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Fair Value for Biological Assets: An Empirical Approach

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Abstract

In view of the difficulty in adopting the International Accounting Standard (IAS) 41, which determines the measurement of biological assets, this study aimed at empirically approaching a fair-value based methodology to evaluate biological assets, without an active market. In order to meet the study proposal, a case study with a quantitative approach was carried out to assess a soybean crop cultivated in the Mato Grosso do Sul State. Discounted Cash Flow (DCF) was the chosen evaluation method. Data collection was done through analysis of internal reports and semi-structured interviews. Few practical works detailing valuation of biological assets are available in the national and international literature; therefore, this is the main contribution of this work. Results suggest that besides using economic and accounting knowledge, it is advisable to consider agronomic knowledge since this type of information influences the valuation of biological assets in quantitative and qualitative terms. At the end, general comments and a research agenda are presented.

Keywords: IAS 41, CPC 29, CAPM, WACC

1. Introduction

Changes occurring due to the internationalization of economy have moved organizations towards standardization of accounting standards among countries. According to Choi and Meek (2005), such demand results from development and diffusion of multinational operations, as well as global competition and internationalization of the capital market.

Many studies have revealed that economic, social, cultural, historical and geographical aspects have influenced accounting differences among countries (Gray, 1988; Nobes, 1998; Baker & Barbu, 2007; Clements, Neill & Stovall, 2010). From these aspects, different criteria for recognition and measurement of the same fact were created, which consequently differed financial statements. Within this context, the process of creating international accounting standards was started to minimize the informational asymmetry between countries and to standardize accounting procedures (Carvalho, Lemes & Costa, 2009).

The process of standardizing accounting standards has been discussed by accounting class entities, audit firms and research centers worldwide since the establishment of the International Accounting Standards Committee (IASC) in 1973. Years later, in 2001, IASC was replaced by the International Accounting Standards Board (IASB), a board created to gauge accounting standards at the international level (Niyama, 2007).

The IASC standards were named International Accounting Standards (IAS). After creation of the IASB, standards were then renamed International Financial Reporting Standards (IFRS). Thus, the adoption of IFRS by several countries in the world is mentioned by Daske, Hail, Leuz and Verdi (2008) as the major regulatory milestone in the history of accounting.

With the process of replacing the IASC with the IASB, some pronouncements, already issued, have been revised and renamed, but some of them have not gone through this reformulation and continue to this day (Deloitte Touche Tohmatsu Limited [DELLOITE], 2016). Such non-reformulated standards remain named IAS and among them, there is the IAS 41 – Agriculture, which was revised between 2008 and 2014, but did not have its name changed to IFRS.

In line with this worldwide movement, in 2005, the Brazilian Federal Accounting Council (Conselho Federal de Contabilidade Brasileiro - CFC) created the Brazilian Accounting Pronouncements Committee (Comitê de Pronunciamentos Contábeis - CPC). The purpose of CPC was to centralize and issue technical pronouncements, guidelines and interpretations to place the Brazilian accounting within international standards. Since its inception, CPC issued 47 technical pronouncements, 20 interpretations and 8 guidelines (Brazilian Accounting Pronouncements Committee [CPC], 2016).

Among several published technical pronouncements, CPC No. 29 - Biological Assets and Agricultural Products was issued in accordance with IAS 41, which establishes the accounting treatment with respective disclosure for biological assets and agricultural products. This standard came into effect as of January 1, 2010 (Technical Pronouncement CPC-29, 2009).

IAS 41 regulated the agribusiness sector, which for a long time remained outside the accounting discussions due to the lack of tradition in preparation and divulgation of its financial statements (Elad, 2004; Dean & Clarke, 2005). Rech, Pereira, Pereira and Cunha (2006) affirm that IAS 41 presents an international standard whose purpose is to fill some gaps in the accounting area. It should be noted that this was the first international accounting standard issued with a focus on agricultural activities; that is, directed specifically to entities that operate in this sector.

According to Kieso, Weygandt and Warfield (2014), animals and living plants are considered biological assets. Marion (2010, p. 2) defines biological assets as "everything that is born, grows and dies, including annual and perennial crops, animals, livestock and breeding stock". Such assets represent a significant patrimony share of entities, mainly those of the agribusiness sector. According to the International Accounting Standard IAS-41 (2000), these biological assets are subjected to growth, degeneration, production and reproduction, causing qualitative and quantitative changes in themselves.

IAS 41 determines that biological assets and agricultural produces should be valued at fair value-based criteria, except in the case of impossibility to estimate them reliably. According to Landsman (2005), fair value is the result of agents' evaluation, who are willing to consent a value for an exchangeable asset, both having interest in effecting transaction. IFRS 13 defines fair value as the value received for the sale of an asset or paid for the transference of a liability, through a non-forced transaction between market agents, at the valuation date. Thus, fair value can be considered the point of agreement among interests of buyer and seller, in a particular transaction (Iudícibus & Martins, 2007).

Fair value-based valuations have gained strength in the last years since they use criteria that reflect the economic and financial reality of entities and therefore increase the value relevance of the accounting information (Barth, Landsman & Lang, 2008; Argiles, Bladón & Monllau, 2009; Armstrong, Barth, Jagolinzer & Riedl, 2010; Elad & Herbohn, 2011; Hinke & Starova, 2013; Hou, 2015). However, it is important to emphasize that this evaluation requires a certain degree of judgment by the appraiser, which could influence the reliability and consequently the relevance of information (Yang, Rohrbach & Chen, 2005; Kallapur & Kwan, 2004; Bohušová, Svoboda & Nerudová, 2012).

In general, the valuation of biological assets is neither clear nor concrete. There are still many uncertainties about how to value assets and comply with the standards established by IAS 41. In this context, the question that guides this study is: how to measure the fair value of biological assets, without active market, in a reliable way and in accordance with IAS 41? Therefore, this study aimed at empirically approaching a fair-value based methodology for biological assets, without an active market.

In this direction, the article is organized to present a discussion about the fair value of biological assets and its implications for the reality of the organizations that work in the agricultural sector. In sequence, we present a discussion about the Discounted Cash Flow method and discount rate. The methodology session presents the characteristics of the object of study and the quantitative methods used in the valuation. After introducing the methodology, the same is applied to the object of study. At the end of the article, observations and research agenda are presented.

2. Theory

2.1 Fair value for biological assets

IAS 41 conveys several important considerations for agricultural sector accounting, including the requirement to present biological assets in statements in a discriminatory manner, as well as the fair value of these assets, discarding the historical cost valuation in most situations.

