INSTITUTE OF FORESTERS OF AUSTRALIA
NEW ZEALAND INSTITUTE OF FORESTRY

FOREST VALUATION STANDARDS

New Zealand Institute of Forestry
– Te Pūtahi Ngāherehere o Aotearoa Incorporated –

EXPOSURE DRAFT
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Cover photo acknowledgements: New Zealand grown Radiata pine (iStock) and Australian Eucalyptus forest (IFA corporate image).

FOREWORD

This document represents the first joint publication of the Forest Valuation Standards by the Institute of Foresters of Australia (IFA) and the New Zealand Institute of Forestry (NZIF).

Forest valuation methods continue to advance to meet the evolving disclosure requirements for reporting forest values. Increasingly advanced forest modelling systems enable valuers to incorporate real-world complexity and granularity into their forest representations.

In presenting this first edition of joint IFA-NZIF Forest Valuation Standards, we acknowledge the support of Forests and Wood Products Australia (FWPA) and the substantial work and effort of the following:

- The NZIF Forest Valuation Working Party
- The IFA Forest Valuation Subcommittee and Working Group

This product is a team effort and is presented to all IFA and NZIF members as guidance on best appraisal practices.

It is the intention that this document will be available electronically to IFA and NZIF members through the respective websites of the two organisations with periodic.

Yours faithfully,

Bob Gordon
President

James Treadwell
President

PREFACE

ABOUT THIS DOCUMENT

Purpose	The purpose of this document is to provide a set of standards and guidelines for the physical and financial description and the valuation of commercial plantation and natural forests in Australia and New Zealand. They are applicable to plantation and natural forests of any size and ownership. These standards apply to a range of purposes as outlined in Chapter A1.
Authority	This document has been prepared under the authority of the Institute of Foresters of Australia (IFA) and the New Zealand Institute of Forestry (NZIF). The IFA and the NZIF are the bodies representing forestry professionals in Australia and New Zealand. Both the IFA and the NZIF have as one of their objectives to serve their respective members by providing professional standards.
Layout	Parts B and C of this document includes the actual Forest Valuation Standards, and the standards are marked and numbered in capital bold font, for example: **STANDARD B1.1**
Users	These standards have been developed primarily for the members of the IFA and NZIF engaged in the physical and financial description, and the valuation, of a forest resource for internal or external reporting. They are also developed for all other users of forest valuations.
Binding on IFA and NZIF members	The IFA and NZIF has resolved that all members shall be bound by these standards, or shall disclose departures, when preparing forest valuations.

BACKGROUND

FOREST VALUATION WORKING GROUPS

IFA Forest Valuation Subcommittee and Working Group	The Australian Forest Valuation Standard (*A Standard for Valuing Commercial Forests in Australia* – 'AFVS') and associated Handbook were published in 2012. They were developed to provide professional and sectoral interpretation to the formal standards applied to forest valuations in Australia[1]. The AFVS played a key role in provided guidance and sectoral confidence in addressing issues associated with forestry valuations. At a meeting of the Institute of Foresters on 26th August 2016 participants endorsed a proposal to refresh the process for managing and maintaining the AFVS. Specifically, the IFA Forest Valuation Standard Subcommittee was formed to provide a forum for bringing together the practitioners and procurers of forest valuations, being individual forest owners[2]. One of the key drivers for this was to build and disseminate knowledge, to create confidence in the sector, and avoid concentration of risk.
NZIF Forest Valuation Working Party	The Council of the New Zealand Institute of Forestry established the Forest Valuation Working Party in 1993 with the Terms of Reference given on page V. In August 1994 a Discussion Draft set of Forest Valuation Guidelines was released and submissions invited. A substantially revised Exposure Draft was released in October 1996 and again submissions were invited. A final version of the Standards was released in May 1999. The Forest Valuation Working Party continued to develop the Forest Valuation standards. The Working Party published four supplementary technical releases in following years. An exposure draft representing a partial update of the standards was released in April 2019. Submissions were invited and the Working Party disseminated revised updates in September 2020.

[1] Both documents were co-funded by FWPA.

[2] Usually in the form of trusts or companies, represented and branded by a smaller number of forest managers.

TERMS OF REFERENCE

IFA Forest Valuation Subcommittee and Working Group	A Formal IFA Sub-committee was convened in September 2016, with Terms of reference including: 1) A standing Sub-committee of the Institute of Foresters Australia be created with the purpose of further development, managing updates and promoting the Australian Forest Valuation Standard. 2) The Sub-committee will publicise meetings and invitations will be issued to Members of the IFA and other interested parties; 3) The Sub-committee will seek to establish formal ties with the New Zealand Valuation Working Party; and 4) The Sub-committee seek support from appropriate funding sources to provide funding for further development and promotion of the AFVS.
NZIF Forest Valuation Working Party	1) To develop guidelines for forest valuation which include: • The purpose for forest valuation • Alternative approaches to forest valuation for each purpose • Guidelines on the appropriate method for each purpose • Standards of forest description • A checklist of valuation inputs • Guidelines on reporting format including: – Disclosure of valuation inputs – The methodology employed – Disclaimers 2) Reconciliation of change in value over time. 3) To liaise, as appropriate, with other interested parties both in New Zealand and overseas, and if necessary, co-opt other persons with specialist knowledge to assist in deliberations. 4) To recommend to Council means of implementing the guidelines including mechanisms for professional education. 5) To recommend to Council the desirability of, frequency and format for collection and publication of commonly applied valuation inputs including log price information, discount rates and costs. 6) To recommend to Council the desirability of, and mechanics for the collection, analysis and publication of market values for forest sale transactions. Notes: 1) Forest valuation guidelines should be developed for at least the following purposes: • Statutory reporting for companies (Public, Private, SOE, Local Bodies) • Prospectus promotion

