

VALUATION OF BIOLOGICAL ASSETS AT FAIR VALUE

For purposes of compliance with
accounting standards



ibape **SP**
Qualidade em perícias e avaliações

2020

VALUATION OF BIOLOGICAL ASSETS AT FAIR VALUE

**For purposes of compliance with
accounting standards**



This technical publication proposes to clarify
and assist the valuation of biological assets

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Translation of the Portuguese
version into English by KPMG

“Valuation of biological assets at fair value” is a technical publication
of the IBAPE/SP Valuation Chamber.

ABOUT US

THE BRAZILIAN INSTITUTE OF ENGINEERING VALUATIONS AND EXPERT ASSESSMENTS OF SÃO PAULO (IBAPE/SP)

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FOREWORD

Agribusiness accounts for almost a quarter of Brazilian Gross Domestic Product (GDP) and produces goods and services totaling R\$ 1.5 trillion per annum, according to calculations by the Center for Advanced Studies in Applied Economics (CEPEA), “Luiz of Queiroz” Higher School of Agriculture (ESALQ), in partnership with the Brazilian Confederation of Agriculture and Livestock (CNA).

Many Brazilian companies, especially those in the agribusiness industry, must account for and measure their Biological Assets at fair value and require the support of valuation engineering.

This context demonstrates the importance of the topic addressed in this booklet of IBAPE/SP, named “Valuation of biological assets at fair value for purposes of compliance with accounting standards,” which aims to facilitate the understanding, interpretation and compliance with accounting standards by professionals, specifically with “CPC 29 – Biological Assets and Agricultural Produce” and “CPC 46 – Fair Value Measurement,” as well as to demonstrate the application of valuation techniques to measure the fair value of biological assets.

Aiming to achieve these goals, the publication tries to encourage the reader to explore the universe of accounting sciences. Chapter “1. Introduction” presents a history of the relevant accounting standards, the rationale for the need for the booklet and its objectives. Chapter “2. Principles” presents the accounting principles applicable to biological assets and guides professionals on their implications in fair value valuations. Chapter “3. Definitions, Acronyms and Abbreviations” follows the general line of this publication and emphasizes interpretations of accounting standards.

Valuation techniques in cost, income and market approaches are presented and interpreted in chapter “4. Methodologies,” which also provides guidance on the best approach to each case. Chapter “5. Measurement” schematically illustrates such approaches.

Finally, the work presents five appendices with practical examples of fair value calculations of different biological assets: Sugarcane (Appendix A), Planted Forests (Appendix B), Grains (Appendix C), Orange (Appendix D), and Livestock - Cattle, Poultry and Swine (Appendix E).

We would like to conclude by congratulating the Working Group, which was able to combine qualities that are sometimes opposing in this booklet: simplicity, practicality and depth. This publication has made an important contribution to bring the work closer to the needs of organizations and stakeholders in their financial statements.

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1. INTRODUCTION

1.1 TIMELINE - ACCOUNTING STANDARDS

Attention: The definitions and technical terms are explained in section 3.

- a) 2001: The International Accounting Standards Board published the first standard intended for the agricultural sector: IAS 41 – *Agriculture*.
- b) 2009: The Accounting Pronouncements Committee (CPC) published the Brazilian standard correlated to IAS 41: CPC 29 – Biological Assets and Agricultural Produce.
- c) 2014: IAS published *Agriculture: Bearer Plants (Amendments to IAS 16 and IAS 41)*, amendment that introduced the concept of bearer plant.
- d) 2015: Review 8 was then published, amending CPC 29 and introducing the concept of bearer plant.
- e) Pursuant to Law No. 11,638, dated December 28, 2007, and Law No. 11,941¹, dated May 27, 2009², Brazilian financial statements correlate with International Financial Reporting Standards (IFRS). In 2009, the Accounting Pronouncement Committee published the CPC 29 - Biological Assets and Agricultural Produce³ with the purpose of defining the accounting treatment and the respective disclosures regarding biological assets and agricultural products. The corresponding international standard is IAS 41 – *Agriculture*.
- f) Pursuant to CPC 29, biological asset is a live animal and/or plant.
- g) According to CPC 29, the biological asset or agricultural produce shall be measured at fair value less costs to sell. For fair value purposes, CPC 46 – Fair Value Measurement⁴ shall be referred, which provides that the fair value is the price received upon the sale of an asset or which would be paid by transfer of a liability of a non-forced transaction between market participants at the measurement date.

¹ BRASIL, 2007.

² BRASIL, 2009.

³ CPC 29, 2009 <http://www.cpc.org.br/CPC/Documentos-Emitidos/Pronunciamentos/Pronunciamento?Id=60> Check if this replacement is correct

⁴ CPC <http://www.cpc.org.br/CPC/Documentos-Emitidos/Pronunciamentos/Pronunciamento?Id=78>

- h) The following are not biological assets: assets that are not intended to generate future income for the company, for example: bearer plants, fungi and racehorses.
- i) In June 2014, the IFRS published an amendment that affects the accounting treatment of biological assets: Agriculture: Bearer Plants (Amendments to IAS 16 and IAS 41). According to the International Accounting Standards Board (IASB), the body responsible for developing the aforementioned international accounting guidance, the dissociation between the concepts of biological asset and bearer plant solves some of the questions that have been asked about mature plants that produced fruits (until that moment valued at fair value).
- j) According to CPC 29, the bearer plant is a living plant that: (a) is used in the production or supply of agricultural produce; (b) is expected to bear produce for more than one period; and (c) has a remote likelihood of being sold as agricultural produce, except for incidental scrap sales.
- k) Since the plant is already at its peak of development, not undergoing significant changes, such a determination of fair value was unnecessary. The bearer plant is within the scope of CPC 27 – Property, Plant and Equipment⁵.
- l) This amendment reached Brazil in 2015, through Review 8 of the accounting pronouncements. Thus, the accounting periods beginning after January 1, 2016 must comply with the changes in the standard.

In summary, Chart 1 indicates the main Accounting Pronouncements (CPCs) involved in the valuation of biological assets and bearer plants.

Chart 1 – Main CPCs on biological assets

FAIR VALUE	BIOLOGICAL ASSETS	BEARER PLANT
CPC 46	CPC 29	CPC 27
Fair Value Measurement	Biological Assets and Agricultural Produce	Property, Plant and Equipment

⁵ <http://www.cpc.org.br/CPC/Documentos-Emitidos/Pronunciamentos/Pronunciamento?Id=58>

1.2 NEED FOR THE BOOKLET

- a) Compliance with the standard; that is, to comply with the technical pronouncements of the Federal Accounting Council.
- b) Provide guidance on the techniques to be used to calculate the fair value of biological assets.
- c) Several Brazilian companies have biological assets, according to CPC 29, item 10, an entity shall recognize a biological asset or agricultural produce when, and only when:
 - 1) The entity controls the asset as a result of past events;
 - 2) It is probable that future economic benefits associated with the asset will flow to the entity; and
 - 3) The fair value or cost of the asset can be measured reliably.
- d) Therefore, any company that owns biological assets, whether in the agricultural sector or not, shall account for and measure this biological asset at fair value whenever it meets the requirements described above.
- e) There is no consensus in the market regarding the correct techniques for measuring fair value for biological assets.
- f) Pursuant to CPC 29 – Biological assets: “A biological asset shall be measured at its fair value less costs to sell.”
- g) According to CPC 46, fair value is a market-based measurement and not a specific measurement of the entity. For some assets and liabilities, there may be observable market information or market transactions available, while such data is not available for others. However, the objective of measuring fair value in both cases is the same – estimating the price at which a non-forced transaction to sell the asset or to transfer the liability would occur between market participants at the measurement date under current market conditions (i.e., an exit price at the measurement date from the point of view of the market participant holding the asset or liability). We will detail the approaches and concepts in chapters 4 and 5.
- h) The market understands the need for details on methodologies for valuing biological assets to determine their fair value.

- i) The agricultural produce explained in ABNT NBR 14.653-3 does not meet the concept of biological asset and bearer plant. They are used in the valuation of real estate and must not be used for accounting purposes of CPC 29.
- j) Review 8 of CPC 29 changed the scope of the fair value calculation of biological assets, since the concept of bearer plant was introduced, as defined in Section 3.
- k) The CPC 29/IAS 41 pronouncement introduced major innovations in the treatment of biological assets, aiming to present:

1.3 OBJECTIVE AND SCOPE

- a) Help the industry by promoting a greater standardization of the methodologies used to calculate biological assets;
- b) Assist in discussions between clients and auditors;
- c) Facilitate compliance with CPC 29;
- d) Interpretation of standards (CPC 29 and CPC 46);
- e) Adoption of Valuation techniques for fair value measurement of biological assets.

The following is not within the scope of this booklet: (i) measurement of bearer plants, (ii) reproductive improvements (ABNT) and (iii) Purchase Price Allocation (PPA).

2. PRINCIPLES

The general principles for valuing biological assets are discussed below according to the Accounting Pronouncements Committee (CPC).

2.1 GENERAL POINTS

Chart 2 lists the main points of the standards related to biological assets (CPC 29) and their measurement (CPC 46).

Chart 2 - Main points of the standards related to biological assets (CPC 29) and their measurement (CPC 46).

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE ON FAIR VALUE MEASUREMENT TECHNIQUES
29	3	2	<p>“This Pronouncement is applied to agricultural produce, which is the harvested produce of the entity’s biological assets, at the point of harvest. Thereafter, CPC 16 – Inventories or another applicable Technical Pronouncement is applied. Accordingly, this Pronouncement does not deal with the processing of agricultural produce after harvest.”</p>	<p>After harvesting, CPC 16 – Inventories shall be applied; i.e., if the grain/fiber has already been harvested on the base date, it is not within the scope of CPC 29.</p> <p>At the point of harvest, the fair value can be measured using the market methodology (Market Approach). At this point, that is, at the point of harvest, there is no justification for the asset not being valued, since there is an active market. Before that, due to the lack of an active market, it is common to use the Income Approach methodology.</p>
29	5	4	<p>“A biological asset is a living animal or plant.”</p>	<p>The biological asset is only what is alive on the base date of the valuation; that is, still planted in the field.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
29	45	11	<p>“Biological assets may be classified either as mature biological assets or immature biological assets. Mature biological assets are those that have attained harvestable specifications (for consumable biological assets) or are able to sustain regular harvests (for bearer biological assets).”</p>	<p>Corn, soybeans and cotton are classified as consumable biological assets that can be mature (grains/fiber at the point of harvest on the base date) or immature (grains/fiber under development on the base date).</p> <p>Example of possible valuation techniques during the biological asset life cycle:</p> <p>(a) Biological asset = soybean plant Immature = Before R5. Its fair value may be similar to its cost. Mature/Point of harvest = As of the phenological stage R5 (grain filling). Its fair value is measurable and a discounted cash flow can be projected.</p> <p>(b) Biological asset = eucalyptus (cycle of 6/7 years) Immature = Up to 2/3 years. Its fair value may be similar to its cost. Under development = between 2/3 years and 6/7 years. Its fair value is measurable and a discounted cash flow can be projected. Mature/Point of harvest = As of the age of harvest (6/7 years) Its fair value is measurable and the market approach can be used.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
29	8	5	<p>“Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. (See CPC 46 Technical Pronouncement – Fair Value Measurement).”</p>	<p>This item refers to CPC 46 – Fair Value, since it is applicable to the fair values of biological assets. Pursuant to CPC 29, fair value is “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.”</p>
46	62	12	<p>“The purpose of using a valuation technique is to estimate the price at which an orderly transaction for selling the asset or transferring the liability would be made between market participants on current market conditions at the measurement date. Three widely used valuation techniques are (i) market approach, (ii) cost approach and (iii) income approach. The main aspects of these approaches are summarized in items B5 to B11. The entity shall use valuation techniques consistent with one or more of these approaches to measure fair value.”</p>	<p>CPC 46, in line with asset valuation standards, outlines the approaches that can be adopted to measure fair value, such as: market approach, cost approach or income approach. Such approaches will be detailed in Chapters 4 and 5 of this booklet.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
46	65	13	<p>“Valuation techniques used to measure fair value shall be applied consistently. However, a change in a valuation technique or its application (e.g. a change in its weighting when multiple valuation techniques are used or a change in an adjustment applied to a valuation technique) is appropriate if the change results in a measurement that is equally or more representative of fair value in the circumstances. That might be the case if, for example, any of the following events take place:”</p> <ul style="list-style-type: none"> (a) new markets develop; (b) new information becomes available; (c) information previously used is no longer available; (d) valuation techniques improve; or (e) market conditions change. 	<p>CPC 46 indicates the valuation techniques, but it is not the source/ bibliography for this matter. We refer to the current and established valuation standards and methodologies. However, it is clear from CPC that improvements in valuation techniques may occur and shall be considered in the fair value calculation.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
46	A	21/22	<p>“Cost approach: A valuation technique that reflects the amount that would be required currently to replace the service capacity of an asset (often referred to as current replacement cost).”</p> <p>“Income approach: Valuation techniques that convert future amounts (e.g. cash flows or income and expenses) to a single current (i.e. discounted) amount. The fair value measurement is determined on the basis of the value indicated by current market expectations about those future amounts.”</p> <p>“Market approach: A valuation technique that uses prices and other relevant information generated by market transactions involving identical or comparable (ie similar) assets, liabilities or a group of assets and liabilities, such as a business.”</p>	<p>The approaches for measuring fair value are valuation techniques. Their application depends on the characteristics of the asset assessed. In the case of biological assets, the cost approach is usually adopted for young forests, under the age of 3 years. The market approach can be adopted when the biological asset is at the point of harvest on the base date, since it is the only time it can be sold. The income approach is based on projections of the biological asset existing on the base date until its harvest and manages to capture the different stages of the different biological assets on different base dates. It is important to highlight that there is a difference between not being able to assess an asset and this asset is not subject to valuation since its fair value is close to its cost. For biological assets, the most commonly used approach is the income approach.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
29	22	7	<p>“An entity does not include any cash flows for financing the assets, taxation, or re establishing biological assets after harvest (for example, the cost of replanting trees in a plantation forest after harvest).”</p>	<p>When valuating biological assets based on the cash flow (Income Approach), this reflects the conditions of the biological asset existing on the base date only until its harvest.</p>
29	24	7/8	<p>“Cost may sometimes approximate fair value, particularly when:</p> <p>(a) Little biological transformation has taken place since initial cost incurrence (for example, for seedlings planted immediately prior to the end of a reporting period or newly acquired livestock); or (Amended by CPC 08 Review).</p> <p>(b) The impact of the biological transformation on price is not expected to be material (for example, for the initial growth in a 30 year pine plantation production cycle).”</p>	<p>The biological assets valued by the Cost Approach are generally long-cycle crops in their early stages (e.g. planted forests when young) or assets with little biological transformation where the cost is similar to the fair value. For other biological assets, the remaining approaches apply better.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
46	B11	27	<p>“Those valuation techniques include, for example, the following:</p> <p>(a) Present value techniques (see paragraphs B12–B30);</p> <p>(b) Option pricing models, such as the Black-Scholes-Merton formula or a binomial model (ie a lattice model), that incorporate present value techniques and reflect both the time value and the intrinsic value of an option; and</p> <p>(c) The multi-period excess earnings method, which is used to measure the fair value of some intangible assets.”</p>	<p>In the Income Approach, one of the valuation techniques is the Discounted Cash Flow (DCF) method, and more specifically a Multi Period Excess Earnings (MPEE). Used in the valuation of intangible assets, as well as for biological assets.</p> <p>Considering the valuation of a biological asset through MPEE to estimate its fair value using the expected future economic gains attributable to this asset, it is necessary to make some adjustments in the cash flow if the asset whose value is being estimated is considered in its overall context (together with other assets). Thus, to the extent that assets that contributory asset charges (CAC), such as agricultural machinery and equipment, are identified, the values of the cash flows arising from these assets shall be deducted, since, as the name suggests, they are contributory and do not constitute the fair value of the asset itself.</p> <p>Furthermore, as part of the value of the asset, the Tax Amortization Benefit (TAB) is an element of the fair value of all assets that are deductible for tax purposes. Added to the amount after taxes, it is an amortization benefit that reflects the additional value of an asset as a result of its ability to deduct the amortization of the asset over its tax life. Thus, the amortization benefit is essentially the present value of the tax savings resulting from the asset amortization.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
46	B13	27	<p>“Present value (i.e. an application of the income approach) is a tool used to link future amounts (e.g. cash flows or values) to a present amount using a discount rate.”</p> <p>“A fair value measurement of an asset or a liability using a present value technique captures all the following elements from the perspective of market participants at the measurement date:</p> <ul style="list-style-type: none"> (a) An estimate of future cash flows for the asset or liability being measured; (b) Expectations about possible variations in the amount and timing of the cash flows representing the uncertainty inherent in the cash flows; (c) The time value of money, represented by the rate on risk-free monetary assets that have maturity dates or durations that coincide with the period covered by the cash flows and pose neither uncertainty in timing nor risk of default to the holder (i.e. a risk-free interest rate); (d) The price for bearing the uncertainty inherent in the cash flows (i.e. a risk premium); (e) Other factors that market participants would take into account in the circumstances.” 	<p>Since the biological assets develop throughout the harvest and are not always at the point of harvest on the base date; that is, their harvest and consequently their income is future, and thus the most appropriate methodology for their valuation are the cash flows. Discounted cash flows are future estimates brought to present value considering the inherent risk of the activity. This is an extremely widespread and reliable valuation methodology for fair value measurement.</p>