Prior to the adoption of IAS 41, most countries measured biological assets at historical cost or at formation cost. Agricultural products are valued at fair value or historical cost, depending on the accounting standards of each country. The most relevant agricultural products of the local are the targeted for valuation (Elad & Herbohn, 2011).

According to Nobes (1998), fair value represents the amount that buyers and sellers are willing to deal their assets in a business transaction. According to the Technical Pronouncement CPC-46 (2012, page 2) "fair value is a market-based estimation and not a specific entity-based valuation." Lipe (2002) affirms that a fair value estimated at normal market conditions is a well-defined measure of value, so there is no significant question as to its relevance and credibility. Occurs that, for some assets there is availability of information or observable market transactions, for others not. However, the reason of gauging fair value in both cases is to estimate price in a non-forced transaction to sell the asset under current market conditions.

Hou (2015) analyzed criteria of recognition, mensuration and disclosure of forest biological assets in China. Once adopted, these criteria might result on an increased credibility of companies and reliability of financial information.

Hinke and Starova (2013) recommended the adoption of standards and principles stated by IFRS in the accounting system of the Czech Republic. Once implemented, these standards and principles might result in reliable accounting information, especially with respect to the use of fair value as the basis for valuation of biological assets.

Martins, Machado and Callado (2014) evidenced that the capital market perceives a fair-value based valuation with certain conservatism, but without interfering in the quality of the information. The authors concluded that the fair-value based valuation is reliable and relevant, and gives important information for the market.

Some studies have presented obstacles and disadvantages with the adoption of IFRS by rural entities. Argilés-Bosch, Aliberch and Garcia-Bladon (2012) analyzed empirically some difficulties in accounting biological assets at fair value and at historical cost in the agricultural sector. According to the authors, biological assets are affected by their costs of reproduction, growth and degeneration so that allocation of costs becomes complex and difficult. On this way, the fair value enables the evaluation and preparation of calculations, avoiding complexities in their attainment. According to the authors, accounting practices in the agricultural sector of Spain are flawed.

Maina and Wingard (2013) explain that, in Kenya, the lack of active and transparent markets is a great challenge for using a fair-value based method in the valuation of biological assets. On the same way, Mates et al. (2015) identified controversies in the evaluation and mensuration criteria of the standard to be adopted by the agri-food industries of Romania, which makes its adoption difficult. Bohušová et al. (2012) identified that the determination of fair value represents one of the major obstacles to adopt IAS 41, mainly in the case of agricultural products in the stage of biological transformation without an active market.

In order to evaluate the fair value of biological assets, CPC 29 established a hierarchy of value in concordance with the hierarchy already used by FASB, belonging to SFAS 157, which treat valuation at fair value, applicable to all US accounting standards.

2.1.1 Fair value hierarchy

In order to improve consistency and comparability in fair value valuations, as well as improve disclosures, IFRS 13 establishes a fair value hierarchy that classifies the inputs applied to valuation techniques into three levels. The figure below details the levels of the fair value hierarchy.
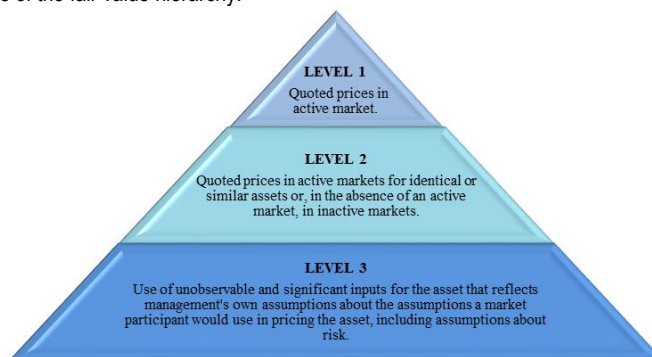

LEVEL 1
Quoted prices in
active market.

LEVEL 2
Quoted prices in active markets for identical or
similar assets or, in the absence of an active
market, in inactive markets.

LEVEL 3
Use of unobservable and significant inputs for the asset that reflects
management's own assumptions about the assumptions a market
participant would use in pricing the asset, including assumptions about
risk.

Figure 1: Fair value hierarchy
Source: Prepared by authors based on IFRS 13.

Information at level 1represents the most reliable evidences on fair value and may be used without adaptations for its valuation, whenever possible. Information at level 2 is observed either directly or indirectly for substantially the full term of the asset, including inputs that are corroborated by observable market data (International Financial Reporting Standards IFRS-13, 2010).

In relation to the assumptions about risk, inputs at level 3 include that risk underlying a specific valuation technique used to gauge fair value (such as pricing models) and the risk inherent in information used in the valuation technique. IFRS 13 (2010) guides companies to develop non-observable data by using the best information available at the moment of valuation, which can include data of the own entity.

Exhaustive efforts are not needed by the entity to obtain information on assumptions of market participants. However, the entity should consider them, whenever reasonable available. Non-observable data that were developed according to CPC guidelines are considered assumptions of market participants and therefore meet the proposal of the fair value valuation (CPC-29, 2009).

At level 3 of fair value hierarchy, the asset valuation requires a certain degree of judgment by the appraiser and this could influence the reliability and consequently the relevance of the generated information (Yang et al., 2005). In the absence of an active market for equity, the alternatives are levels 1 and 2 of the fair value hierarchy; however, the relevance of the information can be questioned due to loss of reliability (Poon, 2004). On the same reasoning, Watts (2003) and Herbohn and Herbohn (2006) argue that working with valuations based on estimates gives managers more opportunity to manage results. Martins (2002) alerts that if the market is not efficient, the market price may not represent a fair value because information used in the price formation may be biased by both the seller and the buyer. In this condition, the market value should not be considered as a fair value for the asset. According to the author, in inefficient market conditions, the present value of future cash flows is preferential for estimating fair value.

2.2 Discounted Cash Flow Valuation Method

Discounted Cash Flow (DCF) is a method well established in the market and highly regarded by literature since it demonstrates the real ability to generate wealth in a business. Williams (1938) was one of the first authors to associate the value of a business with the sum of all values generate by it. According to the author, the value of any share or company is determined by the amount that enters and leaves the company's cash, discounted at an appropriate rate.

Damodaran (2010) emphasizes that the value of a business can be obtained by discounting its expected cash flows. Assaf Neto (2003, p. 586) states that a company "is valued for its economic wealth expressed at present value, sized by the cash benefits expected in the future and discounted at a rate of attractiveness that reflects the opportunity cost of various capital providers."

