

Understanding the measurement of biological assets in accordance with IFRS 13 *Fair Value Measurement*

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Aim

- » The aim of this session is to enhance knowledge and understanding, in the Ethiopian accountancy market, of the fair value of biological assets measured in accordance with IFRS 13 *Fair Value Measurement*.
- » *[Note: the valuation session that follows after the coffee break is dedicated to enhancing skills in the Ethiopian accountancy market in the practical application of IFRS 13 to measuring the fair value of biological assets in the Ethiopian context.]*

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Ethiopian context

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Ethiopian context 10-year Economic development plan (2021-2030)

- » Government of Ethiopia (GOE) 10-year economic development plan (2021-2030) has **agriculture as a top priority sector**.
 - » Plan envisages building a **climate resilient green economy**: fight land degradation; reduce pollution; reduce GHG emissions; increase forest protection and development; increase production of electricity from renewable sources for domestic use and for export; and focus on modern and energy saving technologies.
- » GOE continues to invest heavily in the expansion of the **sugar industry**.
- » Developing agro-processing sector (e.g. processed food, beverages, and **livestock** products – meat, milk, and eggs), as well as the **textile/apparel** and leather industries.
 - » Building Integrated Agro-Industrial Parks (IAIP) in four pilot areas: Amhara, Oromia, SNNP, and Tigray regional states
- » Cash crops show potential for growth and offer possible investment opportunities in areas such as **coffee, oilseeds, pulses, fruits and vegetables, honey, cut flowers, tea, and spices**.

Source: www.trade.gov/country-commercial-guides/ethiopia-agricultural-sector

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Ethiopian context 10-year Economic development plan (2021-2030)

Agriculture Focus Areas	Objectives
1. Free agriculture from rain dependence	<ul style="list-style-type: none"> • Improve income and livelihood options for farming and pastoral communities through increased productivity and competitiveness • Raise export of agricultural output and substitute imports • Make agriculture a viable and profitable enterprise through value addition • Create rural employment opportunities • Enhance livestock health access and quality • Preserve animal genetic resources and increase pastoral research • Improve the development of animal feed and access to markets • Develop livestock specific extension package for each livestock type
2. Agricultural mechanization services	
3. Contract farming, cluster approach and land consolidation	
4. Livestock, animal feed and animal health	
5. Horticulture (irrigation and urban farming)	
6. Private sector participation	
7. Institutional implementation capacity	
8. Climate resilient sustainable agricultural development	

Source: www.trade.gov/country-commercial-guides/ethiopia-agricultural-sector

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Ethiopian context

Homegrown Economic Reform Plan

- » To overcome challenges in the agricultural sector, Homegrown Economic Reform Plan (developed with support from IMF) prescribes :
- » Enhance **productivity** of small-holder farmers and pastoralists through provision of modern inputs and services;
 - » **Develop a legal framework that will allow farmers to lease land and to become shareholders in large commercial farms;**
 - » **Modernize livestock production** through improving veterinary infrastructure, research and innovation, and establishing linkages with other industries;
 - » Establish effective linkages between agriculture producers and **commodity markets** as well as the commercial value chain;
 - » Encourage private sector investment in agricultural R&D and exploring PPPs to expand medium and **large-scale irrigation infrastructure;** and
 - » Develop a legal framework for agriculture-specific financial services such as micro-lending, crop insurance and **forward contracts.**

Source: www.trade.gov/country-commercial-guides/ethiopia-agricultural-sector

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Ethiopian context

Ethiopian exports

The top exports from Ethiopia are [Coffee](#) (\$1.16B), [Gold](#) (\$860M), [Other Oily Seeds](#) (\$337M), [Other Vegetables](#) (\$272M), and [Cut Flowers](#) (\$235M), exporting mostly to [United Arab Emirates](#) (\$1.05B), [United States](#) (\$495M), [Somalia](#) (\$361M), [Saudi Arabia](#) (\$248M), and [Germany](#) (\$248M).
(source: <https://oec.world/en/profile/country/eth>)

Item	2016/17	2017/18	2018/19	2019/20	2020/21
Total export value	2.9	2.8	2.7	2.67	3.41
Total value of Agricultural export	2.34	2.38	2.3	1.94	3.16
Agricultural exports share out of total exports (%)	81	85	85	73	93
Coffee exports	0.897	0.767	0.789	0.82	1.1
Coffee exports share of total agricultural exports (%)	38	32	34	42	35
Coffee exports share of total exports (%)	31	27	29	31	32

Source: Post calculation

Source: USDA, Ethiopia: Coffee Annual, 09 2022, p4 see www.fas.usda.gov/data/ethiopia-coffee-annual-7

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Ethiopian context Coffee

- » Ethiopia is the largest coffee producer in Africa and the fifth-largest in the world.
- » Usually grown at an [altitude](#) of 1500-2200 metres above sea level and harvested between November and February, Ethiopian coffee accounts for 3% of the worldwide coffee market.
- » Arabica and native heirloom varieties are most commonly grown on small plantations throughout the country.
- » While over 850 million pounds of coffee is produced in Ethiopia, only around half of that is exported – the rest is consumed domestically.
- » Yirgacheffe, Harrar and Sidama are the most well-known regions. Sidama produces some lower quality coffee so is usually the cheapest you can get from Ethiopia. Other beans, such as Yirgacheffe, can be more expensive, but tend to reflect better price-to-quality value.

Source: <https://coffeebeansdelivered.com.au/blogs/news/the-ethiopian-coffee-industry>

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Ethiopian context Ethiopian coffee market (2021/22 Ethiopian coffee production)

- » **Domestic market** = 42% (of which around 5% is smuggled for cross-border trade and the black market).
 - » Domestic market is mainly coffee rejected or failed to meet ECX export quality standards.
 - » However, the **local price is usually higher than international price** for coffee arabica.
- » **Export market** = 58%, of which:
 - » 80–85% goes through the Ethiopian Coffee Exchange (ECX);
 - » 5–10% through direct trade by cooperatives; and
 - » 5% through commercial farms.
- » In January 2022 only, Ethiopia sold around 11,200 bags (672 MT) of coffee online during the **Ethiopian coffee brands launch on China's largest E-commerce platform**, Alibaba (Tmall Global) because of joint effort with the United Nations Economic Commission for Africa (ECA) and the Government of Ethiopia.
- » The main reason behind the increased coffee export from Ethiopia is the recurrent drought and the frost that occurred in parts of Coffee Arabica producing areas of South America which affected the volume and quality of coffee arabica production.