Source: CPC 29, 2015; CPC 46, 2018.

2.2 RELIABILITY

According to CPC 29 (2015)

A biological asset shall be measured on initial recognition and at the end of each reporting period at its fair value less costs to sell, except for the case described in paragraph 30 where the fair value cannot be measured reliably. [...] There is a presumption that fair value can be measured reliably for a biological asset.

However, that presumption can be rebutted only on initial recognition for a biological asset for which quoted market prices are not available and for which alternative fair value measurements are determined to be clearly unreliable. In such a case, that biological asset shall be measured at its cost less any accumulated depreciation and any accumulated impairment losses. Once the fair value of such a biological asset becomes reliably measurable, an entity shall measure it at its fair value less costs to sell. Once a non current biological asset meets the criteria to be classified as held for sale (or is included in a disposal group that is classified as held for sale) in accordance with CPC 31 Technical Pronouncement – Non current Assets Held for Sale and Discontinued Operations, it is presumed that fair value can be measured reliably. (Amended by CPC 03 Review)

As an example of cases in which the fair value cannot be measured reliably and that the same is close to cost, we have the following:

– **Young forests:** For eucalyptus planted forests up to 2 or 3 years or pine for up to 5 years, forest inventory has often not yet been carried out. This occurs since the trees are not yet sufficiently developed. Thus, for these areas, that still lack data on height and diameter collected to estimate the Annual Average Increase. There is still uncertainty that these areas will generate any economic benefit: it is common that very young trees are attacked by leaf-cutting ants that would prevent their correct development. These areas are commonly recorded at their historical cost.

– **Soybeans before R5:** The soybean plant, before reaching the R5 phenological stage, does not yet have grains. Thus, the productivity estimate is still uncertain to project a cash flow. These areas can be recorded at their historical cost. It is worth highlighting that the cycle of this crop is short and a company may need to assess its biological assets on different base dates/quarterly. In this case, it may be impracticable to quantify the areas on each base date before and after R5 and to evaluate the former at cost and the others by the income ap-

proach. Thus, the adoption of the cash flow estimate for the total area on all base dates may facilitate this task.

The main points regarding the reliability of the fair value measurement of biological assets are listed below.

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE ON FAIR VALUE MEASUREMENT TECHNIQUES
29	6(c)	5	“Measurement of change. The change in quality (for example, genetic merit, density, ripeness, fat cover, protein content, and fiber strength) or quantity (for example, progeny, weight, cubic meters, fiber length or diameter, and number of buds) brought about by biological transformation or harvest is measured and monitored as a routine management function.	Biological assets develop between planting to the point of harvest, so that their conditions are different on each base date. The monitoring of such development over time is a routine function of Agricultural companies and of the extremely skilled agronomists.
29	12	6	“A biological asset shall be measured on initial recognition and at the end of each reporting period at its fair value less costs to sell, except for the case described in paragraph 30 where the fair value cannot be measured reliably.”	The biological assets should be valued at fair value (see CPC 46).

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
29	30	9	<p>“There is a presumption that fair value can be measured reliably for a biological asset. However, that presumption can be rebutted only on initial recognition for a biological asset for which quoted market prices are not available and for which alternative fair value measurements are determined to be clearly unreliable. In such a case, that biological asset shall be measured at its cost less any accumulated depreciation and any accumulated impairment losses.”</p> <p>“Once the fair value of such a biological asset becomes reliably measurable, an entity shall measure it at its fair value less costs to sell. Once a non-current biological asset meets the criteria to be classified as held for sale (or is included in a disposal group that is classified as held for sale) in accordance with CPC 31 Technical Pronouncement – Non-current Assets Held for Sale and Discontinued Operations, it is presumed that fair value can be measured reliably. (Amended by CPC 03 Review)”</p>	<p>Biological assets can be measured reliably as they are held for sale and there is available market data (prices, costs, etc.).</p> <p>This presumption is only refuted when no market information is available and other valuation techniques are not proven to be reliable. The existing valuation techniques and methodologies are well established and duly applicable to the calculation of the fair value of biological assets, since the assumptions of income and costs available in market information are addressed, so the measurement at cost is not applicable in these cases.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
29	51	11/12	<p>“The fair value less costs to sell of a biological asset can change due to both physical changes and price changes in the market. Separate disclosure of physical and price changes is useful in appraising current period performance and future prospects, particularly when there is a production cycle of more than one year. In such cases, an entity is encouraged to disclose, by group or otherwise, the amount of change in fair value less costs to sell included in profit or loss due to physical changes and due to price changes. This information is generally less useful when the production cycle is less than one year (for example, when raising chickens or growing cereal crops).”</p>	<p>CPC 29 recognizes that the fair value of biological assets can be influenced by physical changes (e.g., a drought) and also by market prices. This fact does not prevent its measurement, mainly for short cycle biological assets, as is the case of annual crops.</p>

CPC	ITEM	PAGE	TRANSCRIPTION	GUIDANCE
29	53	12	<p>“Agricultural activity is often exposed to climatic, disease and other natural risks. If an event occurs that gives rise to a material item of income or expense, the nature and amount of that item are disclosed in accordance with CPC 26 Technical Pronouncement – Presentation of Financial Statements. Examples of such an event include an outbreak of a virulent disease, a flood, a severe drought or frost, and a plague of insects.”</p>	<p>Furthermore, CPC 29 recognizes that natural events (pests, incidence of phytopathology, drought, fire) can affect biological assets. This fact does not prevent its measurement and predictability through the risk in the discounted cash flow, and therefore is the best approach to be used.</p>
29	15	6	<p>“The fair value measurement of a biological asset or agricultural produce may be facilitated by grouping biological assets or agricultural produce according to significant attributes; for example, by age or quality. An entity selects the attributes corresponding to the attributes used in the market as a basis for pricing.”</p>	<p>CPC 29 indicates that the measurement of biological assets can be made with the creation of groups, as long as there is coherence and market price available for this grouping. For example, regarding cattle measurement, it can be grouped by category, such as bulls, calves, 12 to 24-month heifers and fresh cows.</p>
46	B15	28	<p>“A fair value measurement using present value techniques is made under conditions of uncertainty because the cash flows used are estimates rather than known amounts.”</p>	<p>CPC 46 indicates that the fair value measurement using cash flows is an estimate and a fully applicable methodology to the measurement objective, thus making it a reliable tool. This is an extremely widespread Valuation methodology.</p>

Source: CPC 29, 2015; CPC 46, 2018.

2.3 VALUE LEVELS

According to Appendix A to CPC 46:

Level 1 inputs

Prices quoted (not adjusted) in active markets for identical assets and liabilities to which the entity may have access on the measurement date.

Example: price of soybean bag in Rio Verde, Goiás on December 31, 2017, consulted on the Agrolink website for Rio Verde, Goiás, on December 31, 2017.

Level 2 inputs

Inputs that are observable for assets or liabilities, whether directly or indirectly, except for quoted prices, included in Level 1.

Example: price of soybean bag in Rio Verde, Goiás, on December 31, 2017, consulted on the Agrolink website for Goiás on December 31, 2017.

Level 3 inputs

Non-observable data for the asset or liability.

Example: synthetic soybean price estimate, calculated based on soybean oil price, discounting the corresponding costs, unit conversions and extraction efficiency.

2.4 PRINCIPAL AND ADVANTAGEOUS MARKETS

According to items 15 to 21 of CPC 46:

In the absence of a principal market for an asset, the most advantageous market for its measurement shall be used. It is understood that in the sale of the asset the company would carry out the transaction in the market for this asset or, if non-existent, in the most advantageous market; that is, with greater profitability. However, when there is a principal market for the asset, the fair value measurement shall represent the price in this market even if there is a different and potentially more advantageous market.

3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 KEY TERMS

CPC: Accounting Pronouncements Committee.

Produtos do CPC: Technical Pronouncements, guidance and interpretations.

CPC 29: Biological Assets and Agricultural Produce: Technical pronouncement related to the accounting treatment and the respective disclosures regarding biological assets and agricultural produce. CPC 29, 2015.

CPC 46: Fair Value Measurement: Technical Pronouncement that aims to (a) define fair value; (b) establish in a single Pronouncement a structure for the measurement of fair value; and (c) establish disclosures on fair value measurements. CPC 46, 2012.

CPC 27: Property, Plant and Equipment: Technical Pronouncement that establishes the accounting treatment for property, plant and equipment, so that users of the financial statements may understand the information on an entity's investments in PP&E, as well as in their changes. The key aspects to be considered in the recording of fixed assets are asset recognition, calculating their book values and the sums of depreciation and losses due to devaluation in connection with these. CPC 27, 2009.

IFRS: International Financial Reporting Standards

IASB: International Accounting Standards Board.

IAS: International Accounting Standards

IAS 41: Agriculture: international technical pronouncement that defines the accounting for agricultural activity/biological assets. Translated through IAS 41.

IFRS 13: Fair Value Measurement: international technical pronouncement that defines fair value measurement. Translated through IFRS 13.

Fair value: Pursuant to CPC 46, is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants on the measurement date. Furthermore, it defines that fair value is a market-based measurement and not a specific measurement of the entity. CPC 46, 2012.

Cost approach: according to CPC 46, is a valuation technique that reflects the amount that would be required currently to replace the service capacity of an asset (often referred to as current replacement cost). CPC 46, 2012.