Póvoa (2007) considers this method the most complete for pricing assets. Discounted cash flow is based "on the 'present value' rule, where the value of any asset is the present value of its expected future cash flows" (Damodaran, 2010, p. 12). The equation that reflects the present value of cash flows can be summarized as follows:

$$CFPV = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$$

Calculated as:

CFPV = present value of cash flows

CF_t = cash flow in the period t

$t = n$ = period in the cash flow valuation model

r = discount rate

Barth, Cram and Nelson (2001) highlight the importance of estimating the future cash flow, especially in relation to the valuation of companies and price of their shares. The authors believe that the Operating Cash Flow (OCF) is the best predictor of future cash flows.

2.2.1 Discount rate

The cost of capital indicates the minimum rate of return required by the various sources of financing of a company or the minimum return required to attract investment (Borsatto, Correia & Gimenes, 2015). Second Damodaran (2007, p. 19), "in discounted cash flow valuations, discount rates should reflect the degree of risk of cash flows."

Discount rate can be defined as the rate used to calculate the present value (PV) of future cash flows, that is, the expected value of cash flows at present value (Ross, Westerfield & Jaffe, 2002; Copeland, Koller & Murrin, 2002; Damodaran, 2009). Póvoa (2007) indicates discount rate as one of the most important estimates for calculation of the

present value of cash flows.

Among several types of discount rates used for valuation of assets and companies, two are notable: The Capital Asset Pricing Model (CAPM) that calculates the cost of equity and the Weighted Average Cost of Capital (WACC) model that measures the cost of equity and the cost of third-party capital. According to Damodaran (2009) and Martelanc, Pasin and Pereira (2010), CAPM considers opportunity cost of common equity equal to return on risk-free bond, plus the company's systemic risk, multiplied by the price of market risk (premium for risk). The CAPM model enables to estimate the financing cost of equity (Copeland et al., 2002). Given the possibility of financing by both the equity and the third-part capital, the discount rate suggested by Póvoa (2007) and Ross et al. (2002) is the WACC.

3. Methodological procedures

This paper aims to empirically approach a fair-value based method to valuate biological assets, without an active market. Therefore, a quantitative case study was conducted to evaluate a soybean crop in the Mato Grosso do Sul State. Soybean was the crop selected for this study because it has been the main planted crop in Brazil over the past few years. Soybean areas corresponded to more than 49% of the planted area in Brazil in 2013 (Data from Ministry of Agriculture, Livestock and Food Supply, 2013).

Data collection was made by internal surveys, technical reports and financial statements. Semi-structured face-to-face interviews and Skype conferences were the collection methods. In addition, the Administrative Manager, Agricultural Manager and Controller Analyst were contacted by telephone and e-mail, between November and December 2016.

3.1 Characterization of the object of study

The company is located at Southern Mato Grosso do Sul. According to EMBRAPA (Brazilian Agricultural Research Corporation) this is the soybean macro-region of south-central Brazil. The company is a limited liability company, made up of family members, who act in the management and operation of the business. The capital structure of the company is listed below:

Table 1: Capital structure

Item	Financed capital
Debt (D)	R$ 9.258,000,00
Equity (E)	R$ 57.308.000,00
(D + E)	R$ 66.566.000,00
D / E	0,16154813
D / (D + E)	0,13908001
E / (D + E)	0,86091999

Source: Prepared by the authors based on the company's financial statements

Real income is the tax regime, which is subject to 15% income tax aliquot, increased at 10% as it exceeds the taxable profit of R$ 240.000,00, plus the tax aliquot of 9%, referring to social contribution on net profit. The 2.85% part of the gross revenue should also be paid in contribution to the FUNRURAL (Rural Worker Support Fund). Agricultural activity is exempt from PIS and COFINS and has deferred ICMS in accordance with State Decree No. 9.895/2000.

Currently the company uses 3.150 hectares to grow soybean and in the off-season, the area is cultivated with corn. The 2016/2017 soybean crop was planted between September 21 to October 30, 2016 and the harvest is scheduled to begin at February 8 and end at March 10, 2017. Cultivation occurs in non-flooded soil and the soybean cultivars are: RR1, genetically modified with Roundup Ready® technology and RR2, genetically modified with Bt + Roundup Ready® technology. The cultivars are recommended by EMBRAPA for the southern region of Mato Grosso do Sul.

According to the agricultural manager, the company planted 48% of the area with cultivar RR1 and 52% with cultivar RR2. This distribution was made according to the seed traits and the sowing period. Figure 2 shows the soybean growth stages and the distribution of operational activities in hectares throughout the stages. The planted area was considered relevant for distribution of production costs.

Table 2: Soybean growth stages and distribution of operational activities

Soybean Growth Stages	Vegetative Stage October 20 to December 7, 2016				Reproductive Stage December 8, 2016 to February 7, 2017		
2016/2017 crop	September	October	November	December	January	February	March
Planting (ha)	930	2220	-	-	-	-	-
Harvest (ha)	-	-	-	-	-	1900	1250
Cultivation (ha)							
- Fertilizers	930	2220	-	-	-	-	-
- Herbicides	3150	3150	-	3150	-	-	-
- Insecticides	-	1503	3150	3150	3150	-	-
- Fungicides	-	-	3150	3150	-	-	-

Source: Prepared by the authors based on the company's agronomic information

3.2 Valuation method

Discounted Cash Flow (DCF) with an adjusted Net Operating Profit After Taxes (NOPAT) approach was the valuation method used in this study. The following equation was used for calculation of the revenue:

$$R_{(x)} = p_{(x)} \times q_{(x)}$$

Where: $R_{(x)}$ represents the revenue as a function of variable x; $p_{(x)}$ is the price of x; $q_{(x)}$ is the sold quantity of x; and x is the good available for sale. For valuation of biological assets, this formula can be used to obtain an estimate of revenue expected by the asset; however, certain subjectivity in estimating revenue must be considered, mainly in terms of quantity.

In order to define the $q_{(x)}$ variable, a survey on crop yield was made using the company's internal information provided by the agricultural manager and information on soybean yields at the Mato Grosso do Sul State, available by historical series of the National Supply Company at http://www.conab.gov.br/ (accessed on December 20, 2016)

The variable $p_{(x)}$ was calculated with basis on quotations history published by the Agrolink website (http://www.agrolink.com.br/cotacoes/historico/ms/, accessed on January 5, 2017), during period of January to December 2016.