Source: USDA, Ethiopia: Coffee Annual, 09 2022, p3&4 see www.fas.usda.gov/data/ethiopia-coffee-annual-7

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Ethiopian context

Ethiopian coffee market: policies and practices

- » **Observed practice:** in the past coffee traders have **distorted the export market** by exporting coffee at a loss to earn foreign currency that is then used to import construction materials and vehicles to sell in Ethiopia at a huge profit.
- » **Export Coffee Contract Administration directive:** On 28/01/2020 Coffee and Tea Authority coordinate with National Bank of Ethiopia (NBE) to create a mechanism that each day fixes a **minimum coffee export price** based on the global weighted average price given to different grades of coffee from various regions.
 - » If sell below the minimum coffee export price, the Administration and Ministry of Trade take legal action.
- » **NBE recently announced Directive:** in response to critical shortage of foreign currency in Ethiopia:
 - » Max. 20% of coffee exporters export earnings may be retained in USD to fund imports.
 - » Min. 80% of coffee exporters export earnings must be converted to Birr for local use.

Source: USDA, Ethiopia: Coffee Annual, 09 2022, p5-p6 see www.fas.usda.gov/data/ethiopia-coffee-annual-7 11

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Ethiopian context

Ethiopian coffee market: current developments

- » The growth in production volume is mainly due to the **higher yields** observed in the coffee growing belts mainly in southern and western regions and **new tree** arrival for harvesting.
- » The two common coffee processing methods of are sun-dried and wet processing. Ethiopian coffee is currently:
 - » 70-80% **unwashed** or sun-dried; and
 - » 20-30% **washed** coffee.
- » Unwashed coffee earns a lower price in many markets, including the U.S where consumers prefer “cleaner” washed coffee. Other countries, like Japan, specifically require unwashed coffee for a more natural and richer taste.

Source: USDA, Ethiopia: Coffee Annual, 09 2022, p2 see www.fas.usda.gov/data/ethiopia-coffee-annual-7 12

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Ethiopian context Ethiopian coffee market: current developments

- » June 2021: Ethiopia launched a state-of-the-art coffee training center that aims to enhance the **sustainability** and **value chain** in Ethiopia's coffee sector (at Ethiopian Coffee and Tea Authority (ECTA) in Addis).
- » Factors considered for coffee quality during export in Ethiopia:
 - » Certification (eg **fair-trade**)
 - » Coffee **grade** and coffee cupping tests
 - » **origin**: from well-recognized geographical location in particularly Harar and Yirgacheffe
 - » Post-harvest treatment: sun dried or **washed** coffee.
- » Good quality coffees are sometimes labelled under specialty coffee that account for 25% of export volumes.

Source: USDA, Ethiopia: Coffee Annual, 09 2022, p2 see www.fas.usda.gov/data/ethiopia-coffee-annual-7

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Ethiopian context Ethiopian khat market

- » Ethiopia is a **leading khat producer** in East Africa. Khat generates significant export revenue and local taxation.
- » In pursuit of higher income some Ethiopian farmers have **moved from coffee toward growing only khat**. The transition has led to declines in food security, biodiversity, soil health, and women's empowerment. Khat plants require less care and are drought resistant compared to coffee.

Source: USDA, Ethiopia: Coffee Annual, 09 2022, p1-p2 see www.fas.usda.gov/data/ethiopia-coffee-annual-7

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When are biological assets measured at fair value?

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Which IFRS Accounting Standards apply to which biological assets (ie living plants and animals) and harvested produce?

Summary of class discussion: animals

	IAS 41 <i>Agriculture</i>	IAS 16 <i>Property, Plant and Equipment</i>	IAS 2 <i>Inventories</i>
Cows	Breeders' cows	Field ploughing oxen	Dealers' cows / Farmers' cow carcasses (from point of slaughter).
Donkeys	Breeders' donkeys	Beasts of burden donkeys	Dealers' donkeys / Breeders' donkey carcasses (from point of slaughter).
Fish	Breeders' fish	Fish tanks (fishponds)	Dealers' fish / Breeders' fish carcasses (from point of slaughter).

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Which IFRS Accounting Standards apply to which biological assets Bearer plants

- » **Judgement** must be exercised to determine whether some plants are bearer plants (an **artificial construct**).
- » **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.” (paragraph 5 of IAS 41)

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Which IFRS Accounting Standards apply to which biological assets Not bearer plants

- » “the following are **not bearer plants** (paragraph 5A of IAS 41):
 - (a) plants cultivated to be harvested as agricultural produce (for example, **trees grown for use as lumber**);
 - (b) plants cultivated to produce agricultural produce when there is more than a remote likelihood that the entity will also harvest and sell the plant as agricultural produce, **other than as incidental scrap sales** (for example, **trees that are cultivated both for their fruit and their lumber**); and
 - (c) **annual crops** (for example, maize and wheat).”

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Which IFRS Accounting Standards apply to which biological assets (ie living plants and animals) and harvested produce?
Summary of class discussion: bearer plants

	IAS 41 Agriculture	IAS 16 Property, Plant and Equipment	IAS 2 Inventories
Coffee plants	Nurseries' plants (propagating plants for sale) / cherries ripening on farmers' plants.	Coffee farmers' plants excluding attached produce (cherries).	Dealers' plants (trader, no propagation) / Farmers' harvested coffee cherries.
Tea plants	Nurseries' plants / leaves growing on farmers' plants.	Tea farmers' plants excluding attached produce (leaves).	Dealers' plants / Farmers' harvested tea leaves.

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Which IFRS Accounting Standards apply to which biological assets (ie living plants and animals) and harvested produce?
Summary of class discussion: rubber plantation

	IAS 41 Agriculture	IAS 16 Property, Plant and Equipment	IAS 2 Inventories
If judged to be bearer plants	Nurseries' plants / latex in the farmers' plants.	Rubber farmers' plants excluding produce (latex) inside the trees.	Dealers' plants / Farmers' harvested latex.
If trees not judged to be bearer plants	Nurseries' plants / Farmers' plants.		Dealers' plants / Farmers' harvested latex.

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Which IFRS Accounting Standards apply to which biological assets (ie living plants and animals) and harvested produce?

Summary of class discussion: rubber tree classification judgement

- » A **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.** (paragraph 5 of IAS 41)
- » Judgement is required to determine whether rubber trees are bearer plants (in the scope of IAS 16).
 - » It is typically easily concluded that farmed rubber trees satisfy parts (a) and (b) of the bearer plant definition.
 - » The judgement in assessing part (c) of the bearer plant definition hinges on whether there is **more than a remote likelihood** that the reporting entity will also harvest and sell the tree as agricultural produce, **other than as incidental scrap sales**, for example, for use as firewood. (paragraphs 5A and 5B of IAS 41).
 - » The IASB observes that rubber trees **usually** meet the definition of a bearer plant (paragraph 4 of IAS 41).

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Observed practice, sugarcane classification

Extracts from accounting policies in Crookes Brothers 2022

Consolidated Annual Financial Statements (p25) (emphasis added)

3.7 Property, plant and equipment

...“Costs capitalised to **bearer assets** (**sugar cane roots**, banana palms, deciduous and macadamia trees) include all direct costs of land preparation and planting.” ...