	• Client reporting for: – Sale and purchase – Partnership accounts – Insurance cover – Compensation – Disputes/expert advice – Collateral – Taxation Forest valuation carried out by company or organisation staff for in-house use (e.g. management reporting or decision making) are beyond the scope of these terms of reference. 2) Current company accounting policy on the treatment of forest values in company accounts should be reviewed by the Working Party particularly in terms of any interaction and linkage with forest valuation methods. However, it is not the role of this Working Party to develop guidelines on accounting policy. 3) Forest valuation guidelines should, at least in the first instance, be restricted to the valuation of plantation in terms of monetary values.

FOREST VALUATION STANDARD FEEDBACK

Feedback invited	Comments on this document are welcome and should be sent to:
Australia	Convenor, IFA Forest Valuation Subcommittee GPO Box 1272 Melbourne Victoria 3001, Australia
New Zealand	Convenor, NZIF Forest Valuation Working Party NZ Institute of Forestry PO Box 10-513 Wellington 6143, New Zealand

CONTENTS

1 PART A – BACKGROUND ISSUES

CHAPTER A1 – PURPOSES OF FOREST VALUATION

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • updating section on disclosure in the financial statements to include reference to International Financial Reporting Standards; • inclusion of a section on acquisition subject to the Public Works Act; and • inclusion of insurance cover with compulsory sale or compensation.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • included the words New Zealand in front of NZ specific references i.e. Acts and Standards; • introduced relevant Australian legislative Acts and Standards; • included the word 'fire and cyclone' after reference to loss; • added legal cases as another example of purpose; • reformatted and joined various tables; • brought Australian references to before New Zealand references;
Current Status	Released as draft.

CHAPTER A1 – PURPOSES OF FOREST VALUATION

Purpose matters	A forest valuation is required for a particular purpose. There is a prospect that the same valuation may also be suitable for other purposes, but this cannot be assured. Some forms of valuation are purpose specific as the following review of applications explains.
Sale and purchase	A common reason for forest valuation is to assist in negotiations for the sale and purchase of a forest. For example, a seller may wish to establish a reserve price and a buyer may wish to determine a reasonable price to pay for an asset.
Disclosure in the financial statements of business entities	Forest valuations are commonly required for reporting of financial performance. There is a requirement for assets to be disclosed in the statement of financial position under the Australian Corporations Act 2001 and the New Zealand Companies Act 1993 and Financial Reporting Act 1993. This may be achieved by either a formal fair valuation process or by observing other accounting conventions. **International Financial Reporting Standards (IFRS) 13-Fair Value Measurement 2012** sets out in a framework for measuring fair value and became effective 1 January 2013. Other standards are specified by the regulators of the respective stock exchanges and accounting standards boards.
Compulsory sale or compensation, including insurance cover	In the cases of a compulsory sale or compensation for a loss (e.g. fire, cyclone damage), the owner will require fair compensation for the loss of the tree crop in addition to any loss associated with any limitations imposed on the use of the land. In compulsory sale or compensation situations the owner is not a willing seller. The owner requires to be put in the same financial position as they would have been in, assuming no loss and retained ownership of the tree crop. Tree crop values for compensation purposes include assessments of the appropriate level of tree crop insurance cover.
Compulsory acquisition	In **Australia**, the compulsory acquisition of land is legislated under Section 51 (xxxi) of the Australian Constitution. It can be carried out at federal, state, territory or local government levels based on various state land administration acts. In **New Zealand**, if compulsory sale takes place in accordance with section 62 of the New Zealand Public Works Act 1981, then no allowance can be made on account of the taking of an interest in the land being compulsory. The Act prescribes that the tree crop market value is assessed on a before and after basis. The process should consider all impacts on the tree crop affected. The difference between the before and after situation is the level of compensation required. This difference in value represents the

	market value of the tree crop on the land that is to be acquired. The impact that the acquisition of this portion of the tree crop has on the market value of the tree crop in the remainder of the forest also need to be considered. Examples of impacts on the market value of compulsory acquisition on the remaining tree crop are: • the possible increase in roading costs; and • the possible increase in the risk of wind damage on the cut face offset by improved fire accessibility.
Property division	This may include property division for business restructuring, partnership dissolution or a matrimonial property split. If land includes trees, the value of the trees may be significant in the total value of the property.
Equity transfer (sales of shares)	The value of the shares of a forest owning entity may be significantly influenced by the value of the forest.
Collateral	A forest may provide the security for a loan. The lending institution needs reassurance that the realisable value of the forest asset is sufficient to repay the loan in the case of default.
Taxation	Different tax treatments apply to land and forest. When the trees and land are sold in the same transaction, the respective components must be itemised. The purchaser of trees is entitled to deduct the cost of the trees from the eventual proceeds from their future sale. It is therefore important to the purchaser to allocate the total purchase price of the forest into land and tree crop components . It may become further necessary to distribute the total value of the tree crop between croptypes and age classes.
Forest planning and management	Forest valuations prepared on a consistent basis over time provide a stable reference for comparison of alternative management options and investments.
Stewardship	Comparative forest valuations are a tool to measure the performance of management in their role as stewards. Valuations developed for this purpose may contribute to calculation of the forest manager's remuneration.
Legal cases	Comparative forest valuations are sometimes called for in legal disputes, such as fraudulent misrepresentations, before- and after-cases, product price setting in related-party issues, or for forests owned or managed by companies under administration.