Cost standardization is recommendable to avoid under or overvaluation of assets by the entities; therefore, a standard cost to evaluate biological assets would be feasible for this proposal. Stickney and Weil (2001) define standard cost as the expected cost of producing a product unit. In this case, a predetermined cost is taken as a reference. Martins (2003) considers standard cost as a support technique to establish a basis for comparison, which is often regarded as the ideal cost of producing a good or service. I our study, the standard cost was founded on information surveyed by EMBRAPA (2016) and reported on the Press Release 211, which assess the economic viability of soybean in the 2016/2017 crop, in the Mato Grosso do Sul State. This press release presents specific production costs of soybean cultivars RR1 and RR2, used by the company in this study, in addition to the remuneration of production factors. However, only those operational costs necessary to project cash flows were considered for the analysis.

Because the company uses both the equity and the third-party capital to fund its operations, weighted average cost of capital (WACC) is the discount rate adopted in this study, following suggestion of Póvoa (2007) and Ross et al. (2002). Thus, WACC is estimated by the following equation:

$$WACC = k_e \, X \, \frac{E}{(D+E)} + k_d \, X \, (1-T) \, X \, \frac{D}{(D+E)}$$

Where: K_e represents the cost of equity, K_d is the cost of third-party capital, T is the corporate income tax rate, D is the value of the firm's debt, E is the value of the firm's equity and $(D + E)$ represents the total value of the firm's financing (equity and debt).

The cost of third-party capital was calculated considering the tax benefit of debt. According to Martins (2001), the cost of third-party capital can be obtained by equation:

$$K_i = K \times (1 - i)$$

Where: K_i is the cost of third-party capital, net of taxes; K is the cost of third-party capital, before taxes, calculated by the weighted average interest rate of the company's financing; and i is the income tax rate of 34%, as described in the previous section.

Despite vast literature on pricing models explaining how investors assess asset risk, the cost of equity was estimated by CAPM model, which is most commonly used because its simplicity and intuitive approach (Blank, Samanez, Baidya & Aiube, 2014). According to Copeland et al. (2002), the CAPM model allows to estimate the cost of equity financing, using the following equation:

$$ke = Rf + [E(Rm) - Rf] \times \beta$$

The risk-free rate is represented by variable R_f. The US Treasury bonds (T-bond) with a 10-year redemption period, available on the US Treasury website have been used as (Rf) (http://www.treasury.gov/resource-center/data-chart-center/interest-rates/, last accessed on December 23, 2016). The rate was quoted at 2.57% on December 20, 2016. Since this rate is measured in dollars, it is necessary to convert it to a national currency rate. The equation used to do this conversion is shown below:

$$(1 + i_t) = \left(\frac{1}{E_t}\right) \times (1 + i_{t*} + crp) \times E_{t+1^e}$$

Variable i_t is the rate expressed in national currency and i_{t*} is the rate value in foreign currency. Variable crp is the country risk premium, represented in this study by the EMBI+ Brasil index, calculated by JP Morgan Chase and scored at 324 points on December 20, 2016 (http://www.ipeadata.gov.br/ExibeSerie/, last accessed on December 23, 2016). Variable E_t is the current exchange rate on date t and E_{t+1^e} represents the expected exchange rate at date t + 1, where t is the date or period. The exchange rate at 3.3586, published by the Central Bank of Brazil, was obtained on December 20, 2016 (R$/US$) and used for variable E_t (http://www4.bcb.gov.br/pec/taxas/port/ptaxnpesq.asp?id=txcotacao, last accessed on December 23, 2016). The quote of 3,4000 (R$/US$), forecasted to year 2017 and presented in the BCB Focus report in December 30, 2016 was used for variable E_{t+1^e} (http://www.bcb.gov.br/pec/GCI/PORT/readout/readout.asp, last accessed on January 5, 2017).

After calculating the risk-free rate, the market risk premium rate was defined $[E(Rm) - Rf]$. This study used an 8.2% rate as a premium for the Brazilian market risk, previously identified by Fernandez, Ortiz and Acín (2016) in a study carried out with 71 countries, aimed to identify this rate.

The measure of market risk is represented by (β). The unleveraged sectoral beta of the Farming / Agriculture sector, calculated at 0.59 by Aswath Damodaran (http://pages.stern.nyu.edu/~adamodar/New_Home_Page, last accessed on January 5, 2017), was used in this study. As the sectoral beta is already unleveraged, it was only leveraged for the capital structure of the company under study. The calculation of the leveraged beta was performed using the following equation:

$$\beta_L = \left\{\beta_{UNL} \times \left[1 + (1 - t) \times \left(\frac{D}{NW}\right)\right]\right\}$$

Where: β_{UNL} is the unleveraged beta; β_L is the leveraged beta; t is the income tax rate; $\left(\frac{D}{NW}\right)$ is the leverage ratio or the ratio between the debt value (D) and the net worth (NW).

After calculation of the leveraged beta, the cost of capital was estimated using the CAPM model. After estimating the cost of capital and the cost of third-party capital, the WACC was finally obtained. Because this rate is annual and the cash flows of the soybean crop are monthly, the transformation into a monthly equivalent rate was made by the following equation:

$$i_q = \sqrt[nm]{(1 + i_t)^{n_y}} - 1$$

Where: i_q represents the monthly index; i_t is the annual index; nm is the number of months; and n_y is the number of years. In this way, the discount rate was obtained to bring the future cash flows to present value, thus determining the biological asset value at measurement date.

Vegetative and reproductive soybean stages as well as planting and harvesting periods, respective to the cultivated seed varieties, were included in the period of analysis of the cash flows. As shown in the previous section, the period from planting to harvest occurs between September 2016 and March 2017, which is the total time considered for the cash flows analysis. Details of calculation and estimates are presented in the results and analysis section.

4. Results and Analysis

4.1 Adjusted Cash Flow (CF)

4.1.1 Income

The 10-year historical average of soybean yields is based on maintenance of the same cultivation techniques, crop management and planted areas in the last ten years. Collected data on soybean yields and differences between yields observed by the company and surveyed by CONAB are presented below.

Table 2: Productivity of soybean crop.

