 to be disclosed in conjunction with the 2010 financial statements for comparison purposes (CVM, 2009).

The definition of biological asset addresses the concept of living animal or plant, subject to biological or cyclic transformations. This CPC also guides a new form of measurement and evaluation for biological assets and agricultural products, specifically item 12, which determines that:

> a) biological assets shall be measured at fair value but selling expenses at the time of initial recognition and at the end of each reporting period, unless the fair value can not be measured reliably;
> b) agricultural production obtained from biological assets of an entity shall be measured at fair value less costs to sell at the time of harvest.

CPC 29 (2009), in its item 8, presentes a definition of a fair value reference and determines that:

> [...] fair value is the value at which an asset can be traded, or a liability settled, between interested parties, knowledgeable about the business and independent of each other, without the factors that pressurize the settlement of the transaction, or that characterize a compulsory transaction (CPC, 2009, item 8).

In the case of Brazil, since it is a sector of the economy highly relevant in the composition of the national GDP, according to (CEPEA, 2015), the understanding of the

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complexity of the valuation of the Agricultural and Livestock sector, as well as the size and relevance of these operations, that there is a need to question whether fair value is really the best valuation method for this asset class (Nascimento, 2011).

There are accounting currents of scholars in which the fair value valuation of an asset or liability may be of greater relevance than the historical cost, ie, at the value at which it was acquired or formed, since the fair value reflects the theoretical value by which the asset could be bought or sold in a current transaction between interested parties. In fact, a system that reflects the prices of recent transactions may lead to a better understanding of the risk profile of companies (Gwilliam, & Jackson, 2008; Iudícibus, & Martins, 2007).

An essential condition for the valuation of a biological asset or agricultural product at fair value is the existence of quotation of values in an active market, and that this information is available to its users; as defined in paragraph 8 of CPC 29 (2009). In order to characterize the existence of active market, it is necessary that the product meets the following conditions:

> (a) the items traded within the market are homogeneous;
> (b) there are buyers and sellers willing to negotiate, these can usually be found, at any time; and
> (c) the prices are available to the public.

In the absence of these conditions, CPC 29 (2009) requires the use of the present value net cash flow theoretical technique to be generated by the biological assets and the agricultural production adjusted by the estimate of expenditures with sales efforts.

According to Nascimento (2011), the Brazilian reality is that for certain *commodities*, specifically in the case of biological assets, the market is organized vertically and concentrated in a few industries. The author still infers that even if the values specified in CPC 29 were available, in some cases they may not necessarily reflect the conditions of a balanced and competitive market, since it is necessary to understand the influence on the formation of prices of these large groups, especially in the food industry.

It corroborates with this understanding the study by Pozen (2009) which led him to propose to the *Security Exchange Commission* (SEC) the development of a new financial statement with the purpose of reconciling the net cash flow and the net result determined by the value method fair. Stafford-Bush (2009) also states in its letter to the *Financial Reporting Standards Board* that in New Zealand, gains arising from changes in the fair value of biological assets recognized under IAS 41 are often excluded by financial General and rating agencies in their assessments of the financial condition of the entities analyzed.

In June 2014, the *Amendment "Agriculture: Bearer Plants"* was published. This one *Amendment*, would be an amendment, inclusion, correction, exclusion of some part of the original pronouncement. In November 2015, Revision 8 of the accounting pronouncements was disclosed, including not only the aforementioned amendment, but also all the other changes that occurred between the last review and the present one. This article aims to speak briefly about such rectifications of CPC 29. According to the IASB, this change solves some questions that have been asked regarding mature plants that bear fruit. As it was done until then, such assets should be valued at fair value.

The solution found was the creation of the concept of *bearer plant* (hereinafter referred to as CPC), the biological assets should be treated as set forth in IAS 41 / CPC 29, while the carrier plants should be treated as set forth in IAS 16 / CPC 27. It is also highlighted that the products generated by the generating plant continue to be treated as biological assets. In accordance with IAS / 16, it is optional for the entity to measure an item of the carrier plant at its fair deemed cost, recognizing the difference in retained earnings.

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Through this slant, it is verified that the organizations, as part of the globalized system, are seeking to develop and internally apply CPC 29 (2009) for measurement and practice of disclosure of biological assets at fair value.

2.3 Studies related to biological assets

The research of Rech and Oliveira (2011) aimed to analyze the criteria adopted by forestry companies for the measurement and disclosure of biological assets. As a result, firms measured biological assets at fair value based on discounted cash flow. However, the information presented by the companies was insufficient to understand the future cash generation capacity of these assets.