CHAPTER A2 – WHAT IS VALUE?

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • reformatted the chapter to be consistent with other chapters; • referred to the Australian AASB 141 Agricultural Standard in some detail; • clearly stated the hierarchy of standards for Australia and New Zealand; • added year to the relevant Australian standards; • separated Australian and NZ references to their respective standards; and • added definitions for the key Australian Accounting Standards referred to.
Reviews by NZIF, Oct 2020	Reworked chapter to comprehensively cover reporting of value.
Current Status	Released as draft.

CHAPTER A2 – WHAT IS VALUE?

Introduction	The previous Chapter A-1 distinguished different purposes for valuation. It acknowledged that not all purposes might be satisfied by the same value. In general, though, forest valuers have been increasingly finding that most applications can be met using the value that would be realised in a near-term transaction. One of the biggest influences encouraging convergence has been a sea-change in recommended practice from the accounting profession. This has been especially evident in the approach that the International Accounting Standards Board (IASB) has taken towards reporting the value of biological assets. Previous preference had been to report values based on accumulated cost. This had the advantage of referring to actual financial records, with the corresponding benefits of tangible evidence and reduced subjectivity. Inconveniently, though the assigned 'values' could come to bear little resemblance to what the assets were capable of realising in the event of sale. Two styles of reference to transaction-evidenced values have become most common. These are 'market value' and 'fair value'. The first has been a preferred term within the ranks of valuers. With the development of the new financial reporting standards, there was evident concern that while 'market value' was well established, the prevailing definitions were too varied and thereby too loose. The IASB instead chose to refer to its extractions from transaction-based evidence as 'fair value'. As the following sections indicate, practitioners may perceive some subtle differences between market value and fair value. From some quarters there has been an inclination to combine both adjectives and refer to 'fair market value'. While potentially tautologous, the double-barrelled reference does convey that the users are attempting to comply with both definitions at once. Expressions of professional opinion on the assessment and reporting of asset value include those shown in Table 2-1.

Table 2-1: Reporting of Asset Value

Domain	Documentation	Professional body
Asset valuation	Uniform Standards of Professional Appraisal Practice (USPAP)	Appraisal Foundation
	International Valuation Standards (IVS)	International Valuation Standards Council (IVSC)
	RICS Valuation – Global Standards[3]	Royal Institution of Chartered Surveyors (RICS)
Financial reporting	International Financial Reporting Standards (IFRS)	International Accounting Standards Board (IASB)
	FASB Fair Value Measurement (Topic 820)[4]	Financial Accounting Standards Board (FASB)

	Given the organisations' purpose, they have needed to define 'market', 'fair' and other forms of value. Examples of their definitions are demonstrated in the following.
IVSC	The International Valuation Standards Council (IVSC) definitions (in IVS104 Bases of Value) include: ***Market value*** is the estimated amount for which an *asset* or liability *should* exchange: • on the valuation date; • between a willing buyer and a willing seller; • in an arm's length transaction; • after proper marketing; and • where the parties had each acted knowledgeably, prudently and without compulsion. The concept of Market Value presumes a price negotiated in an open and competitive market where the *participants* are acting freely. The Market Value of an *asset* will reflect its highest and best use. ***Equitable Value*** is the estimated price for the transfer of an *asset* or liability between identified knowledgeable and willing parties that reflects the respective interests of those parties.

[3] https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/valuation/rics-valuation--global-standards-jan.pdf
[4] https://asc.fasb.org/imageRoot/81/118196181.pdf

	Equitable Value requires the assessment of the price that is fair between two specific, identified parties considering the respective advantages or disadvantages that each will gain from the transaction. In contrast, Market Value requires any advantages or disadvantages that would not be available to, or incurred by, market *participants* generally to be disregarded. ***Investment Value*** is the *value* of an *asset* to a particular owner or prospective owner for individual investment or operational objectives. Investment Value is an entity-specific basis of *value*. Although the *value* of an *asset* to the owner *may* be the same as the amount that could be realised from its sale to another party, this basis of value reflects the benefits received by an entity from holding the *asset* and, therefore, does not involve a presumed exchange. Investment Value reflects the circumstances and financial objectives of the entity for which the *valuation* is being produced. It is often used for measuring investment performance.
USPAP	The Appraisal Standards Board (ASB) of the Appraisal Foundation is based in Washington, D.C. It develops, interprets and amends the Uniform Standards of Professional Appraisal Practice (USPAP). USPAP defines **appraisal** as • (Noun) 'the act or process of developing an opinion of value; an opinion of value.' • (Adjective) 'of or pertaining to appraising and related functions such as appraisal practice or appraisal services.' **Market value** is defined as: a type of value, stated as an opinion, that presumes the transfer of a property (i.e., a right of ownership or a bundle of such rights), as of a certain date, under specific conditions set forth in the definition of the term identified by the appraiser as applicable in an appraisal. The 2020-21 edition of USPAP includes Advisory Opinion 22, addressing the issue of how 'market value' affects the scope of work in a real property appraisal assignment. It emphasizes the requirement to declare the criteria that are being employed in distinguishing 'market value' from other forms of value. An example definition of Market Value is provided, with careful qualification to declare that it is tabled, '… only as an example'.