...“property, plant and equipment was depreciated on the straight-line basis ... **Sugar cane roots** 7 – 9 years”

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Observed practice, forest assets classification

Extracts from accounting policies in Sveaskog 2022 Annual Financial Statements (p81) (emphasis added)

FOREST ASSETS

Sveaskog's land holdings amount to 3.89 million hectares, of which 3.03 million is productive forest land. **The valuation includes a total of 2.75 million hectares** containing a timber supply estimated at 263 million cubic metres of forest. **The difference between Sveaskog's total productive land holdings and the valuation's land holdings is the deduction of reserves, ecoparks, trial parks and voluntary provisions. ... Forest assets are divided into standing timber (biological assets) and land assets. ...**

Biological assets [IAS 41 fair value model]

...**standing timber** is recognised as **biological assets in accordance with IAS 41**, which means that biological assets are measured and recognised at each reporting date at level 3 of the fair value hierarchy (see Note 28). Changes in fair value are recognised in the income statement and Sveaskog performs a valuation on an earnings basis, where future the cash flow from timber extractions less any harvesting costs, etc. has been discounted to a present value. These calculations include future timber extractions corresponding to a forest growth cycle of 100 years in northern Sweden and 80 years in southern Sweden. The timber extractions are based on Sveaskog's felling and forestry plans. Sveaskog has set aside large areas of productive forest land as nature conservation areas. **The value of standing timber in the nature conservation areas is not included in the value determined on an earnings basis. Other value of the forest land in the form of e.g. hunting income and other lease income is not included in the value determined on an earnings basis.**

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Observed practice, forest assets classification

Extracts from accounting policies in Sveaskog 2022 Annual Financial Statements (emphasis added)

Land assets [IAS 16 revaluation model]

The value of the **land assets amounts to the residual between ... the total market value of the forest assets and the value of the biological assets** that were based on discounted cash flow. The change in value for land is recognised as other comprehensive income and does not affect the year's financial performance. The increase is accumulated in equity under the heading revaluation reserve. The increase is, however, recognised in the income statement to the extent that it reverses a decrease in fair value that was previously recognised in the income statement. If the carrying amount of the asset decreases as a result of revaluation, the decrease is recognised in the income statement. The decrease must, however, be recognised in other comprehensive income to the extent that there is an existing credit balance in the revaluation reserve in respect of that asset, in which case the amount in the revaluation reserve must also be reduced.

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When are biological assets measured at fair value? Summary of class discussion

IFRS Accounting Standard	At initial recognition	Subsequent measurement
IAS 41 <i>Agriculture</i>	Business combination / Otherwise fair value less costs to sell (including government grant).	Fair value less costs to sell.
IAS 16 <i>Property, Plant & Equipment</i> (non-produce part of bearer plants)	Acquired in: (i) exchange of non-monetary items; (ii) government grant (FV alternative); and (iii) business combination.	Revaluation model / Cost model when impaired to fair value less costs to sell.
IFRS 5 <i>Non-current Asset Held for Sale</i> (NCAHFS)	Fair value less costs to sell if measured using fair value model before classified NCAHFS / Otherwise, impair to fair value less costs to sell.	Fair value less costs to sell if measured using fair value model before classified NCAHFS / Otherwise, impair to fair value less costs to sell.
IAS 2 <i>Inventories</i> (agricultural produce at the point of harvest)	Cost = point-of-harvest fair value less costs to sell.	Note: the NRV measurement exception is entity-specific and thus different from fair value less costs to sell. 27

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Acquisition-date measurement of biological assets Quiz: Summary of class discussion

- » **Which measurement applies to biological assets acquired in a business combination on its acquisition date?** Choose one of: 1) historical cost; 2) **fair value**; 3) fair value less costs to sell; 4) value in use; 5) it depends...
- » **Which measurement applies to biological assets acquired by way of government grant on its acquisition date?** Choose one of: 1) historical cost; 2) fair value; 3) fair value less costs to sell; 4) value in use; **5) it depends on whether the item is a bearer plant.**
 - » **If IAS 41 (not bearer plant) = fair value less costs to sell; and**
 - » **If IAS 16 (bearer plant), it depends on the filer's choice, either: (i) fair value; or (ii) nominal amount (because IAS 20 applies).**

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Acquisition-date measurement of biological assets

Quiz: Summary of class discussion

- » Which measurement applies to biological assets acquired by way of exchange of non-monetary items on its acquisition date? Choose one of: 1) historical cost; 2) fair value; **3) fair value less costs to sell;** 4) value in use; 5) it depends...
- » Which measurement applies to agricultural produce at the point of harvest? Choose one of: 1) historical cost; 2) fair value; **3) fair value less costs to sell;** 4) value in use; 5) it depends...

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Subsequent measurement of biological assets

Quiz: Summary of class discussion

- » Which measurement applies to a biological asset when it is classified as non-current asset held for sale? **5) it depends:**
 - » If the fair value model applied before such classification (typically IAS 41) then fair value less costs to sell.
 - » If the cost model applied before such classification (e.g. IAS 16 bearer plant) then the lower of reclassification-date carrying amount and reporting-date fair value less costs to sell.
- » Which measurement applies to a biological asset (eg bearer plant) when it is revalued? **2) fair value.**
- » Which measurement applies to a biological asset (eg bearer plant) when it is impaired? **5) it depends, recoverable amount = the higher of: (i) value in use; and (ii) fair value less costs to sell.**

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What is fair value?

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Fair value: an asset *the concept*

- » The fair value of an asset is:
 - » the price that would be received to sell an asset (exit price)
 - » in an orderly transaction (not a forced sale)
 - » between market participants (market-based view)
 - » at the measurement date (current price) (IFRS 13 *Fair Value Measurement*)

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Fair value measurement objective

- » **Objective** of fair value measurement: **estimate the price** at which an orderly transaction to sell an asset would take place between market participants at the measurement date under current market conditions (paragraph B2 of IFRS 13)
- » The objective **provides focus** to fair value measurement
 - » **Market participant perspective**: consequently, the entity's intention to hold an asset is not relevant when measuring fair value.

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Fair value market participants

- » Characteristics of market participants (ie buyers and sellers in principal market (or most advantageous market)):
 - » independent
 - » knowledgeable
 - » diligent
 - » use all available information
 - » willing to transact for the asset or liability
 - » able to transact for the asset or liability
- » Assumption: market participants act in their economic best interest

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Measuring the fair value of biological assets

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Fair value: market participant perspective *application guidance: how to measure fair value*

- » To measure the fair value of a biological asset:
 - » determine all characteristics of the asset being measured (exclude things that are not characteristics of the asset or liability);
 - » apply the valuation premise;
 - » determine the highest and best use;
 - » determine the principal (or most advantageous) market;
 - » determine the appropriate valuation technique/s and inputs that **market participants would use** when pricing the asset
 - » determine the level of the fair value hierarchy within which the inputs are categorised.