Crop	Productivity by company (kg/ha)	Productivity by CONAB (kg/ha)	Difference (kg/ha)	Productivity by company (sc/ha)	Productivity by CONAB (sc/ha)	Difference (sc/ha)
2005/2006	2544	2280	264	42,40	38,00	4,40
2006/2007	3164	2810	354	52,73	46,83	5,90
2007/2008	2945	2639	306	49,08	43,98	5,10
2008/2009	2718	2436	282	45,31	40,60	4,71
2009/2010	3490	3100	390	58,17	51,67	6,50
2010/2011	3277	2937	340	54,62	48,95	5,67
2011/2012	2846	2550	296	47,43	42,50	4,93
2012/2013	3214	2880	334	53,56	48,00	5,56
2013/2014	3236	2900	336	53,94	48,33	5,60
2014/2015	3606	3120	486	60,11	52,00	8,11
2015/2016	3325	2980	345	55,42	49,67	5,76
Average	**3124**	**2785**	**339**	**52,07**	**46,41**	**5,66**

Source: Prepared by the authors based on internal information of the company and CONAB surveys (2016).

This study adopted a 10-year historical average of soybean yields observed by the company among crop periods, which corresponds to 52.07 bags of 60 kg per hectare of grains. Therefore, 164.020,5 bags of soybeans were used for the cash flow analysis, considering that the company used an averaged area of 3.150 hectares to grow soybean per year.

The values of products originated from biological assets are appropriate for pricing, since they are already defined in the market at measurement date. The average price of a soybean bag (60kg) in 2016 was R$70, 7091 for the Mato Grosso do Sul market. Thus, the income used for discounted cash flow was calculated as follows:

$$R_{(x)} = p_{(x)} \times q_{(x)}$$
$$R_{(x)} = R\$\ 70{,}7091 \times 164.020{,}5$$
$$R_{(x)} = R\$\ 11.597.741{,}94$$

The amount of R$ 11,957,741.94 was distributed in cash flows according to the forecasted harvesting of the biological asset, that is, 40% of the planted area is expected to be harvested in February and 60% in March, according to information in Table 1.

4.1.2 Production costs

EMPRAPA's information on the 2016/2017 crop was considered for standard cost. Operating costs include inputs, agricultural operations, administrative costs and depreciation. Inputs represent 62,5% of the total cost while fuel and manpower account for 23,6% of the total cost. Table 2 shows the production costs per hectare of the soybean crops RR1 and RR2, in the Mato Grosso do Sul State.

Table 3: Operating Costs

Cost component	RR1 Soybean Cost (R$/ha)	RR2 Soybean Cost (R$/ha)	RR1 Soybean Total Cost	RR2 Soybean Total Cost	Total Cost (RR1+RR2)	Share
Inputs	1.245	1.425	1.871.821	2.051.157	3.922.979	62,5%
- Seeds	152	382	227.705	249.521	477.225	7,6%
- Fertilizers	479	479	719.651	788.600	1.508.252	24,0%
- Lime	174	174	262.048	287.154	549.203	8,8%
- Herbicides	111	111	166.112	182.026	348.138	5,5%
- Insecticides	133	82	200.064	219.232	419.297	6,7%
- Fungicides	116	116	174.228	190.920	365.148	5,8%
- Other inputs	81	81	122.014	133.703	255.717	4,1%
Agricultural operations	470	446	707.071	774.815	1.481.886	23,6%
Administrative costs	54	59	80.636	88.362	168.998	2,7%
Depreciation	222	222	333.937	365.930	699.867	11,2%
Total operating costs	**1.992**	**2.151**	**2.993.465**	**3.280.264**	**6.273.729**	**100,0%**

Source: Prepared by authors based on EMBRAPA's information (2016) and company's information.

Among components of total costs, inputs and agricultural operations were distributed into soybean growth stages to project cash flows, considering that each stage demands specific crop treatments, as shown in Table 2. The other cost components were uniformly and linearly distributed up to the harvesting time.

4.1.3 Presentation of Cash Flows

Table 4 presents the cash flows for the analyzed period, according to information previously presented in this study.

Table 4: Cash Flows

	09/2016	10/2016	11/2016	12/2016	01/2017	02/2017	03/2017	Total
(+) R	-	-	-	-	-	6.995.463	4.602.279	11.597.742
(-) TR	-	-	-	-	-	199.371	131.165	330.536
(-) CT	702.229	1.615.179	1.347.649	861.802	342.094	283.299	252.613	5.404.865
IN	490.531	1.403.481	1.135.951	650.104	130.396	71.601	40.915	3.922.979
- Se	143.168	334.058	-	-	-	-	-	477.225
- Ft	150.825	603.301	603.301	150.825	-	-	-	1.508.252
- L	54.920	219.681	219.681	54.920	-	-	-	549.203
- H	116.046	116.046		116.046	-	-	-	348.138
- I	-	104.824	104.824	104.824	104.824	-	-	419.297
- Fg	-	-	182.574	182.574	-	-	-	365.148
- Oi	25.572	25.572	25.572	40.915	25.572	71.601	40.915	255.717
Oop	211.698	211.698	211.698	211.698	211.698	211.698	211.698	1.481.886
(-) OE	24.143	24.143	24.143	24.143	24.143	24.143	24.143	168.998
AC	24.143	24.143	24.143	24.143	24.143	24.143	24.143	168.998
(=) EBITDA	-726.371	-1.639.321	-1.371.792	-885.945	-366.236	6.488.651	4.194.358	5.693.344
(-) DAE	87.512	250.384	202.656	115.980	23.263	12.774	7.299	699.867
(=) EBIT	-826.352	-1.739.302	-1.471.773	-985.926	-466.217	6.388.670	4.094.377	4.993.477
(-) IR/CSLL	-	-	-	-	-	2.172.148	1.392.088	3.564.236
(=) NOPAT	-826.352	-1.739.302	-1.471.773	-985.926	-466.217	4.216.522	2.702.289	1.429.241
(+) DAE	99.981	99.981	99.981	99.981	99.981	99.981	99.981	699.867
(=) CF	**-726.371**	**-1.639.321**	**-1.371.792**	**-885.945**	**-366.236**	**4.316.503**	**2.802.270**	**2.129.108**

R = Revenue, TR = Taxes Revenue, CT = Costs, IN = Inputs, Se = Seeds, Ft = Fertilizers, L = Limestone, H = Herbicides, I = Inseticides, Fg = Fungicides, Oi = Other inputs, Oop = Other agricultural operations, OE = Operational expenses, AC = Administrative costs, EBITDA = Earnings before interest, taxes, depreciation and amortization, DAE = Depreciation, Amortization and Exhaustion, EBIT = Earnings Before Interest and Taxes, IR/CSLL = Income Tax and Social Contribution on Net Income, NOPAT = Net Operating Profit After Tax, CF = Cash Flow

Source: Prepared by authors based on EMBRAPA's information (2016) and company's information.