'***Market Value*** *means the most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition are the consummation of a sale as of a specified dare and the passing of title from seller to buyer under conditions whereby:*

1. *Buter and seller are typically motivated;*
2. *Both parties are well informed or well advised and acting in what they consider their own best interests;*
3. *A reasonable time is allowed for exposure in the open market;*
4. *Payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and*
5. *The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concession granted by anyone associated with the sale*.'

A footnote to the definition observes:

[1] This example definition is from regulations published by federal regulatory agencies pursuant to Title XI of the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989 between July 5, 1990, and August 24, 1990, by the Federal Reserve System (FRS), National Credit Union Administration (NCUA), Federal Deposit Insurance Corporation (FDIC), and the Office of Comptroller of the Currency (OCC). This definition is also referenced in regulations jointly published by the OCC, FRS, and FDIC on June 7, 1994, and in the *Interagency Appraisal and Evaluation Guidelines*, as revised and updated December 2010.

	This definition is noted as historically it has found frequent mention in the instructions issued by US-based forest investors. In earlier versions of USPAP, this specific definition was formally declared in the main body of the Standards. The Appraisal Foundation's stance has since changed to permit more latitude in definitions. There is then an associated obligation to explicitly declare just what the definition is.
RICS	The Royal Institution of Chartered Surveyors is a professional body promoting and enforcing international standards in the valuation, management and development of land, real estate, construction and infrastructure. The version of RICS Global Standards applicable at the time of writing (issued November 2019, effective from 31 January 2020) adopts and applies the IVSC definitions of Market Value, Equitable Value and Investment Value.
IFRS	The International Financial Reporting Standards (IFRS) Foundation is the parent entity of the International Accounting Standards Board (IASB), an independent accounting standard-setter. **International Financial Reporting Standards (IFRS) 13-Fair Value Measurement 2012** sets out a framework for measuring fair value and became effective 1 January 2013. IFRS 13 defines ***fair value*** as 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.

	When measuring fair value, an entity uses the assumptions that market participants would use when pricing the asset or the liability under current market conditions, including assumptions about risk.
FASB	The Financial Accounting Standards Board (FASB) is an independent nonprofit organization responsible for establishing accounting and financial reporting standards for companies and nonprofit organizations in the United States. The Board has the authority to establish and interpret generally accepted accounting principles (GAAP). In recent years, the FASB has been working with the IASB on an initiative to improve financial reporting and the comparability of financial reports globally. Accounting Standards Codification 820 is part of the FASB's GAAP guidance. It defines ***fair value*** using the same words as IFRS13, i.e. '*… 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.*'
Fair value vs market value	The IFRS/FASB definition of Fair Value has similarities to the IVSC definition of Equitable Value. IVS104 Bases of Value observes that '*Equitable Value is a broader concept than Market Value. Although in many cases the price that is fair between two parties will equate to that obtainable in the market, there will be cases where the assessment of Equitable Value will involve taking into account matters that have to be disregarded in the assessment of Market Value, such as certain elements of Synergistic Value arising because of the combination of the interests.*' Investopedia states that '*In its broadest economic sense, fair value represents the potential price, or the value assigned, to a good or service, taking into account its utility, supply and demand for it, and the amount of competition for it. Although it infers an open marketplace, it is not quite the same as market value, which simply refers to the price of an asset in the marketplace (not intrinsic worth).*' https://www.investopedia.com/terms/f/fairvalue.asp
Financial reporting standards in Australia and New Zealand	In Australia and New Zealand, IFRS 13 Fair Value Measurement has been adopted as **AASB 13** and **NZ IFRS 13** respectively**.** They are the overarching standards under which sit **AASB 141 and NZ IAS 41 Agriculture, AASB 116 and NZ IAS 16 Property, Plant and Equipment, AASB 140 and NZ IAS 40 Investment Property, and AASB 16 and NZ IFRS 16 Leases.** With the introduction of IFRS 13, references to valuation methodology in the other IFRS documents were removed. The previously noted definition is instead expected to apply, i.e. '*… 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.' (AASB 13 (2015)/ NZ IFRS 13).