Source: paragraph B2 of IFRS 13

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Fair value: market participants' viewpoint

application guidance: characteristic of an asset

- » Fair value measurement is for the **particular** biological asset
 - » it captures all characteristics of the biological asset being measured that **market participants would take into account** when pricing the item
 - » location
 - » condition
 - » restrictions on use or sale that are a characteristic of the item
 - » it excludes things that are not characteristics of the asset or liability
 - » transactions costs
 - » restrictions on use or sale that are not a characteristic of the item

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Fair value of biological assets: characteristics of the asset

Example: Summary of class discussion

When measuring the fair value of a beef farmer's cow, which of the following, if any, are characteristics of the cow that market participants would take into account when pricing the cow with reference to the selling price of beef cows observed in the Addis Ababa market? Choose one or more of:

- 1) None, ie use the reference price without adjustment.
- 2) The farmer's cow is 20 kms from the Addis Ababa market.
- 3) The farmer's cow is heavier than the reference price cows.
- 4) The breed of the farmer's cow is different from the reference price cows.
- 5) The farmer has identified the cow for delivery to a customer under a fixed-price sale contract entered into 3 months ago that requires physical delivery of 20 cows 6 months later.

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Fair value of a biological asset
application guidance: valuation premise

If biological asset provides **maximum value through its use in combination with other assets** market participants are assumed to hold complementary assets.

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Fair value of biological assets: valuation premise
Example 1: Summary of class discussion

When measuring the acquisition-date fair value of coffee bushes acquired by a coffee farmer in a business combination, which complimentary assets, if any, are assumed to be held by market participants? Choose one of:

- 1) none;
- 2) **the land on which the coffee bushes are planted; or**
- 3) other (specify...).

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Fair value of biological assets: valuation premise

Example 2: What do you think?

- » **When measuring the fair value of growing sugarcane, which complimentary assets, if any, are assumed to be held by market participants?**
- » **It depends. For example:**
 - » **If the sugarcane is ready for harvesting, 1) none.**
 - » **If the sugarcane is immature, 4) both the roots to which the growing cane is attached and the land in which the roots are planted because these are the complimentary assets that are needed for market participants to 'ripen' the sugarcane and thus maximise its value.**

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Fair value of a biological asset

application guidance: highest and best use

- » Fair value measurement logically assumes that a market participant would put a non-financial asset to its **highest and best use** because that maximises the value of the asset.
- » The highest and best use must be
 - » physically possible
 - » legally permissible
 - » financially feasible

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Fair value of a biological asset

Example 1: highest and best use

- » 'Your' company's pine plantation is planted on Farm 10 in the Adola Woreda.
- » **Assume:**
 - » Land rights in the Adola Woreda are divided into one hundred farms that before planting were essentially homogenous; and
 - » Farming pine, like yours, is the highest and best use for the land rights.
- » On 31/12/2022 two of the farms adjoining your farm were sold (ie sale of the land rights and the trees growing thereon, if any):
 - » Farm 9 sold for **ETB30 million**: land rights with a similar trees of the same age, same condition and same planted area as yours.
 - » Farm 11 for **ETB10 million** because it is undeveloped (yet to be planted).

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Fair value of a biological asset

Example 1: highest and best use


Summary of class discussion

On 31/12/2022 what is the fair value of your land rights (ie excluding the growing trees)? Choose one of: 1) ETB0; **2) ETB10 million;** 3) ETB20 million; 4) ETB30 million; 5) ETB70 million; 6) ETB80 million; 7) ETB100; million; or 8) another amount.

On 31/12/2022 what is the fair value of your growing trees (ie excluding the land rights)? Choose one of: 1) ETB0; 2) ETB10 million; **3) ETB20 million;** 4) ETB30 million; 5) ETB70 million; 6) ETB80 million; 7) ETB100; million; or 8) another amount.

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Fair value of a biological asset
Example 2: highest and best use
What do you think?

- » Facts are the same as Example 1. However, assume:
 - » At 31/12/2032 **Macadamia nut farming** is the highest and best use for your land rights. (Note: Macadamia nut farming is estimated to be three times more profitable than pine plantations).
 - » On 31/12/2032 two of the farms adjoining your farm were sold (ie sale of the land rights and the pine trees growing thereon, if any):
 - » Farm 9 sold for **ETB130 million**: land rights with a similar pine trees of the same age, same condition and same planted area as yours.
 - » Farm 11 for **ETB100 million** because it is undeveloped raw land (ie yet to be planted).

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Fair value of a biological asset
Example 2: highest and best use
Summary of class discussion

- » **On 31/12/2032 what is the fair value of your land rights (ie excluding the growing trees)?** Choose one of: 1) ETB0; 2) ETB10 million; 3) ETB20 million; 4) ETB30 million; 5) ETB70 million; 6) ETB80 million; **7) ETB100 million;** 8) ETB130 million; or 9) another amount.
- » **On 31/12/2032 what is the fair value of your growing pine trees (ie excluding the land rights)?** Choose one of: 1) ETB0; 2) ETB10 million; 3) ETB20 million; **4) ETB30 million;** 5) ETB70 million; 6) ETB80 million; 7) ETB100 million; 8) ETB130 million; or 9) another amount.

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Fair value of a biological asset
Example 3.1: highest and best use
What do you think?

In Examples 1 and 2 fair value was determined with reference to the sale of similar assets at the measurement date (31 December 2022 and 2032). **What additional judgements would be necessary if:**

- » the sale of Farms 9 and 11 were near to but not on 31/12/2032?;
- » the topography and fertility of Farms 9, 10 and 11? differ; and
- » the land rights differ between Farms 9, 10 and 11?

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Fair value of a biological asset
Example 3.1: highest and best use
Summary of class discussion

What additional judgements would be necessary if:

- » the sale of Farms 9 and 11 were near to but not on 31/12/2032?;
 - » Adjust from the reference prices all material price effects that occurred in the intervening period/s.
- » the topography and fertility of Farms 9, 10 and 11? differ; and
 - » Adjust from the reference prices all material price effects of the different topography and land fertility.
- » the land rights differ between Farms 9, 10 and 11?
 - » Adjust from the reference prices all material price effects of the different land rights.

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Fair value of a biological asset

Example 3.2: highest and best use

What do you think?