Income approach: according to CPC 46, are valuation techniques that convert future amounts (e.g. cash flows or income and expenses) to a single current (i.e. discounted) amount. The fair value measurement is determined on the basis of the value indicated by current market expectations about those future amounts. CPC 46, 2012.

Market approach: pursuant to CPC 46, is a valuation technique that uses prices and other relevant information generated by market transactions involving identical or comparable (ie similar) assets, liabilities or a group of assets and liabilities, such as a business. CPC 46, 2012.

Costs to sell: according to CPC 29, are incremental expenses directly attributable to the sale of an asset, except financial expenses and income taxes.

ATTENTION:

- ❖ **Market approach:** Harvest costs.
- ❖ **Income approach:** In the case of the Discounted Cash Flow, expenses are costs and taxes to be incurred in the period over the biological asset.

MPPEM: Multi Period Excess Earnings Method. MPPEM is a revenue-based valuation approach (i.e., it estimates the value based on the expected future economic gains attributable to an asset). The methodology is most commonly used to evaluate the main or most important asset responsible for a company's revenue-generating capacity. Thus, considering the revenue of all the combined assets of a company, to the extent that the revenue from other assets (CAC or contributory assets) is withdrawn, except for the revenue generated by the asset under analy-

sis, it is possible to evaluate the residual gains or excess earnings. In other words, the MPEEM says the fair value of an asset is based on the cash flows attributable to it after deducting the cash flows attributable to other assets (contributory assets).

This approach is commonly used for sugarcane and for wood forests, since land, machinery and equipment and the bearer plant (ratoon cane) are considered contributory assets.

According to item B.3 of CPC 46:

- d) An asset's use in combination with other assets or with other assets and liabilities might be incorporated into the valuation technique used to measure the fair value of the asset. That might be the case when using the multi-period excess earnings method to measure the fair value of an intangible asset because that valuation technique specifically takes into account the contribution of any complementary assets and the associated liabilities in the group in which such an intangible asset would be used. CPC 46, 2012.

CAC: *Contributory Asset Charge.* This is considered contributory assets. It is considered as an entity as a whole and all its operational assets are essential for its smooth operation, so that all these assets contribute to the entity's revenue generation and cash flow. Thus, CAC allows the appropriate apportionment of the entity's cash flows among the assets valued under the MPEEM so that its fair value can be calculated without the values of other assets being improperly incorporated into it. CPC 46, 2012.

Farmers are considered, for example, for whom agricultural machinery is intrinsically linked to agricultural production, since they are essential for the daily operation and consequent generation of revenue and cash flow through the planting and harvesting process. In the case of producers whose agricultural machinery used in this production process is leased, CAC allows the identification and estimation of the proportion of cash flow arising from these specific assets, thus allowing to determine the fair value of the biological asset. Furthermore, the CAC allows to adjust the value between those producers who own machinery and those who do not own. CPC 46, 2012.

WACC: *Weighted Average Cost of Capital.* It is a weighted discount rate between own capital (shareholder) and third party capital.

Biological asset: According to CPC 29, is a living animal and/or plant. Moreover, the product under development of bearer plant is a biological asset. (Included by CPC 08 Review). CPC 29, 2015.

Synthetic price: It is an artificially constructed price based on a price available in the market. For example, a Company producing Palm has access only to the price of palm oil to determine the price of its biological asset. In this case, the bunch of fresh palm fruit. However, it is known that for the production of the palm oil there is a number of processing that add value to the price of the palm oil and, therefore, all these costs to add value to reach the actual price of the fresh fruit shall be removed. Therefore, a synthetic price of a product that is not traded through one which is.

The following examples are not biological assets: racehorses, bacteria and fungi.

This Statement should be enforced when accounting the following items in connection with agricultural activities:

- (a) Biological assets;
- (b) Biological assets, except for bearer plants; (Amended by CPC 08 Review);
- (c) Agricultural produce at the point of harvest; and
- (d) Government grants covered by paragraphs 34 and 35. CPC 29, 2015.

Measurement of biological assets: Pursuant to CPC 29:

A biological asset shall be measured on initial recognition and at the end of each reporting period at its fair value less costs to sell, except for the case described in paragraph 30 where the fair value cannot be measured reliably.

Bearer plant: According to CPC 29, a bearer plant is a living plant that:

- (a) Is used in the production or supply of agricultural produce;
- (b) It is expected to bear produce for more than one period; and
- (c) Has a remote likelihood of being sold as agricultural produce, except for incidental scrap sales.

The bearer animals were excluded from the amendments and will continue to be accounted for under CPC 29/IAS 41.

ATTENTION:

- ❖ The bearing plants and their measurement are not part of the scope of this booklet. The bearer plants are within the scope of CPC 27.

Agricultural produce: Pursuant to CPC 29:

This pronouncement is applied to agricultural produce, which is the harvested produce of the entity's biological assets, at the point of harvest. Thereafter, CPC 16 – Inventories or another applicable Technical Pronouncement is applied.

Orderly transaction: Pursuant to CPC 46:

A transaction that assumes market exposure for a period before the measurement date to enable marketing activities that are common and customary for transactions involving those assets or liabilities; it is not a forced transaction (for example, forced settlement or adverse sale).

Market approach: Pursuant to CPC 46:

A valuation technique that uses prices and other relevant information generated by market transactions involving identical or comparable (i.e. similar) assets, liabilities or a group of assets and liabilities, such as a business.

Information corroborated by the market: Pursuant to CPC 46:

Information (inputs) that is primarily derived from or corroborated by observable market data through correlation or other means.

Risk premium: according to CPC 46:

Compensation sought by risk-averse market participants for bearing the uncertainty inherent in the cash flows of an asset or a liability. Also referred to as a 'risk adjustment'.

3.2 EXAMPLES

Aiming to assist the appraiser, Chart 3 was elaborated with the correlation of examples of what is a bearer plant, biological asset and agricultural produce.

Chart 3 – Examples of crops and livestock.

CROP/ CREATION	BEARER PLANT	BIOLOGICAL ASSETS	AGRICULTURAL PRODUCE
Coffee	Coffee tree (bush)	Coffee bean (under development ¹ or at the point of harvest)	Coffee bean
Sugarcane	Ratoon cane (underground)	Thatch and leaves (overhead)	Sugar and ethanol
Eucalyptus and Pinus	n/a	Tree	Wood
Palm	Palm tree	CFF – Bunch of fresh fruit (under development ² or at the point of harvest)	Palm oil
Livestock	n/a	Animal	Meat
Corn	n/a	Corn plant	Grain or corn seed
Soybean	n/a	Soy plant	Soybean grain or seed
Cotton	n/a	Cotton plant	Fiber and core
Orange	Orange tree	Orange fruit	Fruit or orange juice
Rubber tree	Rubber tree	Latex	Latex
Manioc	n/a	Manioc	Cassava starch

Source: Own authors, 2018 and CPC 29, 2015.

Review 8 of CPC 29 (R8 CPC 29) changed the calculation methodology for bearer plants. It is understood that there is a subdivision of biological assets, known as bearer plants, which are used only in the production of agricultural produce for a certain period.

The IASB decided that bearer plants shall be accounted for as property, plant and equipment - CPC 27 (Property, Plant and Equipment), since their operation is similar to that of manufacturing. Consequently, the amendments include the bearer plants within the scope of CPC 27, instead of CPC 29. Agricultural produce remain within the scope of CPC 29.

ATTENTION:

Because of Review 8 of CPC 29, for purposes of projecting biological assets, we have:

- ❖ Reduction of the flow period for a crop;
- ❖ CAC (Contributory Asset Charge) of the bearer plant;
- ❖ Adjustment of cultural treatments for the current crop.

4. METHODOLOGIES

The fair value measurement approaches are described in Appendix B – CPC 46 application guidance. There are different methodologies within the same approach. This chapter begins by clarifying that:

B1. The judgments used in different valuation situations may be different. This appendix describes the judgments that may be applicable when the entity measures fair value in different valuation situations.

Thus, the appraiser shall use common sense and his/her experience when applying the methodologies.

4.1 VALUATION TECHNIQUES

According to item 61 of CPC 46:

An entity shall use valuation techniques that are appropriate in the circumstances and for which sufficient data are available to measure fair value, maximizing the use of relevant observable inputs and minimizing the use of unobservable inputs.

It also indicates which valuation techniques are most used:

- (i) Market approach;
- (ii) Cost approach;
- (iii) Revenue approach (CPC 46, 2012)

According to the Standard NBR 14.653-1 of ABNT (Brazilian Association of Technical Standards, 2011):

The income capitalization method identifies an asset's value, based on present capitalization of its forecasted net income, taken into account feasible scenarios. The income capitalization method can identify the market value. In the case of the use of special assumptions, the result is a special value.

The Brazilian Institute of Engineering Inspections and Appraisals (IBAPE), in its national standard, provides for that the income method is indicated to calculate the value of projects, intangible assets, among others. NBR 14.653-1, 2001.

4.2 COST APPROACH

4.2.1 Standards

According to Appendix A to CPC 46: “A valuation technique that reflects the amount that would be required currently to replace the service capacity of an asset (often referred to as current replacement cost).”

According to Appendix B to CPC 46:

B8. The cost approach reflects the amount that would be required currently to replace the service capacity of an asset (often referred to as current replacement cost).

B9. From the perspective of a market participant seller, the price that would be received for the asset is based on the cost to a market participant buyer to acquire or construct a substitute asset of comparable utility, adjusted for obsolescence. That is because a market participant buyer would not pay more for an asset than the amount for which it could replace the service capacity of that asset. Obsolescence encompasses physical deterioration, functional (technological) obsolescence and economic (external) obsolescence and is broader than depreciation for financial reporting purposes (an allocation of historical cost) or tax purposes (using specified service lives). In many cases the current replacement cost method is used to measure the fair value of tangible assets that are used in combination with other assets or with other assets and liabilities.

According to item 24 of CPC 29:

Cost may sometimes approximate fair value, particularly when:

- a) Little biological transformation has taken place since initial cost incurrence (for example, for seedlings planted immediately prior to the end of a reporting period or newly acquired livestock); or (Amended by the CPC 08 Review).

- (b) The impact of the biological transformation on price is not expected to be material (for example, for the initial growth in a 30 year pine plantation production cycle).

This approach is little used to determine the value of biological assets, since it shall only be applied when the fair value of the asset is close to the costs.

4.2.2 Interpretations

The cost approach consists of identifying all the expenses attributed to the biological transformation of the analyzed assets.

As it is an approach whose criteria and concepts may differ between the agents involved in a valuation process (investors, appraisers, auditors, administrators, among others), the assessment of a biological asset made through this approach shall be duly substantiated and evidenced.

The application of this approach is defined in item 4.2.1 of this document, but it is worth highlighting that this approach can be applied in the following cases:

- a) Bearer plant valuation (according to item 15 of CPC 29, since the bearer plant is considered for valuation purposes as a property, plant and equipment item);
- b) Biological asset with short life cycle. In these cases, the total cost incurred is close to the fair value (examples: swine and poultry);
- c) Biological asset whose biological transformation was minimal until the base date of the valuation (examples: plantations made near the base date of the valuation or assets whose life cycle is very long and the biological transformation in the base period of the valuation is small);
- d) Biological assets under development (examples: Beginning of the pod until its filling in the case of grains, formation of the fruit until the beginning of maturation or maturation in case of fruit trees).

Item 33 of CPC 29 states the following:

In determining cost, accumulated depreciation and accumulated impairment losses, an entity considers Technical Pronouncements CPC 16 – Inventories, CPC 27 – Property, Plant and Equipment and CPC 01 – Asset Impairment.

Therefore, to determine the costs related to biological assets, the following shall be observed:

Item 12 of CPC 16:

The costs of conversion of inventories include costs directly related to the units of production, such as direct labor. They also include a systematic allocation of fixed and variable production overheads that are incurred in converting materials into finished goods. Fixed production overheads are those indirect costs of production that remain relatively constant regardless of the volume of production, such as depreciation and maintenance of factory buildings, equipment and right-of-use assets used in the production process, and the cost of factory management and administration. Variable production overheads are those indirect costs of production that vary directly, or nearly directly, with the volume of production, such as indirect materials and indirect labor.

Item 16 of CPC 27:

The cost of an item of property, plant and equipment comprises: (a) Its purchase price, including import duties and non-refundable purchase taxes, after deducting trade discounts and rebates; (b) Any costs directly attributable to bringing the asset to the location and condition necessary for it to be capable of operating in the manner intended by management, and (c) The initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located, the obligation for which an entity incurs either when the item is acquired or as a consequence of having used the item during a particular period for purposes other than to produce inventories during that period.

According to the items of the pronouncements presented, it can be understood that the cost shall be composed of all expenses related to the transformation of assets and products. Focusing on biological assets, the costs to be considered in a valuation by the cost approach shall be composed of acquisition and development costs (direct or indirect costs) attributed to the biological asset.

Usually, in valuations of biological assets by the cost approach, the historical cost recorded in the balance sheet of the companies at the base date of the valuation is used. However, it is worth highlighting that in many cases the historical costs recorded in the balance sheet refer basically to the acquisition costs of biological assets (seedlings, grafts and others) and do not cover other costs inherent to the biological transformation process (such as inputs, labor, cultural treatments, among others). Thus, the accounting information becomes less representative of the effective cost of the biological asset.

In view of such scenario, it is important to verify upon the valuation whether the company has a structured costing process and what are the criteria adopted for allocating costs to biological assets. If the company does not have a structured costing process, the appraiser shall analyze the company's financial statements to identify the cost factors that shall be considered in the valuation of the biological asset.