Market participants are defined in AASB 13 / NZ IFRS 13 as '*Buyers and sellers in the principal (or most advantageous) market for the asset or liability that have all of the following characteristics:*

a) They are independent of each other, i.e. they are not related parties (as defined in AASB124 / NZ IAS 24) , although the price in a related party transaction may be used as an input to a fair value measurement if the entity has evidence that the transaction was entered into at market terms.

b) They are knowledgeable, having a reasonable understanding about the asset or liability and the transaction using all available information, including information that might be obtained through due diligence efforts that are usual and customary.

c) They are able to enter into a transaction for the asset or liability.

d) *They are willing to enter into a transaction for the asset or liability, i.e. they are motivated but not forced or otherwise compelled to do so.'* (AASB 13 2015 Pp 20-21, NZ IFRS 13 p 20)

AASB 141 and NZ IAS 41 Agriculture. These standards prescribe the accounting treatment, financial statement presentation, and disclosure related to the biological component of the forest assets. They require that biological assets are valued at fair value less costs to sell.

Costs to sell '*are the incremental costs directly attributable to the disposal of an asset, excluding finance costs and income taxes*.'

AASB 116 and NZ IAS 16– Property, Plant and Equipment. These standards apply to property, plant and equipment (including land and buildings) used to develop or maintain the assets.

AASB 140 and NZ IAS 40 Investment Property. These standards prescribe the accounting treatment for investment property and related disclosure requirements.

AASB 16 and NZ IFRS 16 Leases. These standards set out the principles for the recognition, measurement, presentation and disclosure of leases.

Australia currently has no authoritative guidance specific to the valuation of Australian Carbon Credit Units (ACCUs) issued by the Clean Energy Regulator (CER) in their role as part of the Australian Government's Emissions Reduction Fund or carbon credits issued by other schemes. In the absence of a specific standard, two relevant standards are:

- AASB 138 Intangible Assets; and

	• AASB 13 Fair Value Measurement. Currently, there is no specific standard for the recognition of units received under the Emissions Trading Scheme (ETS). New Zealand units are issued by the New Zealand Government under applicable legislation. In the absence of a specific standard, the relevant standards is: • NZ IAS 20 Government Grants.
Definition of value used in these standards	The focus of these standards is the estimation of the market value of a tree crop or forest or bundle of assets. Recognising the wider examples that have been previously described in this section, a workable version is as follows: ***Market value*** is the amount for which the defined asset or liability should exchange • on the date of the valuation; • between a willing buyer and a willing seller; • in an arm's length transaction; • after proper marketing; and • wherein the parties had each acted knowledgeably, prudently and without compulsion.
Linkage to Accounting Standards	Despite the different terms and definitions, it is anticipated that in most cases, the fair value of a tree crop or forest that is reported in financial statements will be the same as the market value estimated by the valuer.

CHAPTER A3 – METHODS OF FOREST VALUATION

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF, October 2020 revisions: • Recast into the three main valuation approaches (Sales comparison, Income, Cost); and • Updated option pricing approach.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • reformatted the 1999 Word version (as not in 2019 Exposure Draft); • brought references to Australia to before references to New Zealand; • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place; • flagged the approaches in the opening paragraph; • retained a comment re cross reference to Chapter E2 Glossary that needs to be checked when the glossary is finalised; and • removed 'buyer position' section as essentially a repeat of strategic factors.
Current Status	Released as draft.

CHAPTER A3 – METHODS OF FOREST VALUATION

Methods presented	• Transaction based approach (sales comparison);
	• Cost based approaches – historic costs, current costs, compounded costs; and
	• Income approaches
	  – Expectation value
	  – Liquidation approach.
	  – Option pricing.

TRANSACTION BASED (SALES COMPARISON) APPROACH	
Background	The transaction-based approach involves the analysis of market transactions. It is the theoretically correct procedure to estimate market value for a forest. However, there are often practical difficulties. The Australian and New Zealand markets for forests generally violate the perfect market in which large numbers of willing buyers and sellers enter transactions where identical goods are being exchanged, and transaction prices are readily observable. Consequently, the transaction evidence for forest sales should be interpreted with some caution. However, despite this, available transaction evidence should always be considered and, where appropriate, used in the valuation of a forest.
Analysis of sales	The value of a forest can be estimated by an analysis of transaction information, often referred to as 'comparative sales'. The analysis essentially involves an interpolation or extrapolation of the values of past sales to the forest of interest. Even if forest value is not inferred from past transactions, it can be possible to infer other relevant factors from sales. For example, units of comparison can be derived such as average value ($/ha). Given the differences in forest characteristics these may be of limited use. However, a useful unit of comparison is the implied discount rate. This provides a unit that not only indicates the relative value inherent in the transaction, it can also be applied in the valuation of other forests. It is also possible to analyse transactions using multivariate models. An example of an analysis of sales is the work of Manley and Bell (1992) in developing a relationship between the prices paid for the State plantations sold in 1990 and their underlying characteristics. Manley (2016) updated this model to predict crop value from the discounted stumpage revenue associated with the average stand from 27 forest transactions.