- » Facts are the same as in Example 2, except in **Example 3.2** there have been no recent sales of similar assets (ie Farms 9 and 11 are unsold).
- » **How could the fair value of the growing trees on Farm 10 be measured at 31/12/2032?**
- » **What judgements would be made in measuring such a Level 3 fair value?**

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Fair value of a biological asset

Example 3.2: highest and best use

Summary of class discussion

- » If there had been no recent sales of similar assets (ie Farms 9 and 11 are unsold). **How could the fair value of the growing trees on Farm 10 be measured at 31/12/2032?**
 - » Use a different model to estimate the fair value of the growing trees. For example, a DCF model using **market participant inputs**, ie cash flows (including notional cash flows for the current market rentals for the land use) and discount rate/s.
- » **What judgements would be made in measuring such a Level 3 fair value?**
 - » **Identifying the relevant market participants (for example, macadamia nut farmers);**
 - » **Identifying the model market participants would use to estimate fair value (for example, DCF model);**
 - » **Estimating the model inputs from the market participant perspective (including, if a DCF model, the notional cash flows for the current market rentals for the land use) and the market participant discount rate/s.**

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Fair value of a biological asset

application guidance: appropriate valuation technique/s and inputs

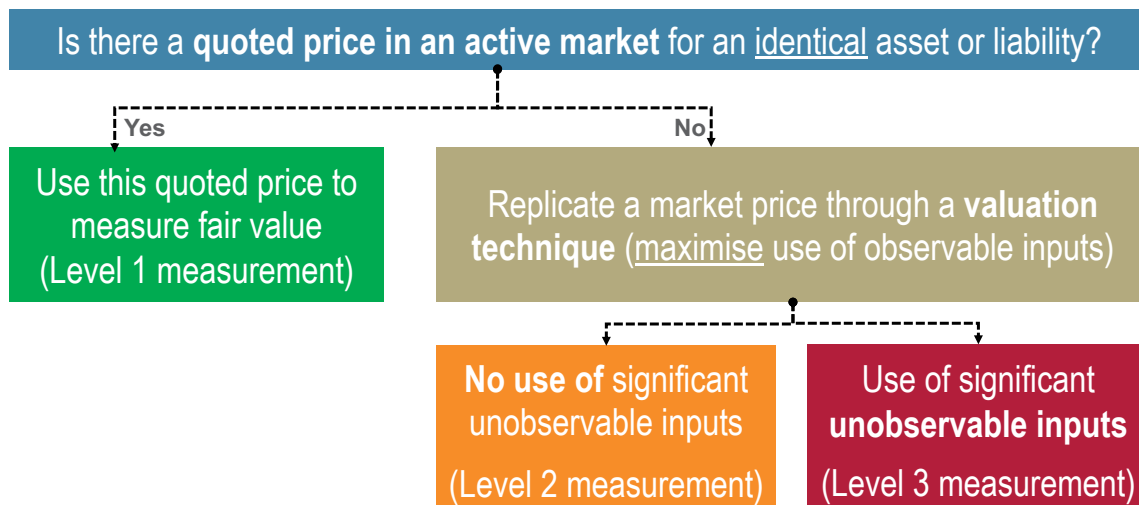
- » Fair value is measured using the valuation technique/s and inputs that **market participants would use** when pricing the asset.
- » The level of the fair value hierarchy within which the inputs are categorised must be determined because:
 - » Unadjusted Price x Quantity rule applies to Level 1 fair value measurement.
 - » To achieve a reliable measurement (faithful representation) different disclosures are specified for each level of the fair value measurement hierarchy.

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Fair value hierarchy

application guidance: Levels 1, 2 and 3



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Fair value measurement hierarchy judging the boundaries of the artificial constructs

- » Boundary between **levels 1 & 2**—do transactions in the market in which the **identical item** trades (and that the entity can access at the measurement date) take place with **sufficient frequency and volume** to provide pricing information on an ongoing basis? (Appendix A to IFRS 13)
- » Boundary between **level 2 and level 3**—significant unobservable inputs?

Example **entity-specific policy**—HSBC (2020) financial statements, p292:

- » “significant unobservable inputs if, in the opinion of management, a significant proportion of the instrument’s inception profit or greater than 5% of the instrument’s valuation is driven by unobservable inputs
- » ‘Unobservable’ in this context means that there is little or no current market data available from which to determine the price at which an arm’s length transaction would be likely to occur. It generally does not mean that there is no data available at all upon which to base a determination of fair value (consensus pricing data may, for example, be used)”

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Fair value of a biological asset Appropriate valuation technique/s

- » Neither IAS 41 nor IFRS 13 prescribe a valuation approach/method.
- » Consequently, each reporting entity **must determine the valuation approach/method** that is most representative for its biological assets.
- » Determine the appropriate valuation approach/method on the basis of **judgement in light of all relevant facts and circumstances**:
 - » Market approach
 - » Income approach
 - » Both market and income approaches
 - » Cost approach

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Fair value of a biological asset

Appropriate valuation technique/s

- » PwC suggests that a hierarchy for measuring biological assets may be summarised as follows:
 - » Price for the asset in an active market.
 - » Recent transaction price for the asset if there is no active market.
 - » Market prices for similar assets, adjusted for the points of difference.
 - » Sector benchmarks.
 - » Present value of the future cash flows expected to be generated from the asset.

Source: PwC, *A practical guide to accounting for agricultural assets*, November 2009, (p7)

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Fair value of a biological asset

Observed practice: approaches for standing timber

- » **Market approach** used by 3 of 25 companies
- » **Income approach** (DCF methods) used by 21 of 25 companies
 - » **Cost model exception from fair value measurement** used by 1 company
 - » The company, with natural tropical rain forest, concluded that cost represents the only option for certain areas with **diverse indigenous species**, where there are **less well-known growth patterns** and where there are **no track records of reliable, quoted prices**.
- » **Multiple approaches** (to measuring fair value) used by a few companies due to nature of their various standings.
 - » **Cost approach** (to measuring fair value) used by 7 of 25 companies for **newly planted trees**.

Source: PwC, *Forest Industry: Application Review of IAS 41, Agriculture: The Fair Value of Standing Timber*, 2011, (p11)

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Market approach

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Fair value of a biological asset Observed practice: approaches for standing timber

- » **Market approach** used by 3 of 25 companies
 - » **plantations** with relatively **short rotation periods** (typically 5-20 years) that are classified as **mature** when reaching a certain stage in their rotation.
 - » This type of **standing timber could be sold at reliable market prices**.

Source: PwC, *Forest Industry: Application Review of IAS 41, Agriculture: The Fair Value of Standing Timber*, 2011, (p11)

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Measuring fair value less costs to sell of standing timber

Example 1: Mondi Group (1 of 6 slides)

Extract from Note 35 Accounting Policies to Mondi's consolidated financial statements for the year ended 31 December 2022 (emphasis added)

"Agriculture – owned forestry assets (note 14)

Owened forestry assets are biological assets measured at fair value less costs to sell, calculated by applying the expected selling price, less costs to harvest and deliver, to the estimated volume of timber on hand at each reporting date. The fair value less costs to sell is determined **using a market-based approach**. The estimated **volume of timber** on hand is determined based on the maturity profile of the area under afforestation, the species, the geographic location, climate and other environmental considerations and **excludes future growth**. The product of these is then **adjusted for risks associated with forestry assets**.