ISSN 2039-2117 (online)
ISSN 2039-9340 (print)

Mediterranean Journal of Social Sciences
MCSER Publishing, Rome-Italy

Vol 8 No 3
May 2017

After determining the net cash flow, the discount rate required to translate the expected value of cash flows into present value was determined.

4.2   Discount rate

4.2.1 Cost of Third-Party Capital

The company's third-party capital is financed by local agribusiness development programs. Rural credit lines are mostly subsidized by Brazilian government, which is why the interest rates are reduced. The sources of third-party capital, surveyed by the Company's Controller Analyst in December 2016, are detailed below. The weighted average interest rate is presented in Table 5.

Table 5: Weighted average interest rate

Source	Financed capital	Share (S)	Interest rate (I)	S x I
Banco do Brasil – Investimento Agro	R$ 2.150.000,00	23,22%	9,50%	2,21%
FCO Rural Investimento	R$ 3.620.000,00	39,10%	8,50%	3,32%
Banco do Brasil – Inovagro	R$ 980.000,00	10,59%	8,50%	0,90%
Banco do Brasil - PCA - Armazéns	R$ 2.508.000,00	27,09%	8,50%	2,30%
Total	**R$ 9.258.000,00**	**100,00%**	**35,00%**	**8,73%**

Source: Prepared by the authors based on internal information of the company

The cost of debt or third-party capital can be considered as the interest that capital providers require to lend resources to a company. This interest generates a tax benefit to the borrower, determined by deductibility in the calculation of income tax. Thus, the cost of debt is reduced, making it more attractive to the borrower. It can be observed in the calculation of effective cost of debt below.

$K_i = K \times (1 - i)$
$K_i = 0,0873 \times (1 - 0,34)$
$K_i = 0,0873 \times 0,66$
$K_i = 0,057618$

The cost of debt after tax benefit was reduced from 8.73% to 5.76% per year. This effective cost was used in the WACC calculation.

4.2.2 Cost of Equity (K_e)

Equity cost was obtained by CAPM model using risk-free T-bond at 2, 57%, redeemable within ten years. As this rate is defined in dollars, a conversion was done for a national currency rate. For the conversion, we used the country risk EMBI + Brazil quoted at 324 points, exchange rate of 3, 3586, forecasted to 3, 4000 for the year 2017. The calculation is as follows.

$(1 + i_t) = \left(\frac{1}{E_t}\right) \times (1 + i_{t*} + crp) \times E_{t+1^e}$

$(1 + i_t) = \left(\frac{1}{3,3586}\right) \times (1 + 0,0257 + 0,0324) \times 3,4000$

$(1 + i_t) = 0,297743107 \times 3,59754$

$(1 + i_t) = 1,071142737$

$i_t = 0,07114273$

Therefore, the risk free rate, converted to national currency, is 7, 11% higher than the American rate of 2, 57%. This rate composed the estimate cost of equity of the company in study.

The leverage of unleveraged beta (calculated at 0.59) was made for the Farming / Agriculture sector. Debt and equity information were extracted from Table 1. Beta (β) calculation is presented below.

$\beta_L = \left\{ \beta_{UNL} \times \left[1 + (1 - t) \times \left(\frac{D}{NW}\right) \right] \right\}$

$\beta_L = \left\{ 0,59 \times \left[1 + (1 - 0,34) \times \left(\frac{9.258.000}{57.308.000}\right) \right] \right\}$

$\beta_L = 0{,}65290684$

Leveraged beta represents the systematic risk measurement of the studied company. It is used in the CAPM to estimate cost of equity.

The market risk premium of 8, 2% was the value calculated by Spanish researchers, after investigating 71 countries. From the collected information, cost of equity was calculated using CAPM model. The calculation is shown below:

$ke = Rf + [E(Rm) - Rf] \times \beta$
$ke = 0{,}071142737 + 0{,}082 \times 0{,}65290684$
$ke = 0{,}071142737 + 0{,}05353836$
$ke = 0{,}124681097$

The estimate cost of equity (ke) totaled 12, 47% and was included in the WACC calculation.

4.2.3 Weighted Average Cost of Capital (WACC)

Because the company uses both the equity and the third-party capital to fund its operations, weighted average cost of capital (WACC) was the model used. Variables $\frac{E}{(D+E)}$ and $\frac{D}{(D+E)}$ were obtained from Table 1. The WACC calculation was performed as follows:

$WACC = k_e \; X \; \frac{E}{(D+E)} + k_d \; X \; (1-T) \; X \; \frac{D}{(D+E)}$
$WACC = 0{,}124681097 \times 0{,}86091999 + 0{,}057618 \times (1 - 0{,}34) \times 0{,}13908001$
$WACC = 0{,}112629365$

The annual weighted average cost of capital, estimated for the studied company totaled 11.26%. Because WACC rate is annual and cash flows of the soybean crop are monthly, a transformation into a monthly equivalent rate was made by the following equation:

$i_q = \sqrt[nm]{(1 + i_{t)})^{n_y}} - 1$
$i_q = \sqrt[12]{(1 + 0{,}112629365)^1} - 1$
$i_q = 0{,}008933502$

In this way, the monthly discount rate of 0, 89 % was obtained, thus bringing the future cash flows to present value.

4.3 Valuation of Biological Assets

The biological asset value at the valuation base date was obtained by Discounted Cash Flow. The present value of the soybean crop is presented below.

$PVCF = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$
$PVCF = \frac{-726.371}{(1+0{,}008933502)} + \frac{-1.639.321}{(1+0{,}008933502)^1} + \frac{-1.371.792}{(1+0{,}008933502)^2}$
$+ \frac{-885.945}{(1+0{,}008933502)^3} + \frac{-366.236}{(1+0{,}008933502)^4} + \frac{4.316.503}{(1+0{,}008933502)^5} + \frac{2.802.270}{(1+0{,}008933502)^6}$
$VPFC = -726.371 - 1.624.806 - 1.347.607 - 826.619 - 353.436 + 4.128.758 + 2.656.652$
$\mathbf{PVCF = 1.870.571}$

Therefore, the present value of cash flows that represents the fair value of the biological asset is R$ 1.870.571, 00.

5. Final Considerations

In view of the difficulty in adopting the IAS 41 standard, which determines the measurement of biological assets, this study aimed at empirically approaching a fair-value based methodology to evaluate biological assets, without an active market.