Aiming to contribute to a structured analysis of costs related to biological assets, the appraiser shall verify the following information:

- a) Company characterization – in which the manager shall identify the size, type of activity, legal nature, diversification and specialization of the enterprise.
- b) Analysis of the costing system – consists in identifying, examining and allocating costs to a given agricultural production activity, aiming at the recognition and allocation of total and critical production costs, thus controlling the total production values. The resources are assigned to each modality. The actions are then assigned to cost objects based on their use. Improved spending on activities recognizes the causal relationships of those items responsible for prices.
- c) Identify and list the production cost components – This step requires to check and account for all items that will be included in cost components. For this purpose, it is important to verify all the activities, services and equipment required for the asset biological transformation and how they are controlled and measured by the company's management.
- d) Establishment of fixed and variable costs – after identifying and raising the amounts and systematizing and managing the expenses related to the biological transformation of the asset, it is necessary to identify the fixed and variable expenses, since the total cost comprises the sum of the total fixed and variable costs.

- e) Consolidate the cost information: Based on the full survey and verification of the information related to the costs of the biological transformation of the asset, a summarized statement that can be prepared based on Table 1, 2, 3 and 4 and presented as an example.

Table 1 – Examples of mechanized operations

DESCRIPTION	UNPRODUCTIVE PHASE/ FORMATION	GROWING PHASE	STABLE PHASE	DECREASING PHASE
	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)
A. MECHANIZED OPERATIONS (\$/ha)				
A.1. SOIL PREPARATION				
A.2. IMPLEMENTATION				
A.3. CULTURAL TREATMENTS				
A.4. HARVEST				
Subtotal A				

Table 2 – Examples of non-mechanized operations

DESCRIPTION	UNPRODUCTIVE PHASE/ FORMATION	GROWING PHASE	STABLE PHASE	DECREASING PHASE
	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)
B. NON-MECHANIZED OPERATIONS (\$/ha)				
B.1. SOIL PREPARATION				
B.2. IMPLEMENTATION				
B.3. CULTURAL TREATMENTS				
B.4. HARVEST				
Subtotal B				

Table 3 – Examples of Inputs

DESCRIPTION	UNPRODUCTIVE PHASE/FORMATION	GROWING PHASE	STABLE PHASE	DECREASING PHASE
	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)
C. INPUTS (\$/HA)				
C.1. FERTILIZERS				
C.2. PHYTOSANITARY				
C.3. HERBICIDES				
C.4. SEEDLINGS				
C.5. EQUIPMENT				
Subtotal C				

Table 4 – Examples of Management and others and Total A+B+C+D

DESCRIPTION	UNPRODUCTIVE PHASE/FORMATION	GROWING PHASE	STABLE PHASE	DECREASING PHASE
	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)	PERIOD (monthly/yearly)
D. MANAGEMENT AND OTHERS (\$/HA)				
D.1. DEPRECIATION				
D.2. FREIGHTS				
D.3. TAXES				
D.4. OTHER COSTS				
Subtotal D				
TOTAL COSTS (\$/HA)				

In case of lack of control or reliability in the measurement of the direct and indirect costs related to the biological transformation of the asset, the other sources of information which may be used for a more adequate calculation of the biological assets shall be evaluated with the company's management.

4.3 INCOME APPROACH

4.3.1 Standards

According to Appendix A to CPC 46:

Valuation techniques that convert future amounts (e.g. cash flows or income and expenses) to a single current (i.e. discounted) amount. The fair value measurement is determined on the basis of the value indicated by current market expectations about those future amounts.

According to Appendix B to CPC 46:

B10. The income approach converts future amounts (e.g. cash flows or income and expenses) to a single current (i.e. discounted) amount. When the income approach is used, the fair value measurement reflects current market expectations about those future amounts.

B11. Those valuation techniques include, for example, the following: (a) present value techniques (see paragraphs B12–B30); (b) option pricing models, such as the Black-Scholes-Merton formula or a binomial model (i.e. a lattice model), that incorporate present value techniques and reflect both the time value and the intrinsic value of an option; and (c) the multi-period excess earnings method, which is used to measure the fair value of some intangible assets.

4.3.2 Interpretations

The income approach converts future amounts (e.g. cash flows or income and expenses) to a single current (i.e. discounted) amount.

The application of this approach occurs through discounted cash flows (DCFs).

The DCF method best represents the price of an entity based on its future profitability (Income Approach).

Fair value – Discounted cash flow. More specifically, the Multi-period Excess Earnings Method (MPEEM). In this methodology, the fair value attributable only to the biological asset is estimated.

Cash flows and discount rates should reflect assumptions that market participants would use when pricing the asset or liability and should take into account only the factors attributable to the asset or liability being measured;

To avoid double-counting or omitting the effects of risk factors, discount rates should reflect assumptions that are consistent with those inherent in the cash flows.

A fair value measurement using present value techniques is made under conditions of uncertainty because the cash flows used are estimates rather than known amounts.

The biological asset does not generate revenue alone. It needs help of other assets to develop, such as land or the bearer plant (asset separate from the biological asset), which provides water, nutrients, structure, among others. In the MPEEM, these contributory assets shall be remunerated for this help (CAC – Contributory Asset Charge, in order to estimate the value attributable only to biological assets).

In the Valuation, the CACs can be estimated by the sum of two components:

1. Return on, that is the depreciation applied at a rate of return. If the rate is post tax, the return on is post tax. If the rate is pre tax, the return on is pre tax.
2. Return of – that is the economic depreciation pre tax or with the tax benefit (post tax).

Note that the estimated pre tax CAB shall be deducted from the pre tax flow and the post tax CAB shall be deducted from the flow only after deducting taxes.

Cash flows shall be discounted at a discount rate, e.g. WACC, estimated considering the asset, country and period.

Like intangible assets, biological assets shall be amortized through the TAX Amortization Benefit (TAB), since the biological asset is also constantly valued by the income method and is an asset that depends on other assets to generate income. In finance, the TAB refers to the present value of the benefit of an income tax resulting from the tax deduction generated by the amortization of an asset. The present value of the tax benefit is a mathematical function of the fair value, and this creates a circularity, since the fair value includes the present value of the tax

benefit. Such circularity can be addressed using a two-step procedure consisting of estimating the asset value in the absence of the tax benefit first and then extrapolating the previous amount using a tax amortization benefit.

4.4 MARKET APPROACH

4.4.1 Standards

According to Appendix A to CPC 46: “A valuation technique that uses prices and other relevant information generated by market transactions involving identical or comparable (i.e. similar) assets, liabilities or a group of assets and liabilities, such as a business.”

According to Appendix B to CPC 46:

B5. Market approach uses prices and other relevant information generated by market transactions involving assets, liabilities or group of assets and liabilities - for example, identical or comparable an a business (that is, similar).

B6. For example, valuation techniques consistent with the market approach often use market multiples derived from a set of comparables. Multiples might be in ranges with a different multiple for each comparable. The selection of the appropriate multiple within the range requires judgement, considering qualitative and quantitative factors specific to the measurement.

B7. Valuation techniques consistent with the market approach include matrix pricing. Matrix pricing is a mathematical technique used principally to value some types of financial instruments, such as debt securities, without relying exclusively on quoted prices for the specific securities, but rather relying on the securities' relationship to other benchmark quoted securities.

4.4.2 Interpretation

- a) The market approach shall be used when there is an identical or similar market involving that asset, so that it is possible to identify a market price for that asset.
- b) This approach is due to the simple application of the price practiced by the market for the asset in question.
- c) Moreover, taxes shall be levied on income according to the current tax legislation and possibly costs to sell, when applicable.
- d) The cost to sell shall only be discounted when the price used in the valuation includes this expense. For example, in the application of the market approach in 7-year old eucalyptus forests if the price used is of harvested wood.

4.5 WHAT IS THE BEST APPROACH IN EACH CASE?

Aiming to determine the best approach to be used, the Appraisal Engineer shall analyze the conditions of the biological asset on the base date to determine which approach shall be adopted. The nature of the asset, the market in which it is inserted and the stage of development of the crop shall be considered. Some suggestions for the approach according to crop status are as follows:

Soybean

Figure 1 – Vegetative stage



Methodology: Cost

Source: EY, 2017

Figure 2 – Beginning of the reproductive stage – Flowering



Methodology: Cost

Source: EY, 2017

Soybean

Figure 3 – Beginning of grain formation – R5



Methodology: Income
Source: EY, 2017

Figure 4 – Point of harvest – R9



Methodology: Market
Source: EY, 2017

Eucalyptus

Figure 5 – Young (1 year)



Methodology: Cost
Source: EY, 2017

Figure 6 – Under development (4 years)



Methodology: Income
Source: EY, 2017

Figure 7 – Mature (8 years)



Methodology: Market
Source: EY, 2017

It is important to highlight that the appraiser engineer, together with the company's controller-ship, shall analyze each case and its specificities to define the best approach for the biological asset. Due to the nature of agricultural operation associated to this asset, it is recommended to consult an Agronomic Engineer, mainly in relation to the technical assumptions: productivity, cultural treatments, etc. Flowchart 1 assists in defining the methodological approach to be used, while Figure 8 indicates a illustrative tree for the valuation and the respective methodological approach.

Flowchart 1: Definition of the methodological approach



Figure 8 – Example for methodological definition



Source: Dreamstime. 2018

5. MEASUREMENT

Given the specificity of the Biological asset, it is necessary to highlight that the valuation of fair value, especially for those assets that do not have an active market, requires a certain degree of judgment by the appraiser.

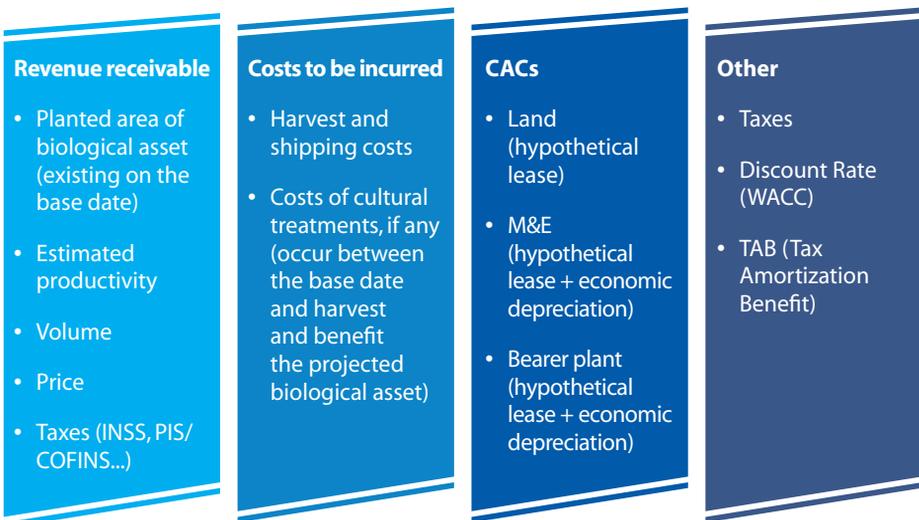
5.1 COST APPROACH

When fair value is kept at cost, this means that at this stage of plant or animal development the fair value and cost are very close.

5.2 INCOME APPROACH

The income approach is presented schematically (Scheme 1).

Scheme 1 - Income approach



5.3 MARKET APPROACH

The market approach is presented schematically (Scheme 2).

Scheme 2 - Market approach





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APPENDIX A

A. SUGARCANE

A.1 Interpretation

Chart A.1 – CPC 29 interpretations regarding sugarcane plantation

CPC 29	INTERPRETATION
<p>1. Definition of biological asset</p> <p>a) Biological asset is a live animal and/or plant.</p> <p>b) The product under development of the bearer plant is the biological asset.</p>	<p>1. Sugarcane</p> <p>a) The aerial part of the sugarcane is a living plant.</p> <p>b) Even at stages of development, the aerial part of the ratoon cane is a biological asset.</p>
<p>2. Definition of bearer plant ("BP")</p> <p>The bearer plant is a living plant that:</p> <p>a) is used in the production or supply of agricultural produce;</p> <p>b) it is expected to bear produce for more than one period; and</p> <p>c) has a remote likelihood of being sold as agricultural produce, except for incidental scrap sales.</p>	<p>2. Ratoon cane (Soca)</p> <p>The ratoon cane does not stop being part of the plant.</p> <p>a) The ratoon cane allows the development of the aerial part;</p> <p>b) The ratoon cane is used for more than one crop, according to the number of cuts explored;</p> <p>c) Hardly the ratoon cane will be harvested and sold as agricultural produce. Its primary function is to be maintained to generate tillers and thus revenue.</p>
<p>3. Definition of projection period</p> <p>a) A harvest is the extraction of the biological asset's produce or the biological asset's cessation of life.</p>	<p>3. Harvest</p> <p>a) As the biological asset is the aerial part of the cane, the projection shall be done until the end of the harvest (1 crop or 2 if there is 18-month old sugarcane).</p>
<p>4. Cost definition</p> <p>a) Costs to sell are incremental expenses directly attributable to the sale of an asset, except financial expenses and income taxes.</p> <p>b) A biological asset shall be measured on initial recognition and at the end of each reporting period at its fair value less costs to sell.</p>	<p>4. Future costs</p> <p>a) The cash flows of biological assets shall only project costs directly attributable to the sugarcane agricultural activity.</p> <p>b) These costs are those that will occur in the current crop, on the biological asset existing on the base date until its harvest. Costs that occurred before or after the base date shall not be projected.</p>