Changes in fair value are recognised in the consolidated income statement within other net operating expenses. At point of harvest, the carrying value of forestry assets is transferred to inventory and recorded as a felling cost reduction to the fair value of forestry assets. Directly attributable costs incurred during the year of biological growth and investments in standing timber are capitalised and presented within cash flows from investing activities."

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Measuring fair value less costs to sell of standing timber

Example 1: Mondi Group (2 of 6 slides)

Extract from Note 14 Forestry Assets to Mondi's consolidated financial statements for the year ended 31 December 2022

14 Forestry assets

€ million	2022	2021
At 1 January	348	372
Investment in forestry assets	49	45
Fair value gains/(losses)	169	(7)
Felling costs	(78)	(62)
Currency movements	(3)	-
At 31 December	485	348
Mature	309	217
Immature	176	131

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Measuring fair value less costs to sell of standing timber

Example 1: Mondi Group (3 of 6 slides)

Extract from Note 14 Forestry Assets to Mondi's consolidated financial statements for the year ended 31 December 2022 (emphasis added)

"The Group has 252,857 hectares (2021: 253,680 hectares) of owned and leased land available for forestry activities, all of which is in South Africa. **80,227 hectares (2021: 80,854 hectares) are set aside for conservation activities and infrastructure needs.** 1,045 hectares (2021: 1,044 hectares) relate to non-core activities. The balance of 171,585 hectares (2021: 171,782 hectares) are under afforestation, which forms the basis of the valuation set out above.

Mature forestry assets are those plantations that are harvestable, while **immature** forestry assets have not yet reached that stage of growth. Timber is harvested according to a rotation plan, once trees reach maturity. **The maturity period ranges from 6.5 to 14.5 years, depending on species, climate and location.**

The fair value of forestry assets is a **level 3** measure in terms of the fair value measurement hierarchy, consistent with prior years. ...

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Measuring fair value less costs to sell of standing timber

Example 1: Mondi Group (4 of 6 slides)

Extract from Note 14 Forestry Assets to Mondi's consolidated financial statements for the year ended 31 December 2022 (emphasis added)

"The following assumptions have a significant impact on the valuation of the Group's forestry assets:

- » The **net selling price**, which is defined as the selling price less the costs of transport, harvesting, extraction and loading. The net selling price is **based on third-party transactions and is influenced by the species, maturity profile and location of timber.** In 2022, the net selling price used ranged from the South African rand equivalent of €14 per tonne to €47 per tonne (2021: €14 per tonne to €44 per tonne), with a weighted average of €33 per tonne (2021: €24 per tonne).
- » The **conversion factor**, which is used to convert hectares of land under afforestation to tonnes of standing timber, is dependent on the species, the maturity profile of the timber, the geographic location and a variety of other environmental factors, such as the anticipated impact of climate change on water scarcity and fire risks. In 2022, the **conversion factors ranged from 7.9 to 23.9 (2021: 8.3 to 24.1).** ...

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Measuring fair value less costs to sell of standing timber

Example 1: Mondi Group (5 of 6 slides)

Extract from Note 14 Forestry Assets to Mondi's consolidated financial statements for the year ended 31 December 2022 (emphasis added)

» “The **risk premium** on **immature timber** of **12.5% (2021: 12.9%)** is based on an assessment of the risks associated with forestry assets in South Africa and is applied for the years the immature timber has left to reach maturity. A risk premium on **mature timber** of **4.0% (2021: 4.0%)** was applied. The risk premium applied to immature and mature timber include factors for the **anticipated impact of climate change on water scarcity and fire risks**. An increase in the severity and frequency of extreme weather events, such as higher temperatures, changes in rainfall patterns and drought conditions, may result in higher timber losses in future years caused by stronger winds, erosion, fires, pests and diseases.

The valuation of the Group's forestry assets is **determined in South African rand** and **converted to euro** at the closing exchange rate on 31 December of each year.

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Measuring fair value less costs to sell of standing timber

Example 1: Mondi Group (6 of 6 slides)

Extract from Note 14 Forestry Assets to Mondi's consolidated financial statements for the year ended 31 December 2022 (emphasis added)

Management has performed **sensitivity analyses** of **reasonably possible changes** in the significant assumptions and the EUR/ZAR exchange rate. The sensitivity table is **based on historical experience**; however, the estimates may vary by greater amounts. Therefore, the Board considers the forestry assets valuation to be a significant accounting estimate. The reported value of owned forestry assets would change as follows should there be a change in these underlying assumptions on the basis that all other factors remain unchanged:

€ million	2022	2021
Effect of €5/tonne increase in net selling price	75	71
Effect of 1% increase in conversion factor (hectares to tonnes)	5	3
Effect of 1% increase in risk premium	(7)	(5)
Effect of 10% increase in EUR/ZAR exchange rate	(44)	(32)

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Measuring fair value less costs to sell of unharvested produce Example 2: Crookes Brothers Limited (1 of 5 slides)

Notes to the 31 March 2021 Annual Financial Statements (emphasis added)

“3. SIGNIFICANT ACCOUNTING POLICIES

3.13 Biological assets

The Group’s biological assets comprise growing crops in the form of sugarcane, deciduous fruit, bananas and macadamias.

Biological assets are measured on initial recognition and at the end of each reporting period at fair value, determined as at 31 March, based on **current estimated market prices for the following season**, less the **estimated costs of harvesting, transport, packing and point-of-sale costs.**” (p25)

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Measuring fair value less costs to sell of unharvested produce Example 2: Crookes Brothers Limited (2 of 5 slides)

Notes to the 31 March 2021 Annual Financial Statements (emphasis added)

“4. Judgements made by management and key sources of estimation uncertainty

4.10 Fair value measurements and the valuation process over biological assets

The Group’s biological assets are held at fair value. Under the supervision and review of the Chief Financial Officer, an experienced and qualified team of management accountants determine the appropriate valuation techniques and inputs used to arrive at the fair value of biological assets. In estimating the fair value of the biological assets, the Group uses **market-observable data to the extent it is available**. Where Level 1 inputs are not available, the Group engages suitable leaders in the agricultural industry, which includes the South African Cane Growers Association and the Group’s co-ops Two-a-Day, Lebombo Growers (Pty) Ltd and macadamia customers, **to establish the appropriate valuation techniques** and prices. Refer to **note 23.2** for the valuation inputs applied in determining the fair value of biological assets at the end of the reporting period and note 38 for the fair value hierarchy of the Group’s biological assets.” (p28)

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Measuring fair value less costs to sell of unharvested produce

Example 2: Crookes Brothers Limited (3 of 5 slides)