Barros, Souza, Araújo, Silva e Silva (2012) sought to analyze the impact of fair value on the measurement of the biological assets of companies listed in B3, in the years 2008 to 2010. They concluded that the application of CPC 29 (2009) had a strong impact on the accounting disclosure of the companies surveyed, the information on the biological assets available in the explanatory notes in general are superficial.

Silva *et al.* (2013) presented the objective of making a diagnosis based on the information provided by public and private companies in the agribusiness sector, focusing on the disclosure requirements of CPC 29 for the year 2010. As results, they identified that a large part of the sample chose to use fair value as a measurement basis, but did not disclose the assumptions considered in the adopted method.

Zanin *et al*. (2013) sought to evaluate the changes in the measurement of biological assets in beef cattle breeding activity in a property in the west of Santa Catarina. They concluded that the profit of the activity was higher by means of the measurement using CPC pronouncement 29.

Macedo, Campagnoni and Rover (2015) aimed to verify in Brazilian companies that have biological assets, the level of compliance with CPC 29, and its association with business characteristics. The results of the survey showed that the average compliance of companies with CPC 29 is 74.68%. Regarding the statistical analysis, it was observed that the level of conformity of companies had associations with business characteristics, such as sector, governance, size, profitability and asset representativeness, and the size of the company has significant interaction with the level of conformity.

The research of Theiss *et al.* (2011) sought to identify compliance with the guidelines of CPC 29 regarding the practices of disclosure of biological assets by the companies listed in B3. The authors concluded that the companies analyzed presented balance in the biological assets accounts in 2010. In general, the companies complied with most of the guidelines of CPC 29 regarding the practices of disclosure of biological assets.

2.4 Studies related to business complexity

The research by Cetorelli and Goldberg (2014) aimed to analyze the organizational complexity of a sample of 170 bank branches. Through the number and geographic dispersion of an institution's affiliates, as well as the levels of ownership affiliates relating complexity to the range of activities. The authors concluded that the sample institutions differ greatly between their affiliates or subsidiaries, and the complexity of ownership compared to ramifications and the degree of diversification of activities in their business is characterized as complexity.

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Farias (2012) sought to investigate the complementary effect between the mechanisms of incentive alignment and monitoring in the control of the financial *reporting* of publicly traded companies in Brazil. The results indicated that the profit and loss incentive plan for directors and managers was the significant incentive mechanism to explain changes in *accruals* , as well as the percentage monitoring mechanisms of external members on the board of directors.

The study by Farooqi, Harris and Ngo (2014) sought to identify the relationship between corporate diversification, real results management, and company value. As a result, the authors found discrepancies that helped explain previous studies.

Silva and Klann (2016) aimed to analyze the effect of business complexity on the management of results of Brazilian companies. The authors concluded that the complexity of companies increased with opportunistic practice of managers, when, in the company forms of individual complexity were presented. But, it could also contribute to their downturn, especially when the company jointly had several measures of complexity. Therefore, this study provides a unified view of how diversification can vary between companies and how it can change over time.

3 Methodological Procedures

This research is characterized as descriptive, documentary and quantitative. Regarding the descriptive research, according to Raupp and Beuren (2008), it is the one that is concerned with knowing the subject analyzed and it is up to the researcher   to study, analyze, record, and interpret the facts of the physical world without manipulation or interference. According to Gil (2010, page 28), "research of this type has as its primary objective the description of the characteristics of a given population or phenomenon or the establishment of relations between variables. "

As for documentary strategy, it consolidates itself by using information and evidence as a data source, using primary sources of information (Martins & Theóphilo, 2016).

Quantitative approach, for Leite (2008), is related to studies that use statistics and mathematics, based on numbers and calculations, as the main resource for the analysis of information. According to Raup and Beuren (2008) quantitative research employs the use of statistical tools, both in data collection and processing. In this context, the search for knowledge about the existence of phenomena is not very intense, since the main focus is to understand the complete behavior of the data and to guarantee the accuracy of the results, avoiding distortions of analysis and interpretations in the deductions, being frequent the use in descriptive studies (Martins, & Theóphilo, 2016).

The population is the universe or set of elements that have characteristics stipulated in common (Gil, 1994). Already, according to Beuren (2008), will be part of the selected universe, according to some criterion of representativeness. The population in question in this study are all companies listed on B3. However, the sample refers only to companies that evidence short or long-term biological assets in their statements.