A.2 Assumptions

Chart A.2 - Assumptions: General, revenue, CACs, discount rate and taxes with the respective units and description – sugarcane

ASSUMPTION	UNIT	DESCRIPTION
General		
▶ LOB	ha	Area planted on the base date by cut
▶ Production cycle	cutting	Number of cuts explored
▶ Forecast period		After Review 8 of CPC 29, the projection of the biological asset is one crop
Income		
▶ Productivity	t/ha	Productivity by cut
▶ ATR	kg/t	Total recoverable sugar
▶ Price	R\$/kg	TRS Price
Operating costs		
▶ Cultural treatments	R\$/ha	Costs to be incurred from cultural practices in the current crop
▶ CCT	R\$/t	Cut, harvest and shipping cost
CACs (Contributory Asset Charge)		
▶ Land CAC	R\$/ha	Hypothetical land lease applied to the planted area
▶ Partnership/lease cost	t/ha	Partnership/lease cost, usually defined in a productivity-based contract
▶ Contractual total recoverable sugar	kg/t	ART of Consecana suggested for partnership contracts
▶ TRS Price	R\$/kg	TRS Price
▶ CAC of bearer plant	R\$/ha	Hypothetical lease of the bearer plant
▶ Depreciation	R\$/ha	Corresponding to the sugar cane that will be harvested in the projection
▶ Spread	%	Market rate
Discount rate		
▶ Discount rate	%	Discount rate to bring the projection to present value (e.g., WACC)
Taxes		
▶ INSS	%	Tax rate corresponding to "Funrural" for Agribusiness
▶ Inc. tax & Soc. contr.	%	Rate of income tax and social contribution on net income
▶ TAB (Tax Amortization Benefit)		Tax amortization benefit

A.3 Calculation

Table A.3 – Illustrative calculation for sugarcane

Cash flow Biological assets					
<i>Sugarcane Example – hypothetical values</i>					
<i>General Assumptions</i>					
Method	DCF MPEEM				
Harvest	18/19 and 19/20				
Base date	03/31/2018				
Model	Actual				
Tax regime	Taxable Income				
Currency	R\$				
Number of cutting	5				
<i>Months</i>				9	9
Period				2018	2019
Revenue projection				2018	2019
Planted area			Total		
1st cut 18 months	ha		2,000	-	2,000
1st cut 12 months	ha		3,000	3,000	-
2nd cut	ha		5,000	5,000	-
3rd cut	ha		4,500	4,500	-
4th cut	ha		5,000	5,000	-
5th cut	ha		5,500	5,500	-
Total	ha		25,000	23,000	2,000
Productivity					
1st cut 18 months	t/ha		120	-	120
1st cut 12 months	t/ha		100	100	-
2nd cut	t/ha		90	90	-
3rd cut	t/ha		80	80	-
4th cut	t/ha		70	70	-
5th cut	t/ha		60	60	-
Average	t/ha		81	78	120
Volume			Total		
1st cut 18 months	t		240,000	-	240,000
1st cut 12 months	t		300,000	300,000	-
2nd cut	t		450,000	450,000	-
3rd cut	t		360,000	360,000	-
4th cut	t		350,000	350,000	-
5th cut	t		330,000	330,000	-
Total	t		2,030,000	1,790,000	240,000

Price				
ATR	kg/t	135	135	135
TRS Price	R\$/kg	0.6161	0.6161	0.6161
Total	R\$/t		83.17	83.17
Gross income	R\$'000		148,881	19,962
INSS/Funrural	2.05%		(3,052)	(409)
Net revenue	R\$'000		145,829	19,552

Provision for costs and CACs

Costs

Cut, harvest and shipping cost

CCT	R\$/t	30	30	30
Total	R\$'000		53,700	7,200

Treatment cost

Treatment of ratoon cane	R\$/ha	1,800	1,800	1,800
Treatment area	ha	2,000	2,000	-
Total	R\$'000		3,600	-

CAC's (Contributory Asset Charges)

Land CAC

Contracted productivity	t/ha	12.0	12.0	12.0
TRS Consecana for contracts	kg/t	121.97	121.97	121.97
TRS Price	R\$/kg	0.5901	0.5901	0.5901
Land cost	R\$/ha	864	863.69	863.69
Remaining area	ha		25,000	2,000
Total	R\$'000		21,592	1,727

CAC of the bearer plant (post tax)

Planting cost	R\$/ha	6,000		
Useful life	cutting	5		
Depreciation	R\$/ha/year	1,200		
1st cut 18 months	R\$/ha/year		1,200	1,200
1st cut 12 months			1,200	1,200
2nd cut	R\$/ha/year		982	982
3rd cut	R\$/ha/year		873	873
4th cut	R\$/ha/year		764	764
5th cut	R\$/ha/year		655	655
Depreciation Weighted by cuts	R\$/ha/year		863	1,200
WACC post ax	%	7%	7%	7%
Return on post tax	R\$/ha		60	84
Return of post tax	R\$/ha		570	792
CAC Bearer Plant	R\$/ha		630	876
Remaining area	ha		25,000	2,000
Total	R\$'000		15,754	1,752

DCF			
Net revenue		145,829	19,552
Land Costs and CAC		(78,892)	(8,927)
EBT		66,936	10,625
Inc. tax & Soc. contr.	34%	(22,758)	(3,613)
Net income		44,178	7,013
CAC Bearer Plant (post tax)		(15,754)	(1,752)
Free cash flow		28,424	5,261
Discount Rate (WACC)	7,0%		
Months		9.00	9.00
Period		9.00	18.00
Part time		4.50	9.00
Discount factor		0.97	0.93
Discounted cash flows		27,478	4,916
Total FDC		32,395	
TAB		16,686	
Number of TAB periods		1.50	
Fair value of biological assets		49,081	RS'000

1,963 R\$/ha

	t/ha	%	ha	ha
1st cut 18 months	120.00	1.00	-	2,000.00
1st cut 12 months	100.00	1.00	3,000.00	-
2nd cut	90.00	0.82	5,000.00	-
3rd cut	80.00	0.89	4,500.00	-
4th cut	70.00	0.88	5,000.00	-
5th cut	60.00	0.86	5,500.00	-

Notes:

- [a] Discounted Cash Flow | Multi Period Excess Earnings
- [b] Base date for calculation and of financial statements. The biological asset existing on that date shall be considered.
- [c] The period is that including the projection of the harvest for all biological assets existing on the base date > income receivable as of the base date, referring to the biological asset existing on the base date
- [d] Area: area planted of biological asset existing on the base date, by age/cut > sugarcane planted in March 2018, to be harvested in September 2018.
- [e] Productivity: expressed in TCH, by age/cut
- [f] Volume: area multiplied by productivity
- [g] Price: the price of sugarcane depends on the TRS price and the amount of ATR of the sugarcane valued on the base date
- [h] Volume multiplied by price
- [i] Taxes on gross revenue: depends on legislation, use when applicable > cost to be incurred as of the base date, which benefits the biological asset existing on the base date
- [j] CCT: costs of cutting, harvesting and transportation of the biological asset existing on the base date
- [k] Cost of ratoon cane treatment: is the agricultural management, costs with fertilization, protection of crops, etc.
Generally, on 03/31, there are no costs to be incurred for the current crop that will benefit the biological asset existing on the base date. For the 18-month old areas, which will be harvested the following year, there are usually still treatments to be incurred, since sugarcane has not developed much before the base date
- [l] Cost of land: hypothetical land lease. It can be estimated based on the cost of lease or partnership, for example. Regardless of who owns the land (biological asset's point of view)
- [m] Bearer plant: hypothetical lease and economic depreciation of the bearer plant.
- [n] Cash flow post tax, WACC post tax
- [o] TAB: Tax Amortization Benefit – aiming to reflect the buyer's perspective, aligned to the concept of fair value, the cash flow can be amortized > DCF + TAB

APPENDIX B

B. PLANTED FORESTS

B.1 Assumptions

Chart B.1 - Assumptions: General, revenue, CACs, discount rate and taxes with the respective units and description – planted forests

ASSUMPTION	UNIT	DESCRIPTION
General		
▶ LOB	ha	Area planted on the base date by age.
▶ Production cycle		Rotation number on the base date
▶ Forecast period		The projection of biological assets is up to the age of forest cutting. For example, from 6 to 7 years for eucalyptus and 14 years for pinus (shallow cut).
Income		
▶ Cutting area	ha	Area to be harvested annually
▶ Productivity	m ³ /ha/year	Average annual increment
▶ Cutting age	years	Harvesting projection age
▶ Volume	m ³	Cutting area * IMA * cutting age
▶ Price	R\$/m ³	Price of wood, average or by assortment (standing or harvested)
Operating costs		
▶ Silvicultural costs	R\$/ha/year	Costs to be incurred from cultural treatments in forest areas, average or by age.
▶ Maintenance area	ha	Corresponds to the biological asset area to be treated annually.
▶ CCT	R\$/m ³	Cut, harvest and shipping cost. If the price is for standing wood, this assumption will not be incurred and shall not be projected.
CACs (Contributory Asset Charges)		
▶ Land CAC	R\$/ha/year	Hypothetical land lease applied to the planted area annually.
▶ Sale price of bare land	R\$/ha	Value of commercialization of bare land with forest potential
▶ Lease rate	%	Percentage paid to land lease resulting in a lease value in R\$/ha/year
Discount rate		
▶ WACC	%	Estimated WACC post tax
Taxes		
▶ INSS	%	Tax rate corresponding to "Funrural" for Agribusiness
▶ PIS/COFINS	%	Rate corresponding to PIS/Cofins.
▶ Inc. tax & Soc. contr.	%	Rate of income tax and social contribution on net income.

B.2 Calculation

Table B.2 – Illustrative Calculation for planted forests – Eucalyptus

Cash flow | Biological assets

Eucalyptus | **Example – hypothetical values**

General Assumptions

Method	DCF MPEEM
Base date	12/31/2017
Model	Actual
Tax regime	Taxable Income
Currency	R\$
Cutting age	7

Months		12	12	12	12	
Period		2018	2019	2020	2021	
Revenue projection		2018	2019	2020	2021	
Planted area		> harvest projection				
Age		2017	1	2	3	4
3	ha	15,003	-	-	-	15,003
4	ha	13,004	-	-	13,004	-
5	ha	14,005	-	14,005	-	-
6	ha	15,006	15,006	-	-	-
7	ha	3,007	3,007	-	-	-
Total Colheita	ha	60,025	18,013	14,005	13,004	15,003
Total Arrendamento		60,025	60,025	42,012	28,007	15,003
Productivity						
Total	m ³ /ha	42	42	42	42	42
Cutting age			7	7	7	7
Volume		Total				
Total	m ³	17,647,350	5,295,822	4,117,470	3,823,176	4,410,882
Price						
Total	R\$/m ³	46	46.00	46.00	46.00	46.00
Gross income	R\$'000	811,778	243,608	189,404	175,866	202,901
PIS/Cofins	9.25%		(22,534)	(17,520)	(16,268)	(18,768)
INSS/Funrural	2.05%		(4,994)	(3,883)	(3,605)	(4,159)
Net revenue	R\$'000	720,047	216,080	168,001	155,993	179,973

Provision for costs and CACs

Costs						
Treatment cost						
Age						
3	ha	15,003	-	-	-	-
4	ha	13,004	15,003	-	-	-
5	ha	14,005	13,004	15,003	-	-
6	ha	15,006	14,005	13,004	15,003	-
7	ha	3,007	15,006	14,005	13,004	15,003
			57,018	42,012	28,007	15,003
Age			R\$'000	R\$'000	R\$'000	R\$'000
3	R\$/ha	300	-	-	-	-
4	R\$/ha	100	1,500	-	-	-
5	R\$/ha	80	1,040	1,200	-	-
6	R\$/ha	-	-	-	-	-
7	R\$/ha	-	-	-	-	-
Total	R\$'000		2,541	1,200	-	-

CAC's (Contributory Asset Charges)

Land CAC						
Lease cost	R\$/ha	250	250	250	250	250
Total area lease	ha	60,025	60,025	42,012	28,007	15,003
Total	R\$		15,006	10,503	7,002	3,751

Amortization

% Volume	100%	30%	23%	22%	25%
Estimated fair value	549,940.77	165,032.62	128,311.88	119,140.85	137,455.42

DCF

Net revenue		216,080	168,001	155,993	179,973
Amortization		(165,033)	(128,312)	(119,141)	(137,455)
Land Costs and CAC		(17,547)	(11,703)	(7,002)	(3,751)
EBT		33,501	27,986	29,851	38,767
Inc. tax & Soc. contr.	34%	(11,390)	(9,515)	(10,149)	(13,181)
Net income		22,110	18,471	19,701	25,586
Amortization		165,033	128,312	119,141	137,455
Free cash flow		187,143	146,783	138,842	163,041
Discount Rate (WACC)	8,0%				
Months		12.00	12.00	12.00	12.00
Period		12.00	24.00	36.00	48.00
Part time		6.00	18.00	30.00	42.00
Discount factor		0.96	0.89	0.82	0.76
Discounted cash flows		180,078	130,779	114,541	124,542
Fair value of biological assets		549,941			
Goal Seek (Fair Value X Amortization)			-		

9,162

>> Unit value (R\$/ha)

Notes:

- [a] Discounted Cash Flow | Multi Period Excess Earnings
- [b] Base date for calculation and of financial statements. The biological asset existing on that date shall be considered.
- [c] The period is that including the projection of the harvest for all biological assets existing on the base date
 - > income receivable as of the base date, referring to the biological asset existing on the base date
- [d] Area: planted area of biological asset existing on the base date, by age
- [e] Productivity: can be expressed in m³/ha or other unit, at the cutting age
- [f] Volume: harvested area multiplied by productivity at the cutting age
- [g] Price: the price on the base date must be equivalent to the same unit adopted for the volume
 - > Value for standing wood. Therefore, there is no CCT cost.
- [h] Volume multiplied by price
- [i] Taxes on gross revenue: depends on legislation, use when applicable
 - > cost to be incurred as of the base date, which benefits the biological asset existing on the base date
- [l] Land CAC: is the lease cost, regardless who is the land owner (biological asset's point of view)
- [l] Amortization - aiming to reflect the buyer's perspective, aligned to the concept of fair value, the cash flow can be amortized. In this case, the tax calculation basis is reduced (non-cash account)
- [n] cash flow post tax, WACC post tax



APPENDIX C

C. GRAINS

C.1 Assumptions

Chart C.1 - Assumptions: General, revenue, CACs, discount rate and taxes with the respective units and description – grains

ASSUMPTION	UNIT	DESCRIPTION
General		
▶ LOB	ha	Area planted on base date by farm/field
▶ Forecast period	Months	For the soybean biological asset evaluated by the income methodology, we consider that the projection period can consider the soybean as of stage R5 of development, when the grain filling begins. This period will vary according to the variety of planted soybeans and their production cycle, of 1, 2 or 3 months.
Income		
▶ Productivity	sck/ha or kg/ha	Productivity per farm/field
▶ Price	R\$/sck or R\$/kg	Price
Operational and harvesting costs		
▶ Production/harvest/handling/transportation	R\$/kg	Costs to be incurred for cultural treatments and costs for harvesting and transportation
CACs (Contributory Asset Charge)		
▶ Land CAC	R\$/ha	Hypothetical land lease applied to the planted area or to the total revenue from that area
▶ WACC	%	WACC post tax
Taxes		
▶ INSS	%	Tax rate corresponding to "Funrural" for Agribusiness
▶ Inc. tax & Soc. contr.	%	Rate of income tax and social contribution on net income.

C.2 Calculation

Table C.2 – Illustrative soybean calculation

Soybean | Biological assets

Soja | *Example – hypothetical values*

General Assumptions

Method	DCF MPEEM
Base date	12/31/2017
Currency	R\$

Months		1	1
Period		Jan	Fev
Revenue projection		Jan	Fev
LOB	Ha	800	1,600
Productivity	sck/ha	60	60
Volume	sc	48,000	96,000
Price	R\$/sck	60	60
Gross income	R\$'000	2,880	5,760
INSS	R\$'000	(59)	(118)
Net revenue	R\$'000	2,821	5,642
Provision for costs and CACs		Jan	Fev
Costs		(2,150)	(1,650)
Cost of crop treatments	R\$'000	(1,500)	(1,000)
Harvest cost	R\$'000	(600)	(600)
Processing cost	R\$'000	(50)	(50)
CAC's (Contributory Asset Charges)			
Land CAC	R\$'000	(500)	(400)
Amortization of fair value		Jan	Fev
Amortization			
% Volume	100%	33%	67%
Estimated fair value	3,109.32	1,036.44	2,072.88
DCF		Jan	Fev
Net revenue		2,821	5,642
Amortization		(1,036)	(2,073)
Land Costs and CAC		(2,650)	(2,050)
EBT		(865)	1,519
Inc. tax & Soc. contr.	34%	294	(516)
Net income		(571)	1,003
Amortization		1,036	2,073
Free cash flow		465	3,075

Discount rate after tax (WACC)	10.0%		
Months		1.00	1.00
Period		1.00	2.00
Part time		0.50	1.50
Discount factor		0.95	0.87
Discounted cash flows		444	2,666
Fair value of biological assets (R\$' 000)		3,109	
Goal Seek (Fair Value X Amortization)		-	Accomplished Goal Seek

Notes:

- [a] Discounted Cash Flow | Multi Period Excess Earnings
- [b] Base date for calculation and of financial statements. The biological asset existing on that date shall be considered.
Hypothetical exercise considering average cycle soybean (110 to 115 days (which can vary from 90 to 120 days depending on the variety and region/climate) in the R5 phase; that is, in the growing stage where it is already possible to estimate the productivity with higher safety.
- [c] The period is that including the projection of the harvest for all biological assets in the R5 development stage on the base date. The projection period will depend on the soybean variety and its production cycle.
- [d] Existing production area on the base date.
- [e] Productivity estimated at sc/bag.
- [f] Volume in bags of 60 kg for harvesting.
- [g] Price of soy bag on basis date.
- [h] Price in R\$/bag multiplied by the estimated harvest volume in bags.
- [i] Taxes on gross revenue: depends on current tax legislation, use when applicable. In this case, a rate of 2.05% was applied.
- [j] Costs of cultural treatments of the asset existing on the base date.
- [k] Harvesting costs of the asset existing on the base date.
- [l] Cost of processing the asset existing on the base date.
- [m] Cost of land: hypothetical land lease. It can be estimated based on the cost of lease or partnership, for example. Regardless of who owns the land (biological asset's point of view). Check how the lease is normally charged for each type of crop.
- [n] Amortization – aiming to reflect the buyer's perspective, aligned to the concept of fair value, the cash flow can be amortized. In this case, the tax calculation basis is reduced (non-cash account)

APPENDIX D

D. ORANGE

D.1 Assumptions

Chart D.1 - Assumptions: General, revenue, CACs, discount rate and taxes with the respective units and description – orange

ASSUMPTION	UNIT	DESCRIPTION
General		
▶ LOB	ha	Area planted on base date by farm/field
OR		
▶ Trees	# trees	Number of productive trees existing on the base date, per farm/field
▶ Forecast period		After Review 8 of CPC 29, the projection of the biological asset is one crop
Income		
▶ Productivity	box/ha or box/tree	Productivity per farm/field
▶ Price	R\$/box	Price
Operational and harvesting costs		
▶ Production/Harvest/ Handling/Transportation	R\$/box	Costs to be incurred for cultural treatments and costs for harvesting and transportation
CACs (Contributory Asset Charge)		
▶ Land CAC	R\$/ha or % revenue	Hypothetical land lease applied to the planted area or to the total revenue from that area
▶ CAC of bearer plant	R\$/ha or R\$/tree	Hypothetical lease of the bearer plant
▶ Installation cost	R\$/ha or R\$/tree	Implementation cost
▶ Rate (bearer plant)	%	Discount Rate WACC
▶ Useful live rate of the trees	%	Depreciation rate according to the useful life of the trees
Discount rate		
▶ WACC	%	WACC post tax
Taxes		
▶ INSS	%	Tax rate corresponding to "Funrural" for Agribusiness
▶ Inc. tax & Soc. contr.	%	Rate of income tax and social contribution on net income.

D.2 Calculation

Table D.2 – Illustrative calculation for orange

Cash flow | Biological assets

Orange | **Example – hypothetical values**

General Assumptions

Method	DCF MPEEM
Base date	12/31/2017
Model	Actual
Tax regime	Taxable income
Currency	R\$

Months	12
--------	----

Period	2018
---------------	-------------

Revenue projection	2018
---------------------------	-------------

Production area	ha	13.0
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Quantity of trees

Field I	# trees	1,000
Field II	# trees	1,500
Field III	# trees	1,000
Field IV	# trees	1,500

Total	Quantity of trees	5,000
--------------	--------------------------	--------------

Productivity

Field I	boxes/tree	3.0
Field II	boxes/tree	2.1
Field III	boxes/tree	2.5
Field IV	boxes/tree	2.1

Average	orange boxes by tree	2.4
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Volume

Field I	boxes	3,000
Field II	boxes	3,150
Field III	boxes	2,500
Field IV	boxes	3,150

Total	boxes	11,800
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Price

Price per box of oranges (USD)	USD/box		10.00
Price per box of oranges (BRL)	BRL/box	3.00	30.00

Final Price in BRL	BRL/box		30.00
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Gross income	R\$'000		354
INSS/Funrural		2.85%	(10)
Net revenue	R\$'000		344

Provision for costs and CACs

Costs

Production and harvest cost

Production costs	R\$/box		7.00
Harvest costs (picking)	R\$/box		5.00
Handling costs	R\$/box		2.00
Total	R\$'000		165

Cost of transportation/freight

Transport	R\$/box		2.00
Total	R\$'000		24

CAC's (Contributory Asset Charges)

Land CAC

Cost of land in the region	R\$/ha		20,000.00
Lease rate in the region	%		4.0%
Land CAC	R\$/ha		800.00
Total	R\$'000		10.4

CAC of the bearer plant (post tax)

Planting cost	R\$/tree	300	
Useful life	years	20	
Depreciation	R\$/tree/year	15	
WACC post tax	%	10%	10%
Return on post tax	R\$/tree		2
Return of post tax	R\$/tree		10
CAC Bearer Plant	R\$/tree		11
Total number of trees	trees		5,000
Total	R\$'000		57

DCF

Net revenue			344
Land Costs and CAC			(199)
EBT			145
Inc. tax & Soc. contr.		34%	(49)
Net income			96
CAC Bearer Plant (post tax)			
Free cash flow			39
Discount Rate (WACC)		10.0%	
Months			12.00
Part time			
Discount factor			0.95
Discounted cash flows			37

Total FDC	37
TAB	24
Number of TAB periods	1.00
Fair value of biological assets (R\$'000)	61

Notas:

- [a] Discounted Cash Flow | Multi Period Excess Earnings
- [b] Base date for calculation and of financial statements. The biological asset existing on that date shall be considered.
- [c] The period is that including the projection of the harvest for all biological assets existing on the base date > income receivable as of the base date, referring to the biological asset existing on the base date
- [d] Area: planted area of biological asset existing on the base date, by field and/or farm > fruits to be harvested as of January 1, 2018
- [e] Productivity: expressed in orange boxes per tree, per field/farm
- [f] Volume: area multiplied by productivity
- [g] Price: the price of the orange box on the international market - usually through contracts with large trading companies
There is no benchmark in the stock market, since the market works with orange juice (processed) and not with the fruit
BRL/USD Exchange according to the base date
- [h] Volume multiplied by price
- [i] Taxes on gross revenue: depends on legislation, use when applicable > cost to be incurred as of the base date, which benefits the biological asset existing on the base date
- [j] Costs of production, harvesting and handling of the existing biological asset on the base date
- [k] Cost of transportation/freight of the existing biological asset on the base date
- [l] Cost of land: hypothetical land lease. It can be estimated based on the cost of lease or partnership, for example. Regardless of who owns the land (biological asset's point of view)
Check how the lease is normally charged for each type of crop
- [m] Bearer plant: hypothetical lease and economic depreciation of the bearer plant.
> Confirm the useful life with the agronomist in charge
- [n] cash flow post tax, WACC post tax
- [o] TAB: Tax Amortization Benefit – aiming to reflect the buyer's perspective, aligned to the concept of fair value, the cash flow can be amortized
> DCF + TAB

APPENDIX E

E. LIVESTOCK

E.1 Cattle

E.1.1 Calculation

Table E.1 – Calculation of cattle using the market approach

Market valuation | Cattle

Example – hypothetical values

Method	Market							
Base date	12/31/2018							
Currency	R\$						Senar rate	0.25%
Description of animals	Quantity (heads)	Live Weight (kg/head)	Use of carcass (%)	Weight @ (@/head) [a]	Average Price (R\$/@)	Average Price (R\$/head) [b]	Fair value - R\$ 000 [c]	Fair Value after Senar R\$ 000 [d]
Males								
0–12 months	1591	n/a	n/a	n/a	n/a	1,180.0	1,877.4	1,872.7
12–24 months	4316	285	50%	9.5	135.00	1,282.5	5,535.3	5,521.4
24–36 months	2757	500	50%	17.8	131.67	2,339.3	6,449.5	6,433.3
Bull	549	600	50%	22.0	131.67	2,892.3	1,587.9	1,583.9
Females								
0–12 months	1732	n/a	n/a	n/a	n/a	1,100.0	1,905.2	1,900.4
12–24 months	4036	255	50%	8.5	123.09	1,046.3	4,222.9	4,212.3
24–36 months	6213	360	50%	12.5	124.96	1,557.9	9,679.1	9,654.9
Head office	8881	480	50%	15.0	124.96	1,874.5	16,647.1	16,605.5
Total	30,075						47,904.3	47,784.5

Notes:

[a] 1 @ equals a value in kg. For this example, we consider that 1@ = 15 kg.

[b] Some categories can be valued by head and not by weight. In this example, this situation occurs with the Male and Female categories (aged 0 to 12 months). For the categories valued by weight, we multiply the value of the average price (R\$/@) by the weight (@/head).

[c] Calculated by multiplying the average price in R\$/head and the number of animals (heads).

[d] Income tax as tax law in force.