	Group	
	2021 R'000	2020 R'000
23. Biological assets continued		
23.2 Biological asset valuations		
The following key assumptions have been used in determining the fair value of biological assets:		
Sugar cane		
Expected area to harvest after 31 March		
– South Africa (ha)	3 517	3 704
– Eswatini (ha)	2 375	2 414
– Zambia (ha)	393	426
Total area (ha)	6 285	6 544
Estimated yields		
– South Africa (tons/ha)	98.3	103.9
– Eswatini (tons/ha)	105.4	106.1
– Zambia (tons/ha)	135.5	127.7
Weighted average	103.3	106.3
Average maturity of cane at 31 March		
– South Africa (%)	64	64
– Eswatini (%)	64	64
– Zambia (%)	64	64
Estimated RV price per ton – South Africa (Rands)	5 119	4 479
Estimated sucrose price per ton – Eswatini (Rands)	4 400	3 716
Estimated ERC price per ton – Zambia (Rands)	4 093	3 923

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Measuring fair value less costs to sell of unharvested produce

Example 2: Crookes Brothers Limited (4 of 5 slides)

Summary of class discussion

Which level of the fair value hierarchy applies to Crookes Brothers Limited's measurement of the fair value of the fruit attached to its growing deciduous fruit trees? Choose one of:

- 1) Level 1—a quoted price (unadjusted) in an active market for an identical asset;
- 2) Level 2—measured using no significant unobservable inputs;
- 3) **Level 3—measured using significant unobservable inputs;**
- 4) Level 4—managements best guestimate; or
- 5) Whichever Level Crookes Brothers Limited chooses to assign to the measurement.

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Measuring fair value less costs to sell of unharvested produce

Example 2: Crookes Brothers Limited (5 of 5 slides)

Note 38 Fair value measurements ... (p69)

	Level 1 R'000	Level 2 R'000	Level 3 R'000	Total R'000
2021				
Investment property	–	67 152	–	67 152
Financial assets	–	–	4 626	4 626
Biological assets	–	–	286 509	286 509
	–	67 152	291 135	358 287
2020				
Investment property	–	41 782	–	41 782
Financial assets	–	–	4 582	4 582
Biological assets	–	–	245 511	245 511
	–	41 782	250 093	291 875

The above assets are measured at fair value on a recurring basis. There have been no material transfers between level 1 and 2 of any financial assets in the current financial reporting period. The fair values of other financial assets under IFRS 9 are not readily determinable, therefore the Directors have measured these investments at cost, which they assess to be the closest approximation of fair value.

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Measuring fair value less costs to sell of unharvested cane

Example 3: Zambia Sugar plc (2021) (1 of 3 slides)

16. GROWING CANE

	Group		Company	
	AUGUST		AUGUST	
	2021	2020	2021	2020
	K'000	K'000	K'000	K'000
The carrying value of growing cane is reconciled as follows:				
Carrying value at beginning of year	384 444	336 745	318 495	283 414
Change in fair value	121 814	47 699	108 208	35 081
Carrying value at end of year	506 258	384 444	426 703	318 495

The fair value of the growing cane is determined using inputs that are unobservable, using the best information available in the circumstances and therefore fall into the level 3 fair value category (see note 2.2.15).

The following are the key assumptions in the valuation of growing cane:

Expected area to harvest (hectares)	16 584	17 167	13 880	14 435
Estimated yield (tonnes cane per hectare)	115.70	108.50	114.70	105.90
Sucrose content in cane (%)	14.36%	14.45%	14.36%	14.45%
Average maturity of cane at 31 March (%)	65.70%	65.70%	65.70%	65.70%

A 1% change in the unobservable inputs could increase or decrease the fair value of the standing cane by the following values:

Estimated sucrose content (tonnes)	275 391	269 148	228 521	220 952
Estimated sucrose price (K/tonne)	5 077	3 906	5 077	3 906

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Measuring fair value less costs to sell of unharvested sugarcane

Example 3: extracts from external auditor's (EY) report on Zambia Sugar plc (2021) (2 of 3 slides)

Key Audit Matter (emphasis added)

"The Company carries its growing cane at fair value in accordance with IAS-41, Agriculture. The growing cane valuation is based on the **estimated sucrose content** (adjusted for the Company's long-term view of the average **maturity of the cane**) and the **estimated sucrose price for the following season**, less the **estimated costs for harvesting and transport**. There is **significant management judgement** in the estimation of the **sucrose content** and **price**, **expected cane yield** and **average maturity** of the growing cane. As at 31 August 2021, the fair value of growing cane was estimated at K506 million.

We considered this as a key audit matter as the determination of the fair value involves significant judgement and estimates. A management expert was utilised in the determination of yield and sucrose content values that will be extracted from the area under cane.

The Company's disclosures about significant judgements and estimates related to fair value of growing cane are included in Note 16 which details the assumptions and key inputs used by management." (p69)

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Measuring fair value less costs to sell of unharvested sugarcane

Example 3: Zambia Sugar plc (2021) (3 of 3 slides)

Summary of class discussion

If Zambia Sugar plc had used a DCF model to measure the fair value of its unharvested sugar cane, which notional cash flows, if any, would necessarily be included as model inputs? Choose one or more of:

- 1) none (because measuring the price that would be achieved in the market if the growing sugarcane was harvested today);
- 2) **market rental for use of the roots to which the growing cane is attached;**
- 3) **market rental for use of the land in which the roots are planted;**
- 4) it depends (specify on what it depends...).

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Income approach

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Fair value of a biological asset Observed practice: approaches for standing timber

- » PwC study: income approach (DCF models) **used by most** (21 of 25 companies) for both **managed natural forests and plantations**. DCF methods used because **lack active markets for large plots of forest land**, implying no reliable quoted market prices for standing timber.
 - » However, since the PwC study evidence from **Sweden** finds the price of forest land in a number of larger forest land deals showing that the value of larger forest assets per hectare or per cubic metres of forest generally lie at the same level as for smaller or medium forest assets. Consequently, some Nordic companies (eg Sveaskog) now use market-based valuations for forest assets (land and trees). Nonetheless Sveaskog uses DCF model to measure the fair value of trees (IAS 41) with the residual forest assets under IAS 16's revaluation model.
- » PwC study: concludes **most important assumptions** used in the DCF-modelling include: (i) harvesting plans; (ii) timber prices; (iii) forestry costs; (iv) growth rates; and (iv) discount rates.

Source: PwC, *Forest Industry: Application Review of IAS 41, Agriculture: The Fair Value of Standing Timber*, 2011, (p11&12)

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Fair value of a biological asset

Observed practice: approaches for standing timber

- » PwC study: differences between preparers' modelling assumptions **could reflect economic differences**. For example, **different species, different environments** (geographic location), etc logically different.
 - » However, PwC also observe **counterintuitive differences** in modelling assumptions, **notably the basis of timber prices**.