In order to meet the study proposal, a case study with a quantitative approach was carried out for evaluation of a soybean crop cultivated in the Mato Grosso do Sul State. Discounted Cash Flow (DCF) was the chosen evaluation method. Data collection was done through analysis of internal reports and semi-structured interviews.

To compose DCF variables, discount rate was elaborated considering weighted average cost of capital as well as CPAM model on estimate of cost of equity. Results indicate a cost of equity higher than cost of third-party capital, mainly

because the company uses resources subsidized by institutions that promote Brazilian agribusiness. The study evidenced that the soybean crop cultivated in 3.150 hectares can be valued at R$ 1.870.571,00, being this its fair value.

Few practical works detailing valuation of biological assets are available in the national and international literature; therefore, this is the main contribution of this work. Results suggest that besides using economic and accounting knowledge, it is advisable to consider agronomic knowledge since this type of information influences the valuation of biological assets in quantitative and qualitative terms.

This comprehensive approach to the object of study contributes to minimize subjectivity in valuation of biological assets and improve their comparability by stakeholders. This can be observed on the standard cost published by EMBRAPA and on the transparent elaboration of discount rate adopted in the projection of cash flows. Another relevant aspect of the study is the consideration of agronomic aspects related to the type of planted variety, which influences cash flow period and operational costs. Areas and periods of crop treatments were also considered as basis for distribution of operating costs over the period. This distribution is important to reflect the reality of costs and cash flows of the company.

Despite the use of numerous accounting and economic tools on measuring fair value of biological assets, such assets are still subject to climatic risks, pests, diseases and other natural risks that may substantially affect their value. Such risks can therefore reduce the reliability and consequently the relevance of the information.

A research agenda is suggested including future studies using models of reversion to the average, in order to identify the level of price equilibrium for calculation of revenue. The use of agrometeorological models is also suggested to determine productivity of the evaluated crop. Agrometeorological models are usually more assertive to predict productivity than historical average, since they consider local edaphoclimatic conditions in which biological assets are grown.

6. Acknowledgments

References

Argiles, J. M., Bladon, J. G., & Monllau, T. (2009). Fair value versus historic cost Valuation for Biological assets: Implications for the quality of financial information. Documentos de Treball, De la Facultat D'Economia i Empresa, 1-16.

Argilés-Bosch, J. M., Aliberch, A. S. & Garcia-Bladon, J. (2012) A comparative study of difficulties in accounting preparation and judgement in agriculture using fair value and historical cost for biological assets valuation. Revista de Contabilidad, v. 15, n. 1, p. 109-142.

Armstrong C., Barth M., Jagolinzer A. & Riedl E. (2010) Market reaction to the adoption of IFRS in Europe. Accounting Review, n. 85, p. 31–61.

Baker, C. R. & Barbu, E. M. (2007) Trends in research on international accounting harmonization. The International Journal of Accounting. v. 42, n. 3, p. 272-304.

Barth, M. E., Cram, D. P. & Nelson, K. K. (2001). Accruals and the prediction of future cash flows. The Accounting Review, v. 76, n. 1, p. 27-58.

Barth, M. E., Landsman, W. & Lang, M. H. (2008) International Accounting Standards and Accounting Quality. Journal of Accounting Research, v. 46, n. 3, p. 467-498.

Blank, F. F., Samanez, C. P., Baidya, T. K. N., & Aiube, F. A. L. (2014). CAPM condicional: betas variantes no tempo no mercado brasileiro. Revista Brasileira de Finanças, v. 12 n. 2, 163-163.

Bohušová, H.; Svoboda, P. & Nerudová, D. (2012). Biological assets reporting: is the increase in value caused by the biological transformation revenue. Agricultural Economics–Czech, v. 58, p. 520-532.

Borsatto, J. L., Jr., Correia, E. F. & Gimenes, R. M. T. (2015). Avaliação de empresas pelo método do fluxo de caixa descontado: o caso de uma indústria de ração animal e soluções em homeopatia. Contabilidade Vista & Revista, v. 26, n. 2, p. 90-113.

Carvalho, N. L., Lemes, S. & Costa, F. M. (2009). Contabilidade Internacional: Aplicação das IFRS 2005. São Paulo: Atlas, 271 p.

Choi, F. D. S. & Meek, G. K. (2005). International accounting. 5th. ed. Upper Saddle River: Pearson Prentice Hall. 528 p.

Clements, C. E., Neill, J. D. & Stovall, O. S. (2010). Cultural diversity, country size and the IFRS adoption decision. The Journal of Applied Business Research. v. 26, n.2, p.115-126.

Copeland, T., Koller, T. & Murrin, J. (2002). Avaliação de Empresas – Valuation: Calculando e gerenciando o valor das empresas. São Paulo: Makron Books, 499 p.

Comitê de Pronunciamentos Contábeis. (2016) Documentos emitidos. Recuperado de http://www.cpc.org.br (Acessado em: 20 de dezembro de 2016).

Damodaran, A. (2007). Avaliação de empresas. São Paulo: Pearson Prentice Hall, 464 p.

Damodaran, A. (2009) Avaliação de investimentos: ferramentas e técnicas para a determinação do valor de qualquer ativo. 2. ed. Rio de

Janeiro: Qualitymark, 1036 p.

Damodaran, A. (2010). *Avaliação de investimentos: ferramentas e técnicas para a determinação do valor de qualquer ativo*. 2. ed. Rio de Janeiro: Qualitymark, 632 p.

Daske, H., Hail, L., Leuz, C. & Verdi, R. (2008) Mandatory IFRS Reporting around the World: Early Evidence on the Economic Consequences. *Journal of Accounting Research*, v. 46, p. 1085-1142.

Dean, G. & Clarke, F. (2005). `True and fair' and 'fair value' - accounting and legal will-o'-the-wisps. *Abacus*. v. 41, nº 2.

Deloitte Touche Tohmatsu Limited (2016). *IAS 41 – Agriculture*. 2016. Recuperado de http://www.iasplus.com/en/standards/ias/ias41 (Acessado em: 05 de janeiro de 2017).

Elad, C. (2004). Fair value accounting in the agricultural sector: some implications for international accounting harmonization. *European Accounting Review*. v. 13, nº 4, 621-641.

Elad, C. & Herbohn, K. *Implementing Fair Value in the Agricultural Sector*. Scotland: Sater – The Scottish Accountancy Trust for Education and Research, 2011, 152 p.

Empresa Brasileira de Pesquisa Agropecuária (2016). *Comunicado técnico 2011 - Viabilidade Econômica da Cultura da Soja na Safra 2016/2017, em Mato Grosso do Sul.* Recuperado de https://www.embrapa.br/web/mobile/publicações.