The collection of data was documented in the Economática® database and in the B3 website in relation to the economic variables of the companies. For Gil (1999), in the documentary research the materials have not yet received an analytical treatment or can be re-elaborated according to the research objectives. Its application is justified by the treatment of dispersed information that can be organized, providing a new source of consultation (Silva, & Grigolo, 2002).

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3.1 Variable and database definitions

Initially, in the procedures of data collection, all the companies available in the Economática were searched, later classified by year, to identify in each period which met the requirements to compose the sample. A total of 141 observations were made in the 5 years surveyed, in the companies that had short or long term biological assets in their financial statements. The period surveyed was from 2011 to 2015.

To organize the data tables were used in Excel®. These data refer to: 1) Value of biological assets of Short Term; 2) Value of the Long-Term Biological Asset; 3) Total Biological Assets; 4) Percentage of Biological Assets / Total Assets; 5) Total Assets; 6) ROA; 7) Current Liabilities; 8) Non-Current Liabilities.

The sampling was non-probabilistic and intentional where the individuals (companies) were chosen in such a way as to facilitate the collection of data to be analyzed (Favero, Belfiore, Silva, & Chan, 2009). In order to run the statistical tests of this research the SPSS® system was used.

In order to measure organizational complexity, the variables, number of subsidiaries, time of market action, company size, profitability and indebtedness were observed (Silva, & Klann, 2016). Table 1 presents the research variables.

Table 1
Research Variables

	Variables	Authors
Dependent	AtivBiol_Totais	Da Silva, Ribeiro e Carmo (2015)
	AtivBiol_PercAT	Da Silva, Ribeiro e Carmo (2015)
Independent	Ativo_Total	Da Silva, Ribeiro e Carmo (2015)
	Log_AT	Leuz (2003), Doyle, Ge e Mcvay (2007), Baptista (2008), Farias (2012).
	ROA	Doyle, Ge e Mcvay (2007); Baptista (2008), Farias (2012).
	Endiv_CP	Bushman et al. (2004), Farias (2012).
	Endiv_LP	Bushman et al. (2004), Farias (2012).
	Endiv_Total	Farias (2012), Da silva; Ribeiro e do Carmo (2015).

Source: Research Data.

As for the measurement of biological assets, it has been verified based on the valuation criterion used by the company according to the explanatory notes based on historical cost, discounted cash flow or market value (Silva; Carmo & Ribeiro, 2015).

Data analysis was performed using statistical techniques, such as multivariate regression and descriptive statistics of the variables, inferring to what extent the model can explain the presented research problem.

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4 Results and reviews

The results of this research will be presented in two moments. In the first subsection the descriptive statistics on the sample will be presented. In the second subsection the results of the statistical tests that seek to meet the objectives of the research will be presented.

4.1 Descriptive statistics of the sample

The primary research data was organized into three groups, according to the operational life cycle periods shown, allowing sub-classification of companies that present short-term biological assets; biological assets only for the long term and those that have biological assets of short and long term, as set out in Table 2:

Table 2

Companies in the sample that showed bological assets

Biological Assets	2011	2012	2013	2014	2015
Nº of Companies with Only Short-Term Biological Assets	9	8	5	4	3
Nº of Companies with Only Long-Term Biological Assets	19	19	16	18	17
Nº of Companies with ST and LT	5	5	4	4	5
Nº of Companies with biological assets (Short Term + Long Term)	33	32	25	26	25

Source: Research data.

Table 2 shows that there was a decrease in the number of companies that annually showed biological assets in the different economic sectors. From 2011 to 2015, this reduction was 24, 25%, that is, from 33 to 25 companies.

Regarding the classification of Biological Assets in the short and long term, the decrease is even greater. The number of companies that released biological assets only in the short term in the year 2015 was 66.67% lower than in 2011. Meanwhile, the number of companies that issued long-term biological assets only reduced 11.53% from 2011 to 2015. For the companies that released biological assets of Short and Long term simultaneously in their balance sheets, this group presented a 25% increase from 2011 to 2015.

In order to meet the proposed objectives of verifying the method of valuation of the biological assets used and disclosed by the companies, the information was organized in table 3:

Table 3

Methodologies for evaluating the biological assets of sample

Methodology of valuation of biological assets	2011	2012	2013	2014	2015
Discounted cash flow	21	21	17	18	18
Historical cost	5	5	5	5	4
Market value	7	6	3	3	3
TotaLS	33	32	25	26	25

Source: Research data.