E.2 Poultry

E.2.1 Assumptions

Chart D.1 - Assumptions: General, revenue, CACs, discount rate and taxes with the respective units and description – poultry

ASSUMPTION	UNIT	DESCRIPTION
General		
▶ Volume		Number of poultry on basis date
▶ Forecast period		After Review 8 of CPC 29, the projection of the biological asset only contemplates the poultry existing on the base date. (without new births)
Income		
▶ Cutting age	days	Estimated age for slaughter
▶ Price	R\$/poultry)	It is necessary to calculate the price per kg, and calculate the average weight of the poultry population. The final price will be obtained by multiplying the two parameters
Operating costs		
▶ Costs for completion and growing of poultry for slaughter	R\$/poultry)	Costs to be incurred with animal feed, medicines, freights (among others) to prepare the animal for slaughter
CACs (Contributory Asset Charge)		
▶ Land CAC	R\$	Hypothetical lease of property, plant and equipment items applied to the poultry treatment and handling
▶ CAC of the Breeding Animals	R\$	Hypothetical lease of the Breeding Animals used in the generation of poultry
Discount rate		
▶ WACC	%	WACC post tax
Taxes		
▶ Inc. tax & Soc. contr.	%	Rate of income tax and social contribution on net income.

E.2.2. Calculation

Table E.2 - Calculation of fair value of poultry

Cash flow | Biological assets

Poultry Inventory | **Example – hypothetical values**

General Assumptions

Method	DCF MPEEM
Base date	12/31/2017
Model	Actual
Tax regime	Taxable income
Currency	R\$
<hr/>	
<i>Days</i>	<i>Year (360 days)</i>
<hr/>	
Período	2018

Revenue projection		0	1	2	3	4	5	6	7	8	9
Days	Cut average age (days)										
Volume (heads)	30	0									
		1	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028
		2	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116
		3	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787
		4	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171
		5	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636
		6	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355
		7	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880
		8	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934
		9	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093
		10	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855
		11	89,336	89,336	89,336	89,336	89,336	89,336	89,336	89,336	89,336
		12	81,040	81,040	81,040	81,040	81,040	81,040	81,040	81,040	81,040
		13	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952
		14	177,118	177,118	177,118	177,118	177,118	177,118	177,118	177,118	177,118
		15	183,654	183,654	183,654	183,654	183,654	183,654	183,654	183,654	183,654
		16	135,076	135,076	135,076	135,076	135,076	135,076	135,076	135,076	135,076
		17	114,326	114,326	114,326	114,326	114,326	114,326	114,326	114,326	114,326
		18	195,157	195,157	195,157	195,157	195,157	195,157	195,157	195,157	195,157
		19	106,162	106,162	106,162	106,162	106,162	106,162	106,162	106,162	106,162
		20	179,211	179,211	179,211	179,211	179,211	179,211	179,211	179,211	179,211
		21	107,646	107,646	107,646	107,646	107,646	107,646	107,646	107,646	107,646
		22	185,482	185,482	185,482	185,482	185,482	185,482	185,482	185,482	185,482
		23	123,708	123,708	123,708	123,708	123,708	123,708	123,708	123,708	123,708
		24	182,115	182,115	182,115	182,115	182,115	182,115	182,115	182,115	182,115
		25	130,891	130,891	130,891	130,891	130,891	130,891	130,891	130,891	130,891
		26	181,375	181,375	181,375	181,375	181,375	181,375	181,375	181,375	181,375
		27	100,004	100,004	100,004	100,004	100,004	100,004	100,004	100,004	100,004
		28	149,164	149,164	149,164	149,164	149,164	149,164	149,164	149,164	149,164
		29	162,164	162,164	162,164	162,164	162,164	162,164	162,164	162,164	162,164
		30	140,137	140,137	140,137	140,137	140,137	140,137	140,137	140,137	140,137
Total			4,210,573	4,210,573	3,908,272	3,759,108	3,659,104	3,477,729	3,346,838	3,164,723	3,041,015
Volume slaughtered			302,301	149,164	100,004	181,375	130,891	182,115	123,708	185,482	107,646
Price			3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6

Revenue projection		10	11	12	13	14	15	16	17	18	19
Days											
Cut average age (days)	30										
Volume (heads)	0	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028
	1	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116
	2	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787
	3	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171
	4	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636
	5	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355
	6	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880
	7	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934
	8	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093
	9	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855
	10	89,336	89,336	89,336	89,336	89,336	89,336	89,336	89,336	89,336	89,336
	11	81,040	81,040	81,040	81,040	81,040	81,040	81,040	81,040	81,040	81,040
	12	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952	61,952
	13	177,118	177,118	177,118	177,118	177,118	177,118	177,118	177,118	177,118	177,118
	14	183,654	183,654	183,654	183,654	183,654	183,654	183,654	183,654	183,654	183,654
	15	135,076	135,076	135,076	135,076	135,076	135,076	135,076	135,076	135,076	135,076
	16	114,326	114,326	114,326	114,326	114,326	114,326	114,326	114,326	114,326	114,326
	17	195,157	195,157	195,157	195,157	195,157	195,157	195,157	195,157	195,157	195,157
	18	106,162	106,162	106,162	106,162	106,162	106,162	106,162	106,162	106,162	106,162
	19	179,211	179,211	179,211	179,211	179,211	179,211	179,211	179,211	179,211	179,211
	20	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	-	-	-	-	-
	26	-	-	-	-	-	-	-	-	-	-
	27	-	-	-	-	-	-	-	-	-	-
	28	-	-	-	-	-	-	-	-	-	-
	29	-	-	-	-	-	-	-	-	-	-
	30	-	-	-	-	-	-	-	-	-	-
Total		2,747,887	2,568,676	2,462,514	2,267,357	2,153,031	2,017,955	1,834,301	1,657,183	1,595,231	1,514,191
Volume slaughtered		179,211	106,162	195,157	114,326	135,076	183,654	177,118	61,952	81,040	89,336
Price	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6

Revenue projection		20	21	22	23	24	25	26	27	28	29	30
Cut average age (days)	30											
Volume (heads)	0	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028	165,028	-
	1	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116	140,116	-
	2	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787	105,787	-
	3	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171	118,171	-
	4	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636	112,636	-
	5	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355	114,355	-
	6	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880	138,880	-
	7	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934	142,934	-
	8	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093	195,093	-
	9	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855	191,855	-
	10	-	-	-	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-	-
	13	-	-	-	-	-	-	-	-	-	-	-
	14	-	-	-	-	-	-	-	-	-	-	-
	15	-	-	-	-	-	-	-	-	-	-	-
	16	-	-	-	-	-	-	-	-	-	-	-
	17	-	-	-	-	-	-	-	-	-	-	-
	18	-	-	-	-	-	-	-	-	-	-	-
	19	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	-	-	-	-	-	-
	26	-	-	-	-	-	-	-	-	-	-	-
	27	-	-	-	-	-	-	-	-	-	-	-
	28	-	-	-	-	-	-	-	-	-	-	-
	29	-	-	-	-	-	-	-	-	-	-	-
	30	-	-	-	-	-	-	-	-	-	-	-
Total		1,424,855	1,233,000	1,037,907	894,973	756,093	641,738	529,102	410,931	305,144	165,028	-
Volume slaughtered		191,855	195,093	142,934	138,880	114,355	112,636	118,171	105,787	140,116	165,028	-
Price	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6

Revenue	0	1	2	3	4	5	6	7	8	9
0										
1	-									
2	-									
3	-									
4	-									
5	-									
6	-									
7	-									
8	-									
9	-									
10	-									
11	-									
12	-									
13	-									
14	-									
15	-									
16	-									
17	-									
18	-									
19	-									
20	-									
21	-									387,526
22	-								667,735	
23	-							445,349		
24	-					655,614				
25	-				471,208					
26	-			652,950						
27	-		360,014							
28	-	536,990								
29	583,790									
30	504,493									
Total	1,088,284	536,990	360,014	652,950	471,208	655,614	445,349	667,735	387,526	

Days	10	11	12	13	14	15	16	17	18	19
Revenue										
0										
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	321,610
12	-	-	-	-	-	-	-	-	291,744	-
13	-	-	-	-	-	-	-	223,027	-	-
14	-	-	-	-	-	-	637,625	-	-	-
15	-	-	-	-	-	661,154	-	-	-	-
16	-	-	-	-	486,274	-	-	-	-	-
17	-	-	-	411,574	-	-	-	-	-	-
18	-	-	702,565	-	-	-	-	-	-	-
19	-	382,183	-	-	-	-	-	-	-	-
20	645,160	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
Total	645,160	382,183	702,565	411,574	486,274	661,154	637,625	223,027	291,744	321,610

Days	20	21	22	23	24	25	26	27	28	29	30
Revenue											
0	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	594,101	-
2	-	-	-	-	-	-	-	-	504,418	-	-
3	-	-	-	-	-	-	-	380,833	-	-	-
4	-	-	-	-	-	425,416	-	-	-	-	-
5	-	-	-	-	405,490	-	-	-	-	-	-
6	-	-	-	411,678	-	-	-	-	-	-	-
7	-	-	499,968	-	-	-	-	-	-	-	-
8	-	514,562	-	-	-	-	-	-	-	-	-
9	-	702,335	-	-	-	-	-	-	-	-	-
10	690,678	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-
Total	690,678	702,335	514,562	499,968	411,678	405,490	425,416	380,833	504,418	594,101	-

Provision for costs and CACs

Days	0	1	2	3	4	5	6	7	8	9
Costs										
0	237,237	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181
1	215,327	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690
2	232,470	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610
3	220,346	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475
4	202,081	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083
5	202,784	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449
6	234,174	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181
7	190,491	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659
8	222,899	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614
9	226,186	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309
10	235,704	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405
11	238,212	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234
12	190,521	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207
13	221,684	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855
14	233,728	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582
15	201,338	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381
16	213,061	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389
17	190,659	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888
18	222,227	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202
19	212,398	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240
20	209,134	23,237	23,237	23,237	23,237	23,237	23,237	23,237	23,237	23,237
21	188,874	23,609	23,609	23,609	23,609	23,609	23,609	23,609	23,609	23,609
22	213,409	30,487	30,487	30,487	30,487	30,487	30,487	30,487	30,487	30,487
23	191,186	31,864	31,864	31,864	31,864	31,864	31,864	31,864	31,864	31,864
24	193,578	38,716	38,716	38,716	38,716	38,716	38,716	38,716	38,716	38,716
25	185,778	46,445	46,445	46,445	46,445	46,445	46,445	46,445	46,445	46,445
26	228,708	76,236	76,236	76,236	76,236	76,236	76,236	76,236	76,236	76,236
27	239,791	119,896	119,896	119,896	119,896	119,896	119,896	119,896	119,896	119,896
28	236,980	236,980	236,980	236,980	236,980	236,980	236,980	236,980	236,980	236,980
29	222,751	222,751	222,751	222,751	222,751	222,751	222,751	222,751	222,751	222,751
30	222,751	222,751	222,751	222,751	222,751	222,751	222,751	222,751	222,751	222,751
Total	6,453,716	1,094,857	635,126	515,231	438,995	392,550	353,834	321,970	291,483	267,874

Provision for costs and CACs		10	11	12	13	14	15	16	17	18	19	
		Days	10	11	12	13	14	15	16	17	18	19
Costs	Cost to be incurred											
0												
1	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181
2	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690
3	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610
4	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475	8,475
5	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083	8,083
6	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449	8,449
7	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181	10,181
8	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659	8,659
9	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614	10,614
10	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309	11,309
11	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405	12,405
12	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234	13,234
13	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207	11,207
14	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855	13,855
15	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582	15,582
16	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381	14,381
17	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389	16,389
18	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888	15,888
19	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202	20,202
20	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240	21,240
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
Total	244,637	223,397	203,195	187,306	170,917	156,536	140,954	127,099	115,891	102,657	88,488	76,249

Provision for costs and CACs

Days	20	21	22	23	24	25	26	27	28	29	30
Costs	Cost to be incurred										
0											
1	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	8,181	
2	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690	7,690		8,181
3	8,610	8,610	8,610	8,610	8,610	8,610	8,610	8,610			
4	8,475	8,475	8,475	8,475	8,475	8,475	8,475				
5	8,083	8,083	8,083	8,083	8,083	8,083					
6	8,449	8,449	8,449	8,449	8,449						
7	10,181	10,181	10,181	10,181							
8	8,659	8,659	8,659								
9	10,614	10,614									
10	11,309										
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
Total	90,252	78,943	68,328	59,670	49,488	41,039	32,956	24,481	15,871	8,181	-