Fernandez, P, Ortiz, A. & Acín, I. F. (2016). Market Risk Premium: a survey 2016. *Revista Española de Capital Riesgo,* n. 3, p. 39-55.

Gray, S. J. (1988). Towards a theory of cultural influence on the development of accounting systems internationally. *Abacus*, v. 24, n. 1, p. 1-15.

Herbonhn, K. & Herbohn, J. (2006). International Accounting Standard (IAS) 41: What are the Implications for Reporting Forest Assets? *Small-scale Forest Economics, Management and Policy*, v. 5, n. 2, p. 175-189.

Hinke, J. & Starova, M. (2013). Application possibilities and consequences of biological assets and agricultural produce reporting in accordance with IFRS principles in the Czech Republic. *AGRIS on-line Papers in Economics and Informatics*, v. 5, n. 4, p. 77-89.

Hou, L. (2015). On the Recognition, Measurement and Disclosure of Forest Biological Assets. *Open Biotechnology Journal*, v. 9, p. 165-169.

International Accounting Standard IAS-41 (2000). Agriculture. Recuperado de www.ifrs.org/ifrss/documents.

International Financial Reporting Standards IFRS-13 (2010). Fair Value Measurement. Recuperado de www.ifrs.org/ifrss/documents.

Iudícibus, S. & Martins, E. (2007). Uma investigação e uma proposição sobre o conceito e o uso de valor justo. *Revista de Contabilidade & Finanças – USP*, v. 18, n. especial, p. 9-18.

Kallapur, S. & Kwan, S. Y. S. (2004). The Value Relevance and Reliability of Brand Assets Recognized by U.K. Firms. *The Accounting Review*, v. 79, n. 1, p. 151-172.

Kieso, D. E., Weygandt, J. J. & Warfield, T. D. (2014). *Intermediate Accounting 15th Edition.* John Wiley & Sons. 1608 p.

Landsman, W. R. (2005). Fair value accounting for financial instruments: some implication for bank regulation. Anais do Workshop on Accounting Risk Management and Prudential Regulation, Basiléia, Suiça.

Lipe, R. (2002). Fair Valuing Debt Turns Deteriorating Credit Quality into Positive Signals for Boston Chicken. *Accounting Horizons*, v. 16, n. 2, p. 169-181.

Maina, P. N. & Wingard, H. C. (2013). Small and medium-sized entities in the agricultural sector: Fair value reporting challenges. *Agrekon*, v. 52, n. 2, p. 52-74.

Marion, J. C. (2010) *Contabilidade rural, contabilidade agrícola, contabilidade pecuária, imposto de renda pessoa jurídica*. 12 ed. São Paulo: Atlas. 280 p.

Martelanc, R., Pasin, R. & Pereira, F. (2010) *Avaliação de empresas: um guia para fusões & aquisições e private equity.* São Paulo: Pearson Prentice Hall. 302 p.

Martins, E. (2001). *Avaliação de empresas: da mensuração contábil à Econômica*. São Paulo: Atlas. 414 p..

Martins, E. (2003). *Contabilidade de custos*. 9ª ed. São Paulo: Atlas. 310 p.

Martins, V. A. (2002). Contribuição à avaliação do goodwill: depósitos estáveis, um ativo intangível. (Dissertação de Mestrado, Universidade de São Paulo).

Martins, V. G., Machado, M. A. V. & Callado, A. L. C. (2014). Relevância e representação fidedigna na mensuração de ativos biológicos a valor justo por empresas listadas na BM&FBovespa. *Revista Contemporânea de Contabilidade*, v. 11, n. 22, p. 163-188.

Mates, D., Grosu, V., Hlaciuc, E., Bostan, I., Bunget, O., Domil, A., Moraru, M. & Artene, A. (2015). Biological assets and the agricultural products in the context of the implementation of the IAS 41: A case study of the Romanian agro-food system. *Archives of Biological Sciences*, v. 67, n. 2, p. 705-714.

Ministério da Agricultura, Pecuária e Abastecimento - MAPA. (2013) *Câmara setorial da cadeia produtiva da soja*. Recuperado de http://www.agricultura.gov.br/vegetal/culturas/soja (Acessado em: 05 de janeiro de 2017).

Neto, A. (2003). *Finanças Corporativas e valor*. São Paulo: Atlas. 610 p.

Niyama, J. K. (2007) *Contabilidade Internacional*. 1. ed. 4. reimp. São Paulo: Atlas, 165 p.

Nobes, C. (1998). Towards a General Model of the Reasons for International Differences in Financial Reporting. *Abacus*, v. 34, n. 2, p. 162-187.

Poon, W. W. (2004). Using fair value accounting for financial instruments. *Latin American Business Review*, v.22, n. 1, 39-41.

Póvoa, A. (2007). *Valuation: Como precificar ações*. 2 ed. São Paulo: Globo, 373 p.

Pronunciamento técnico CPC-29. (2009) Ativos Biológicos e Produtos Agrícolas. Recuperado de http://www.cpc.org.br (Acessado em: 20 de dezembro de 2016).

Pronunciamento técnico CPC-46 (2012) Mensuração do Valor Justo. Recuperado de http://www.cpc.org.br (Acessado em: 20 de

dezembro de 2016).

Rech, I. J., Pereira, C. C., Pereira, I. V. & Cunha, M. F. (2006). IAS 41 - Agriculture: um estudo da aplicação da norma internacional de contabilidade às empresas de pecuária de corte. Anais do Congresso USP de Controladoria e Contabilidade. São Paulo, SP. Brasil. 6.

Ross, S. A., Westerfield, R.W. & Jaffe, J. F. (2002). *Administração financeira*. São Paulo: Atlas, 776 p.

Stickney, C. P. & Weil, R. L. (2001). *Contabilidade Financeira: uma introdução aos conceitos, métodos e usos*. São Paulo: Atlas. 910 p.

Watts, R. L. (2003). Conservatism in Accounting Part 1: Explanations and implications. *Accounting Horizons*, v. 17, n. 3, p. 207-221.

Williams, J. B. *The theory of investment value*. University Of California: Harvard University Press, 1938. 613 p.

Yang, Z., Rohrbach, K. & Chen, S. (2005). The Impact of Standard Setting on Relevance and Reliability of Accounting Information: Lower of Cost or Market Accounting Reforms in China. *Journal of International Financial Management & Accounting*, v. 16, n. 3, p. 194-228.