It can be seen in Table 3 that a broad preference or need of companies is to evaluate these assets by the criterion of Discounted Cash Flow. This fact is proven by the analysis of the

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evolution of valuation practices in the period surveyed, since in 2011 it represented 63.63% of the companies option and in 2015 it reached 72%. These results are in agreement with the study by Cerbasi (2003), in which the author affirmed that it is the most complete practice of asset valuation models, considering several economic and financial variables in the simulations; the residual value, which is the value of the business at the end of the period under analysis and the discount rate, which will be used to calculate the present value of future cash and the residual value.

The historical cost evaluation criterion remained between 15 and 20% of the companies option during the period studied. The market value criterion for the evaluation of biological assets was the last option in terms of decision by the companies to value their biological asset stocks. In 2011 it represented 21.21% of the valuation options and in 2015 only 12%.

4.2 Inferencial statistics of the sample

After the data was organized, the criteria for evaluating the biological assets used by the companies were identified, ANOVA was performed to verify the importance of one or more factors, comparing the means of the response variables at different levels and, results of multiple linear regression. The main results are presented in Table 4 and Table 5.

Table 4
ANOVA

ANOVA (VARIANCE)						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	1,075 E+ 14	4	2688 E+13	42,70	,000*
	Waste	8,562E + 13	136	6295 E+11		
	Total	1,931E+ 14	140			

Source: Research data.

It is possible to verify in Table 4 that the model is statistically relevant, signaling that there is a linear relationship between the dependent variable and some of the explanatory variables, since the model presents a significant p-value at the 1% level for the F test, or the probability that the model is correct is 99%. Thus, the parameters of the model exert influence, since there is a linear combination between the independent variables, which influence the dependent variables (FÁVERO *et al*., 2009).

Table 5 shows the regression coefficients, which allow to analyze the influence of organizational complexity on the measurement of biological assets.

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Table 5
Regression Results

Variables	Non-standardized		Standardized	t	Sig.
	B	Default error	Beta		
Dependent AT Bio Total					
(Constant)	- 6.691.829,742	657.197,596		-10,182	-***
Log_AT	994.568,998	106.851,113	0,654	-9,308	-***
ROA	- 9.546,406	9.457,526	- 0,058	1,009	**0,315**
Endiv_LP	17.942,180	3.911,516	0,281	-4,587	-***
Endiv_Total	- 0,004	0,002	- 0,115	1,732	0,085*
R²			0,56		
R² adjusted			0,54		
Default Error		79.3438,75			
Durbin Watson Test			1,82		
Nº Remarks			141		

Source: Research data.
* significant at the level of 10%
** significant at the level of 5%
***significant at the level of 1%

Among the set of independent variables analyzed, only ROA was not significant in the model. The total indebtedness variable was significant at the level of 10%, while the Total Asset Log and Long-Term Indebtedness variables were significant at the 1% level. It should be noted that the presence of autocorrelation was found, verified by the Durbin-Watson value. According to Gujarati (2011), to correct the problem of autocorrelation one can use the Cochrane- Orcutt method. *The final regression, estimated through this method, obtained the necessary conditions for its analysis, that is, the autocorrelation was corrected.*

As can be seen in Table 5, the variable Endv_lp presented results of 0.281 which explains 28.1% of each unit of variation of the Total Biological Assets, or rather, the variable Endv_lp positively impacts the dependent variable, thus, the greater the capacity of this is in line with the theory, since for Coles, Daniel and Naveen (2008), large and diversified companies depend more on financing and can be seen as organizations, so long-term debt and the concentration of third-party capital portray the financial complexity of the company.

On the other hand, the total indebtiness variable is statistically significant at the 10% level and has a negative effect on the organizational complexity measure dependent variable, this can be explained by the fact that the total indebtiness variable suffers the influence of the short term indebtedness. As a result, it is deduced that the greater the short-term indebtedness of the company, the lower the organizational complexity of the company.

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The Log At Total variable was the variable that most influenced the composition of the total biological assets, representing 65.4%. The Log At Total variable is statistically significant at the 1% level and positively impacts the dependent variable. Thus, the greater the extent of the organization in terms of assets, a greater probability of organizational complexity is assumed. According to Farias (2012), complex processes that involve the size of the company are considered as a measure of organizational complexity, by portraying the organization's extension in terms of assets, which represents a high diversification of its assets and rights.