Practical difficulties

There are often practical difficulties, not unique to forestry, in obtaining transaction evidence, in analysing it and in extrapolating it to the target forest:

i. **Heterogeneous forests**

No two forests are identical. They may differ in terms of maturity, distance to market, species composition, terrain, site productivity, past silviculture, and other factors which will influence their value. Therefore, it will generally be difficult to find a recently sold forest which is directly comparable to the forest of interest.

ii. **Point in time**

Prices, costs and other assumptions provide market information at a point in time. They must be interpreted with caution when subsequently used because underlying market conditions and a range of other factors may have changed.

iii. **Illiquid market**

There are relatively few buyers in the market particularly of larger forests and of immature forests. Some sales may be forced (e.g. liquidation, matrimonial property split) and may not reflect a willing seller situation. Consequently, price might not represent market value (as defined in Chapter A2).

iv. **Scale**

There are limited transactions involving large forests other than, for example, **Australia's** public plantation forest 'sales', which have commonly been of a right to a long-term lease.

v. **Strategic factors**

Transaction evidence may incorporate strategic factors such as the wish to enter or exit a region, complementary age-class distributions, the provision of access or vertical integration opportunities. These can cause difficulties in extrapolation to the target forest. The strategic value recognises the margin the purchaser is willing to pay above what other parties may perceive as 'fair value'.

vi. **Intangibles**

In some situations, the price paid for a forest may reflect factors other than the crop and the land on which it is growing, e.g. in New Zealand, Wāhi Tapu (sacred places) and aesthetics can influence price.

vii. **Lack of publicly available information**

	Forest sales information is often not available either for confidentiality reasons or because the forests represent one component of a 'bundled' sale involving other significant assets. To be useful, disclosure is required not just of price but also the forest characteristics noted in (i) above.
COST BASED APPROACHES	
Background	Cost based approaches involve the accumulation of costs to provide an estimate of value. Cost based approaches to valuation have had appeal because of: • a preference in some cases to value young stands based on replacement cost rather than on future expectations; and • the influence of accounting practice and the concept of objectivity.
Cost not equal to value	The fundamental weaknesses of these approaches are that cost generally does not equal value. As noted by Davy (1987) a 'high' cost forest does not necessarily reflect a 'high' value forest and conversely a 'low' cost forest does not mean a 'low' value forest.
Historic cost method	The historic cost method equates forest value to the sum of the historic costs incurred in developing it. Variations of the method occur over: • what are classified as development costs; • whether maintenance costs are accumulated; and • whether interest costs associated with the debt-financing of the forest are accumulated. Characteristics of the method are: • there is no adjustment for inflation; and • costs relate to the technology of the time in which operations were carried out.
Current cost method	The current cost method accumulates the inflation-adjusted costs incurred in developing a forest. It has received limited application because of the lessening interest by the accounting profession in current cost accounting concepts.
Current replacement cost method (cost compounded method)	In the current replacement cost method, stand value is calculated as the sum of costs compounded forward from the time of occurrence to the present day. Costs are generally expressed in current day dollars. In addition, standard costs, representing current efficient practice, are generally used for each operation. A *modified current cost method* is different to *current cost method* where the former included the accumulation of interest charges. The difference is that the compounding rate used in the current replacement cost approach represents the opportunity cost of

	capital, as distinct from the interest rate on borrowed funds used in a modified current cost method. As noted by Liley (1994) '*whereas the accountant's preference is to recognise only actual, tangible financial charges against the forest, the economist is prepared to recognise a notional cost of capital*'. The current replacement cost approach has some economic underpinning. '*Its claim to validity rests on the assumption of rationality on the part of the investor. It assumes that an investor would not willingly put money into a project without a reasonable expectation of at least getting it back*'. (Fraser et al. 1985). Its application to very young stands has reflected a view that '*this method is most relevant in the initial development stages prior to future revenue being ascertainable*' (Davy, 1987). A specific limitation of the method Is the need to determine an appropriate compounding rate. Often a rate below the opportunity cost of capital has been adopted. Under specific circumstances the value of a crop estimated by the cost-compounded method will equal that estimated in the expectation method by discounting future cashflows. This is when the same cost, revenue and discount rate assumptions are used and a notional land rental is charged in both cases, based on the Land Expectation Value (LEV). This equivalence was noted in 1842 by Faustmann.
INCOME APPROACHES	
Expectation Value Approach	
Net Present Value (NPV) or Discounted Cashflow (DCF) approach	Under the expectation approach future wood volumes are forecast based on some underlying management and harvesting strategy. Future log volumes sold are multiplied by future log prices to give forecast revenue. Costs are subtracted from these revenues to give future net cashflows. These are discounted to the reporting date to give forest value. Variations of the expectation approach arise depending on whether: • a single rotation or perpetual rotations are assumed; or • the framework of an estate or a stand is adopted. There is an economic school of thought that suggests that the replanting decision in forestry should be treated as a separate investment decision. Within this approach, a forest valuation should only capture the value of the existing crop. An alternative viewpoint is that a forest should be valued based on a going concern. Accordingly, with this approach the value of a forest should capture not just the value of the existing crop but also the value of subsequent rotations.