Source: PwC, *Forest Industry: Application Review of IAS 41, Agriculture: The Fair Value of Standing Timber*, 2011, (p11&12)

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Fair value of a biological asset

Observed practice: standing timber price modelling assumptions

- » Some companies base their assumptions on **current market prices** for timber.
 - » **Plantations** in regions with **faster rotation species** (except Chilean companies), there appears to be less of a need for adjusted price assumptions, as current timber prices are considered sufficiently reliable for modelling fair values.
- » Others companies use **adjusted current market prices** to **smooth out short-term volatility** in the market prices for logs.
 - » Nordic regions, mainly **natural forests**, have considerably **longer growth cycles**
- » Disclosures about timber prices modelling assumptions are **generally inadequate**.
 - » Some companies make extensive disclosures, which supports transparency in the financial statements.

Source: PwC, *Forest Industry: Application Review of IAS 41, Agriculture: The Fair Value of Standing Timber*, 2011, (p12)

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Measuring fair value less costs to sell of standing timber

Observed practice example 1, Sveaskog 2022 Annual Financial Statements (p67) (emphasis added) (1 of 4 slides)


Note 1 Accounting policies ... Judgements and estimates in the financial statements (emphasis added)

"In order to calculate the fair value of the biological asset, standing timber, the **estimated cash flow from future revenue from timber extractions less felling costs has been discounted to a present value.** ...

One production cycle for standing timber is estimated by Sveaskog to amount to an average of 100 years in northern Sweden and 80 years in southern Sweden. **Cash flows are calculated on the basis of felling volumes** according to Sveaskog's current felling plan and assessment of future price and cost development. **Prices are based on a rolling ten-year average (2013–2022).** Regarding the **cost development, the current normal cost is applied**, i.e. an average of the previous year's cost as well as the cost for the year and the next year's budget. The inflation assumptions in the model are based on estimated future development during the valuation period. Cash flow before tax is **discounted at an interest rate of 4.5 per cent (4.5).** Sveaskog's Board of Directors assesses that this interest rate **corresponds to the long-term cost of capital for an investment in forest assets** and that is not affected by short-term fluctuations in market rates. According to current felling estimates, which date from 2022 and are based on a forest optimisation model, felling will amount to approximately 5.1 million m³sub per year (6.3). This level is estimated to **increase steadily until 2033, to then remain at a level of approximately 6.8 million m³sub until 2037.** The level is **then estimated to decrease slightly to approximately 6.3 million m³sub (7.2–7.9).** In 2022, approximately 53 per cent (54) of Sveaskog's own forest volume was sold as **sawlogs to sawmills** and 43 per cent (42) comprised **pulpwood** which was sold to the pulp and paper industry. **Other volumes consisted of, for example, biofuel in the form of rejected branches and treetops, which are primarily used as fuel wood; this volume is not included in the valuation."**...

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Measuring fair value less costs to sell of standing timber

Observed practice example 1, Sveaskog 2022 Annual Financial Statements (p82) (emphasis added) (2 of 4 slides)

Note 14 Total forest assets – Biological assets and forest land ... Biological assets model assumptions (emphasis added)

"Revenue (**timber prices**) is based on **prices from a ten-year average (2013–2022)** and thereafter on estimated development during the valuation period **with a nominal price increase of 2.0 per cent (1.75) per year.** This estimated development is adjusted when the company forecasts a different development in their long-term plans.

For the production costs (**felling costs**), a current normal cost is applied that corresponds to the **average of three years** (outcome for the current year, the previous year and the budget for the coming year). These costs are based on an estimated development during the valuation period of 2.0 per cent (2.0) per year.

Sveaskog has set aside areas of productive forest land as nature conservation areas. These areas are not included in the value of forest assets."

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Measuring fair value less costs to sell of standing timber Observed practice example 1, Sveaskog 2022 Annual Financial Statements (p82) (3 of 4 slides)

Note 14 Total forest assets – Biological assets and forest land ...

Summary model assumptions – Forest assets – biological assets and forest land

Summary of model assumptions ¹	2022	2021
Valuation price per cubic metre of forest in SEK	5-year average	5-year average
Timber stocks per million cubic metres of forest	Forest registers as of October 2022	Forest registers as of October 2021
Discount rate	4.50%	4.50%
Revenue	10-year average	10-year average
Nominal price increase	2.00% per year	1.75% per year
Costs	Normal cost ¹	Normal cost ¹
Nominal cost increase	2.00% per year	2.00% per year

1) Normal cost = outcome for the current year and the previous year as well as budget for the coming year.

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Measuring fair value less costs to sell of standing timber Observed practice example 1, Sveaskog 2022 Annual Financial Statements (p82) (emphasis added) (4 of 4 slides)

Note 14 Total forest assets – Biological assets and forest land ... Sensitivity analysis based on key measurement parameters and their impact on Sveaskog's forest assets (emphasis added)

TOTAL FOREST ASSETS

Valuation price per cubic metre of forest in SEK A reduction in the market value of **SEK 5 per cubic metre** of forest lowers the value of forest assets by approximately MSEK 1,300 (1,300). An increase in the market value of SEK 5 per cubic metre of forest increases the value of forest assets by approximately MSEK 1,300 (1,300).

Timber stocks per million cubic metres of forest A reduction in timber stocks of **5 million cubic metres** of forest lowers the value of forest assets by approx. MSEK 1,700 (1,600). An increase in timber stocks of 5 million cubic metres of forest raises the value of forest assets by approx. MSEK 1,700 (1,600).

BIOLOGICAL ASSET

Discount rate A decrease in the discount rate by **0.5 percentage points** will increase the value of the biological asset by approx. MSEK 8,500 (7,400). An increase in the discount rate by 0.5 percentage points will reduce the value of the biological asset by approx. MSEK 6,800 (5,900)

Revenue (timber prices) A decrease in the annual price increase by **0.5 percentage points** will reduce the value of the biological asset by MSEK 13,700 (12,700). An increase in the annual price increase by 0.5 percentage points will increase the value of the biological asset by approx. MSEK 17,200 (15,700).

Expenses (felling, forest management, road and joint costs) An increase in the annual cost increase by **0.5 percentage points** will reduce the value of the biological asset by approx. MSEK 8,900 (8,400). A decrease in the annual price increase by 0.5 percentage points will increase the value of the biological asset by approx. MSEK 7,100 (6,700).

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Cost approach

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Fair value of a biological asset Observed practice: approaches for standing timber

Cost approach used by 7 of 25 companies in PwC study to measure the fair value of **newly planted trees**.

Source: PwC, *Forest Industry: Application Review of IAS 41, Agriculture: The Fair Value of Standing Timber*, 2011, (p11)

Extract from Note 16 Biological Assets to Smurfit Kappa's consolidated financial statements for the year ended 31 December 2022 (emphasis added)

The age threshold for young pine plantations is 96 months and for young eucalyptus plantations is 48 months. As young plantations are not available to sell or harvest, the **cost approach** is used to measure their fair value. **The cost approach is based on the published index by the Colombian government which details the cost of establishing and maintaining a hectare for each species across various age brackets. The number of hectares planted is recorded in the Group's Forestry Information System. ...**

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