Days	0	1	2	3	4	5	6	7	8	9
Operating income	(6,573)	(98,136)	(155,216)	213,955	78,658	301,780	123,379	376,252	119,652	
Depreciation/amortization	(610,964)	(301,467)	(202,113)	(366,567)	(264,536)	(368,062)	(250,019)	(374,867)	(217,557)	
Amortization of amount paid	(610,964)	(301,467)	(202,113)	(366,567)	(264,536)	(368,062)	(250,019)	(374,867)	(217,557)	
Inc. tax/Soc. contr. on net income	-	-	-	-	-	-	-	-	-	-
Calculation of income tax and social contribution										
Taxable base	(617,537)	(399,603)	(357,329)	(152,611)	(185,879)	(66,283)	(126,641)	1,385	(97,906)	
Opening balance			(209,963)	(345,828)	(467,319)	(519,207)	(582,406)	(604,942)	(648,000)	(647,529)
Income tax and social contribution payable									471	
Recoverable income tax and social contribution	(209,963)	(135,865)	(121,492)	(51,888)	(63,199)	(22,536)	(43,058)			(33,288)
IRCS paid										
Closing balance	(209,963)	(345,828)	(467,319)	(519,207)	(582,406)	(604,942)	(648,000)	(647,529)	(680,817)	
Monthly Calculation										
(+) Depreciation/amortization	610,964	301,467	202,113	366,567	264,536	368,062	250,019	374,867	217,557	
CAC's (Contributory Asset Charges)										
CAC of property, plant and equipment										
Farm	0.02%	(3,563)	(3,307)	(3,181)	(3,097)	(2,943)	(2,832)	(2,678)	(2,573)	(2,416)
Rations	0.02%	(1,771)	(1,644)	(1,581)	(1,539)	(1,463)	(1,408)	(1,331)	(1,279)	(1,201)
Use of fixed assets		100.0%	92.8%	86.9%	86.9%	82.6%	79.5%	75.2%	72.2%	67.8%
Farm	10,939,610	10,939,610	10,154,193	9,766,645	9,506,822	9,035,587	8,695,515	8,222,357	7,900,948	7,419,042
Apportionment of the Animal Feed Plant	11,072,945	11,072,945	10,277,955	9,885,685	9,622,695	9,145,715	8,801,499	8,322,574	7,997,247	7,509,467
CAC of the Breeding Animals										
Breeding Animals	0.02%	(3,923)	(3,642)	(3,503)	(3,410)	(3,241)	(3,119)	(2,949)	(2,834)	(2,661)
Use of Breeding Animals		100.0%	92.8%	89.3%	86.9%	82.6%	79.5%	75.2%	72.2%	67.8%
Breeding Animals	20,873,922	20,873,922	19,375,264	18,635,784	18,140,014	17,240,847	16,591,954	15,689,119	15,075,836	14,156,309
Total CAC	(7,487)	(6,949)	(6,684)	(6,506)	(6,184)	(5,951)	(5,627)	(5,407)	(5,077)	
Cash flow	(14,060)	(105,085)	(161,900)	207,449	72,474	295,829	117,752	370,845	114,574	
Discount factor	0.9998	0.9997	0.9995	0.9994	0.9993	0.9991	0.9990	0.9988	0.9987	

Days	10	11	12	13	14	15	16	17	18	19
Operating income	400,523	158,786	499,371	224,267	315,357	504,619	496,671	95,929	175,853	218,952
Depreciation/amortization	(362,193)	(214,558)	(394,421)	(231,058)	(272,995)	(371,173)	(357,963)	(125,208)	(163,785)	(180,552)
Amortization of amount paid	(362,193)	(214,558)	(394,421)	(231,058)	(272,995)	(371,173)	(357,963)	(125,208)	(163,785)	(180,552)
Inc. tax/Soc. contr. on net income	-	-	-	-	-	-	-	-	-	-
Calculation of income tax and social contribution										
Taxable base	38,329	(55,772)	104,950	(6,791)	42,362	133,446	138,708	(29,279)	12,067	38,400
Opening balance	(680,817)	(667,785)	(686,748)	(651,065)	(653,373)	(638,970)	(593,599)	(546,438)	(556,393)	(552,290)
Income tax and social contribution payable	13,032	-	35,683	-	14,403	45,372	47,161	-	4,103	13,056
Recoverable income tax and social contribution	-	(18,962)	-	(2,309)	-	-	-	(9,955)	-	-
IRCS paid	-	-	-	-	-	-	-	-	-	-
Closing balance	(667,785)	(686,748)	(651,065)	(653,373)	(638,970)	(593,599)	(546,438)	(556,393)	(552,290)	(539,234)
Monthly Calculation	-	-	-	-	-	-	-	-	-	-
(+) Depreciation/amortization	362,193	214,558	394,421	231,058	272,995	371,173	357,963	125,208	163,785	180,552
CAC's (Contributory Asset Charges)										
CAC of property, plant and equipment	(2,325)	(2,174)	(2,084)	(1,919)	(1,822)	(1,708)	(1,552)	(1,402)	(1,350)	(1,281)
Farm	(1,156)	(1,080)	(1,036)	(954)	(905)	(849)	(771)	(697)	(671)	(637)
Rations	(1,170)	(1,093)	(1,048)	(965)	(917)	(859)	(781)	(705)	(679)	(645)
Use of fixed assets	65.3%	61.0%	58.5%	53.8%	51.1%	47.9%	43.6%	39.4%	37.9%	36.0%
Farm	7,139,363	6,673,750	6,397,928	5,890,885	5,593,851	5,242,906	4,765,750	4,305,574	4,144,615	3,934,063
Apportionment of the Animal Feed Plant	7,226,380	6,755,092	6,475,908	5,962,685	5,662,031	5,306,809	4,823,836	4,358,052	4,195,131	3,982,012
CAC of the Breeding Animals	(2,560)	(2,394)	(2,295)	(2,113)	(2,006)	(1,880)	(1,709)	(1,544)	(1,486)	(1,411)
Breeding Animals	(2,560)	(2,394)	(2,295)	(2,113)	(2,006)	(1,880)	(1,709)	(1,544)	(1,486)	(1,411)
Use of Breeding Animals	65.3%	61.0%	58.5%	53.8%	51.1%	47.9%	43.6%	39.4%	37.9%	36.0%
Breeding Animals	13,622,654	12,734,215	12,207,917	11,240,426	10,673,654	10,004,015	9,093,550	8,215,487	7,908,360	7,506,604
Total CAC	(4,886)	(4,567)	(4,378)	(4,031)	(3,828)	(3,588)	(3,261)	(2,947)	(2,836)	(2,692)
Cash flow	395,637	154,219	494,992	220,236	311,528	501,031	493,410	92,982	173,016	216,260
Discount factor	0.9986	0.9984	0.9983	0.9982	0.9980	0.9979	0.9978	0.9976	0.9975	0.9974

Days	20	21	22	23	24	25	26	27	28	29	30
Operating income	600,426	623,392	446,234	440,298	362,190	364,451	392,460	356,352	488,547	585,920	-
Depreciation/amortization	(387,747)	(394,292)	(288,876)	(280,683)	(231,117)	(227,642)	(238,829)	(213,800)	(283,181)	(333,529)	-
Amortization of amount paid	(387,747)	(394,292)	(288,876)	(280,683)	(231,117)	(227,642)	(238,829)	(213,800)	(283,181)	(333,529)	-
Inc. tax/Soc. contr. on net income	-	-	-	-	-	-	-	-	-	-	(66,162)
Calculation of income tax and social contribution											
Taxable base	212,679	229,101	157,358	159,616	131,073	136,808	153,631	142,552	205,366	252,391	-
Opening balance	(539,234)	(466,923)	(389,029)	(335,527)	(281,258)	(236,693)	(190,178)	(137,944)	(89,476)	(19,652)	66,162
Income tax and social contribution payable	72,311	77,894	53,502	54,269	44,565	46,515	52,235	48,468	69,824	85,813	-
Recoverable income tax and social contribution	-	-	-	-	-	-	-	-	-	-	-
IRCS paid	-	-	-	-	-	-	-	-	-	-	(66,162)
Closing balance	(466,923)	(389,029)	(335,527)	(281,258)	(236,693)	(190,178)	(137,944)	(89,476)	(19,652)	66,162	-
Monthly Calculation	-	-	-	-	-	-	-	-	-	-	1
(+) Depreciation/amortization	387,747	394,292	288,876	280,683	231,117	227,642	238,829	213,800	283,181	333,529	-
CAC's (Contributory Asset Charges)											
CAC of property, plant and equipment	(1,206)	(1,043)	(878)	(757)	(640)	(543)	(448)	(348)	(258)	(140)	-
Farm	(599)	(519)	(437)	(376)	(318)	(270)	(223)	(173)	(128)	(69)	-
Rations	(607)	(525)	(442)	(381)	(322)	(273)	(225)	(175)	(130)	(70)	-
Use of fixed assets	33.8%	29.3%	24.7%	21.3%	18.0%	15.2%	12.6%	9.8%	7.2%	3.9%	0.0%
Farm	3,701,956	3,203,492	2,696,616	2,325,255	1,964,427	1,667,318	1,374,675	1,067,652	792,803	428,764	-
Apportionment of the Animal Feed Plant	3,747,077	3,242,538	2,729,483	2,353,596	1,988,370	1,687,640	1,391,430	1,080,664	802,466	433,990	-
CAC of the Breeding Animals	(1,328)	(1,149)	(967)	(834)	(705)	(598)	(493)	(383)	(284)	(154)	-
Breeding Animals	(1,328)	(1,149)	(967)	(834)	(705)	(598)	(493)	(383)	(284)	(154)	-
Use of Breeding Animals	33.8%	29.3%	24.7%	21.3%	18.0%	15.2%	12.6%	9.8%	7.2%	3.9%	0.0%
Breeding Animals	7,063,721	6,112,599	5,145,426	4,436,830	3,748,332	3,181,417	2,623,024	2,037,191	1,512,752	818,127	-
Total CAC	(2,533)	(2,192)	(1,845)	(1,591)	(1,344)	(1,141)	(941)	(731)	(543)	(293)	-
Cash flow	597,893	621,200	444,389	438,707	360,845	363,310	391,519	355,622	488,004	585,627	(66,162)
Discount factor	0.9972	0.9971	0.9970	0.9968	0.9967	0.9965	0.9964	0.9963	0.9961	0.9960	0.9959

Days	20	21	22	23	24	25	26	27	28	29	30
Calculation of discount rate											
Actual WACC	5,00%										
Discount rate in the period	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Accumulated discount rate	0.29%	0.30%	0.31%	0.33%	0.34%	0.35%	0.37%	0.38%	0.39%	0.41%	0.42%
Accumulated discount rate - Half	0.28%	0.29%	0.31%	0.32%	0.33%	0.35%	0.36%	0.37%	0.39%	0.40%	0.41%
Formula – Half Rate	0.9972	0.9971	0.9970	0.9968	0.9967	0.9965	0.9964	0.9963	0.9961	0.9960	0.9959
Formula – Full Rate	0.9972	0.9970	0.9969	0.9968	0.9966	0.9965	0.9963	0.9962	0.9961	0.9959	0.9958
Cash flow at present value	596,234	619,392	443,035	437,312	359,649	362,056	390,116	354,299	486,123	583,290	(65,889)

DCF	
Total FDC	8,509,754
Total DCF (Value Included)	8,509,754
Check	-
Price per poultry	2.02

Notes:

- [a] Discounted Cash Flow | Multi Period Excess Earnings
- [b] Base date for calculation and of financial statements. The biological asset existing on that date shall be considered.
- [c] The period is that including the projection of the slaughter for all biological assets existing on the base date
 - > income receivable as of the base date, referring to the biological asset existing on the base date
- [d] Volume: number of biological assets (poultry) existing on the base date, per head
 - > Number of birds for the period, pursuant to the slaughter
- [e] Price: the price calculated per head considering the price per kg and the average weight of the bird in the population
 - > There is no active market for poultry selling since the large producers of these animals work in an integrated manner with external producers, and there is no active market for animals ready for slaughter in Brazil. Thus, prices were estimated based on the average margin per kilogram of "in natura" products of these animals practiced by the Company in question, excluding the industrialization activity expenses (packaging expenses, direct and indirect costs), besides of the industrial profit margin estimated for this activity.
- [f] Revenue: the number of birds for slaughter multiplied by the price
 - > cost to be incurred as of the base date, which benefits the biological asset existing on the base date
- [g] Cost: cost to be incurred for growing the animal until slaughter
- [h] Amortization of the amount paid considering the exhaustion of the existing population. Considered to calculate the tax. (Tax Benefit of Own Assets)
- [i] Income taxes: determination is monthly made.
- [j] Return on Depreciation/Amortization (with no cash effect)
- [k] Contributory assets used: Fixed Assets and Animal Breeders
 - > Calculation considers the percentage of use and a rate of remuneration
- [l] Discount rate: Half-rate factor
- [m] Fair Value of Biological Asset – Sum of the daily values of Cash Flow at Present Value
- [n] Fair Value of Biological Assets provided as the value for calculating the tax benefit of asset amortization

E.3 Swine

E.3.1 Assumptions

Chart E.2 – Assumptions: General, revenue, CACs, discount rate and taxes with the respective units and description – swine

ASSUMPTION	UNIT	DESCRIPTION
General		
▶ Volume		Number of pigs on the base date
▶ Forecast period		After Review 8 of CPC 29, the projection of the biological asset only contemplates the swine existing on the base date. (without new births)
Income		
▶ Cutting age	days	Estimated age for slaughter
▶ Price	R\$/swine)	It is necessary to calculate the price per kg, and calculate the average weight of the swine population. The final price will be obtained by multiplying the two parameters
Operating costs		
▶ Costs for completion and growing swine for slaughter	R\$/swine)	Costs to be incurred with animal feed, medicines, freights (among others) to prepare the animal for slaughter
CACs (Contributory Asset Charge)		
▶ Land CAC	R\$	Hypothetical lease of property, plant and equipment items applied to the swine treatment and handling
▶ CAC of the Breeding Animals	R\$	Hypothetical lease of the Breeding Animals used in the generation of swine
Discount rate		
▶ WACC	%	WACC post tax
Taxes		
▶ Inc. tax & Soc. contr.	%	Rate of income tax and social contribution on net income.

E.3.2 Calculation

- ◆ The calculation for swine follows the same methodology and structure of the poultry valuation.
- ◆ As with poultry, pigs are evaluated by the projected income method in days.
- ◆ The number of days in the flow corresponds to the number of days between the ages of the pigs and the date of slaughter for the animals present on the valuation base date. Usually the period between the birth and the slaughter of the animals occurs in up to 190 days.



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