	A characteristic of the expectation approach is that it uses price information from markets in which transactions are frequently occurring i.e. the log market. Whereas the market for forests tends to be 'shallow', there are regular transactions in the 'deep' log market. The disadvantage is that the log market of interest is that of the future. Other features of the expectation approach are that it: • requires forecasts or future woodflows, log price and costs; and • requires the selection of an appropriate discount rate.
Estate based expectation value	The estate-based expectation approach values the forest as a single entity. The net cashflows of the total estate are forecast and discounted to give forest value. These cashflows are associated with an underlying management and harvesting strategy which applies to the whole estate. The strategy varies depending on: • assumptions or constraints placed on the level of harvesting – at one extreme, the harvest might be unconstrained with each stand harvested at its optimum rotation age and at the other extreme, total harvest (and harvest by log grades) might be constrained to be non-declining; • assumptions about the intensity of silviculture; • assumptions about replanting; and • assumptions about new land planting cost.
Stand based expectation value	This approach values a forest as the sum of the values of each individual stand. The net cashflows of each stand are forecast and discounted to give stand value. As for the estate-based expectation method, assumptions are made about the underlying management and harvesting strategy. The strategy varies depending on: • rotation age, where the optimum rotation can be assumed or the rotation may reflect expectations about when the stand will be harvested to fit in with broader estate considerations; • silvicultural regime; and • replanting, where typically the assumption of no replanting is adopted in the stand-based expectation method. **Note:** Given the same set of assumptions, the stand-based expectation method will give the same forest value as the estate-based expectation value.
Immediate Liquidation Approach	
Stock value or current realisation value	In the immediate liquidation approach, forest value is calculated by estimating the stumpage value of standing merchantable volume. The underlying assumption is that all merchantable

	stands in the forest can be liquidated immediately and sold at current stumpage prices. Young immature stands are assigned zero value. The approach therefore ignores future realisable value. Characteristics of the method are: • the assumption, that a forest could be liquidated immediately without undue influencing stumpage prices, is unrealistic except for small forests; • assigning young stands which are not currently merchantable a zero value ignores their future potential growth.
Option Pricing Approach	
Ability to choose when to harvest	Dixit and Pindyck (1994) develop an options approach to investment to deal with the situation where there is the ability to delay an irreversible decision. They use option pricing to value the situation where an investor has the right but not the obligation to make an investment. The use of option pricing theory for forest valuation has been suggested (Hughes 1987). A forest owner has the option of when to harvest a stand. In theory, the owner may have the option to halt log production when prices are low and increase production when prices are high. Longley *et al.* (1993) suggest that the ability to defer the harvest has a value which is not captured by the expectation approach. In the forest option model of Hughes (1987), forest value is a function of future harvest volume, future harvest cost, current stumpage value, stumpage price volatility (i.e. variance), the time to harvest and the discount rate. Hughes (1997) used this option pricing methodology to value the forest assets of Forestry Corporation of New Zealand sold in 1996. He estimated, using a discount rate of 7.5%, that the option value was $2.075 billion compared to an NPV of $1.804 billion. The implication is that there was an additional 'option' value of $271 million associated with harvesting options which was not captured by the expectation value approach. Manley and Niquidet (2010) evaluated different option value approaches for the valuation of a New Zealand plantation stand. They found that differences between option value and expectation value NPV depended heavily on the log price model assumed. They concluded that '*option valuation approaches have limited relevance for the practice of forest valuation in New Zealand. Practical issues (determination of the log price model, estimation of volatility, allowing for multiple log grades and modelling at the estate-level) need to be addressed before option value approaches can be routinely used for forest valuation*.'

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CHAPTER A4 – DISCOUNT RATES

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • addition to the Introduction of a section on discount rates and valuation approaches; • extension of the cashflows section to include current rotation cashflows vs multiple rotation cashflows and notional land rentals; • extension of the section on pre- or post-funding (capital structure); and • updating the review of discount rate approaches.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • incorporating Australian forest conditions, including Australian natural forests; • incorporating financial reporting and accounting requirements as set by the Australian Accounting Standards Board; and • ensure compliance with Australian law.
Current Status	Released as draft.

CHAPTER A4 – DISCOUNT RATES

Introduction

Investment involves a commitment of funds for a period of time in order to derive a suite of future expected payments. Investors expect to earn a return in exchange for their commitment of funds. This is to compensate them for:

1) The *period of time* the funds are committed;
2) Expected *inflation* rates during the commitment period; and
3) The *uncertainty and risk* associated with future cashflows.

Discount rates can be used to express the required rate of return, or compensation, that investors expect to receive in exchange for their commitment of funds. They are a fundamental component of Discounted Cash Flow (DCF) analysis and are one of the factors to which Net Present Value (NPV) based valuations are most sensitive.

Different discount rates may apply to the tree crop, land, carbon, roads and other durable assets. Each of these assets has unique features, the associated cashflows may have different levels of risk, and the market may have different required rates of return for each.

Discount rates and valuation approaches

Discount rates find expression in each of the main recommended approaches to valuation:

- within the *sales comparison* approach, a compelling unit of comparison to which sales can be distilled is the Implied Discount Rate (IDR);
- the *income (or expectation*) approach is a classic expression of DCF methodology. As such, it requires an explicit representation of discount rate; and
- *Cost-based* approaches to valuation may make use of compound rates. Compounding is the inverse of discounting and, as such, it also requires the selection of an appropriate rate.