The model is statistically significant at the 1% level and has a good explanatory value (55.7%). Therefore, a variation of the dependent variable (AT Bio Total) is explained in 55.70% by the independent variables. Consequently, it has quality to be adopted and allows us to infer that the equation ($Y = 0.654X_i + 0.281x_i - 0.115x_i + e_i$) satisfies the conditions to measure the level of influence of organizational complexity on the accounting of biological assets for the group of companies of B3.

In this case the R^2 of 0.557 allows to consider the model as explanatory. While the adjusted R^2 of 0.54% is more effective with respect to the standard error, reinforcing this indicative and demonstrating that the model is actually adequate for the data.

Based on the sample, the equation allows us to infer that the complexity calculated through total assets, Profitability and Indebtedness explains in 54% the valuation of biological assets. These results are similar to those of Macedo, Campagnoni and Rover (2015) who inferred the average compliance of companies with CPC 29 in 74.68%. The authors also observed that the level of compliance of companies has associations with business characteristics, such as: industry, governance, size, profitability and asset representativeness, and the size of the company has significant interaction with the level of compliance.

5 Final considerations

Technical Pronouncement CPC 29 (2009) - Biological Asset and Agricultural Product aims to specify the accounting recognition for inventories of the biological assets from which the agricultural products are extracted and the stock derived from the agricultural production originated from these assets at the time of harvest or obtaining.

Returning to the objective proposed in this research that was to verify the influence of organizational complexity on the measurement of biological assets in listed companies listed in B3, it has been concluded that the objective was reaching, therefore, the multiple regression model is statistically significant at the level of 1 % and shows that 55.7% of the changes in the measurement records of the biological assets of the sample company can be explained through the variables of organizational complexity.

According to CPC 29 (2009), biological assets can be measured at fair value less estimated costs for sale. However, if the fair value can not be measured reliably, the biological assets must be measured at cost less accumulated depreciation or impairment loss. In this sense, according to the characteristics of the life cycle of the biological asset presented by the company, such as the pulp sector, where its biological assets have between 10 and 15 years to reach the stage of being considered current assets, with market the results of this research, where 72% of the companies in the sample evidenced using the valuation of their biological assets based on the criterion of discounted cash flow, because they explain in their explanatory notes the absence of an active market for the different stages of development of its assets. These

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effects also justify that the Log At Total variable was the variable that most influenced the composition of the total biological assets, representing 65.4%.

In this bias it is understandable that the variable Endv Lp presented results of 0.281, allowing to infer that 28.1% of each unit of variation of the total biological assets can be explained through this variable. One of the factors for this effect may be associated with the life cycle of the biological assets characteristic of some relevant sectors of the sample, which tend to be long term to be realized in revenues. Therefore, the decision makers materialize these investments through long-term liabilities.

Based on the analysis of the descriptive statistics of the sample, it was possible to identify that the number of companies that have in their biological active demonstrations, only in the short term group, reduced from (9 to 3 companies), while in the long term also (19 for 17 companies). This process can be explained by factors related to the complexity of organizations and their activities, resulting from the acquisition of subsidiaries or the merger of large segments of the segment. The companies that present short- and long-term biological assets in their demonstrations are mainly in the food production sector, as is the case of BRF, Brasilagro, Rasip Agro, SLC agricola and JBS, the others are characterized by evidencing long-term biological assets.

Due to the convergence to international accounting standards, several legal and normative changes have been taking place in Brazil. These changes, a priori, seek to provide better information to its users, that is, to present information that is as close as possible to the economic reality of the assets.

The benefits of measuring the fair value of biological assets include the impact on total assets and net income. In the absence of an active market, to evaluate the fair value of biological assets and even agricultural products, under the different phases of their life, that the characteristic of these assets, which change over time, and only then when it reaches some market demand, is that they will have some "active market", able to provide reference to value such assets.

As the main contributions of the study, the results allowed to infer that according to the normative nature of CPC 29 and its impacts on the criteria of evaluations of biological assets and agricultural products, the research produced a predictive model ($Y = 0.654X_i + 0.281xx_i - 0,115x_i + e_i$) able to explain and clarify that aspects of organizational complexity influences the classification of the criterion of measurement of total biological assets, and this model can be very useful to produce information for decision making on the aspects investigated, besides offering an additional theoretical contribution to the advancement of studies related to the identification of organizational complexity and the criteria for measuring biological assets.

The limitations of the research, it should be noted that the results refer only to companies listed in Brazil, which are included in the database of Economática, referring to the period from 2011 to 2015. For further research, it is suggested that CPC 29 regarding to IAS 16 that deals with bearer plants, which may lead to changes in the financial economic reports in the biological assets group.

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