The various roles for discount rates find widespread endorsement among forest valuers. There is less agreement on which individual rates to apply. Forest valuers typically consider a variety of sources and evidence when assessing, selecting and applying discount rates. These may include:

1) *Cost of capital derivations* – the cost of capital derivations may be based on asset pricing models such as the Capital Asset Pricing Model (CAPM) or Arbitrage Pricing Theory (APT) to derive an expected cost of equity. These may then be incorporated into Weighted Average Cost of Capital (WACC) models to reflect the cost of both equity and debt capital;
2) *Implied Discount Rates (IDRs)* – such rates are derived from previous transactions. They are derived by constructing a cashflow for the comparable sale and finding the discount rate(s) at which the present value of the cashflow matches the transaction value;
3) *Applied or Declared Discount Rates* – discount rates applied by the forest owner or independent forest valuers when valuing forest assets;

4) *Declared Hurdle Rates* – hurdle rates represent the minimum threshold that an investor seeks to achieve on their investment;
5) *Capitalisation rates and multipliers* – capitalisation rates and multipliers are commonly used in the property and real estate market. A range of rates is demonstrated, depending on the nature of the revenue to which they are applied. As a generalisation, such rates are applied to the average quantity generated in a single period, although variants allowing ongoing real growth and other adjustors are also demonstrated; and
6) *Internal Rate of Return (IRR)* – as its name implies, the IRR is internal. There is near universal agreement within forest appraisers that this disqualifies its use in valuing the forest. DCF theory instead suggests that the rational purchaser of a forest must attend to the opportunity cost of their capital. The latter references external investment alternatives. The IRR can nevertheless figure in the evaluation process, especially when addressing the attractiveness of perpetuating the forest after the current rotation.

A further classification of rates

One means of classifying discount rates is to distinguish those constructed as 'built-up' rates versus those derived from empirical evidence. This might see the rates described above in the following classifications:

Built-up	**Empirically derived**
WACC Declared Hurdle Rates	IDRs Capitalisation rates and multiplies
Applied or Declared Discount Rates	

Such a classification must be applied warily. A key element within the WACC, for instance, is the so-called β applied with the CAPM. This factor is derived from empirical market evidence.

The potential importance of the classification is that it distinguishes the genesis of the rates. This becomes important when there are attempts to merge rates from different sources, such as by averaging, or 'reconciling' the different estimates. The rates are not structural siblings in their derivation, even if they share a common intended purpose. Only so much reconciliation is possible.

Application of discount rates

Nominal or real

Nominal discount rates include the anticipated effects of inflation during the commitment period. Real discount rates exclude the effects of inflation.

Discount rates applied in forest investment analyses are most commonly expressed in real terms. There are two main reasons for this:

- forest investment analyses may occupy long timeframes as even modest rates of inflation, numbers that are expressed in nominal terms may grow to unrecognisable levels thus denying the opportunity to readily check their credibility; and
- future levels of inflation are uncertain thus removing the need to include inflation relieves the valuer of one more uncertain assumption.

Forest valuers elect real cashflows mindfully. There are certainly circumstances where they will use nominal cashflows, or conduct both representations in parallel. Where there is a requirement to explicitly model debt servicing, nominal cashflows are more likely to be used. This is because the loan principal and repayments are fixed in historic terms. Similarly, rigorous modelling of the application of Australia and New Zealand's current forestry taxation regime requires that the effects of inflation be addressed.

The conversion from nominal rates to real rates employs the Fisher[5] equation

$$\mathbf{i_r = (1 + i_t)/(1+d) - 1}$$

where:

i_r	=	real rate
it	=	nominal rate
d	=	inflation rate

Cashflow timing conventions

Valuing a series of cashflows that occur at different points in time is achieved by converting cashflows to the same point in time. This is achieved by either compounding or discounting. The future value of a present cashflow is derived via compounding:

$$\mathbf{FV_t = C \times (1+r)^t}$$

where:

FV_t	=	future value at date t
C	=	cashflow
r	=	annual interest rate
t	=	time between the cashflow and the valuation date

Conversely, the present value of a future cashflow is derived via discounting:

$$\mathbf{PV = C \div (1+r)^t}$$

where:

PV = present value

When compounding or discounting cashflows, different results will arise, depending on when cashflows are assumed to occur during a period. Modern computing capability and functionality means that there is little

[5] Irving Fisher's monograph Appreciation and Interest (1896) proposed this equation showing the relation between the nominal interest rate, the real interest rate and inflation. See https://archive.org/details/appreciationinte00fish

incremental effort in introducing precision to cashflow timing conventions.

For simplicity, valuers may assume that net cashflows arise (on average) at the midpoint of a cashflow period. If estimating the present value at 1 July of a cashflow occurring between 1 July to 30 June, the valuer may assume that the cashflow arises at the midpoint of this period, i.e. around 31 December. This timing implies that one-half of an annual period separates the cashflow from the valuation date and, as such, present value would be estimated assuming $n = 0.5$.

Estimates of future available cashflows are often comprised of concurrent forecasts of gross revenues (e.g. delivered log revenues), cost of goods sold (e.g. harvest, loading and delivery costs), operational expenditure (e.g. silvicultural and property management costs), capital expenditure (e.g. roading costs) and indirect and overhead costs. Depending on their anticipated timing, cashflows associated with particular cost and revenue streams can be compounded or discounted separately. An example of such an instance may be planting costs which are mainly incurred during the winter months in Australia's southern states and New Zealand.

By default, many spreadsheet packages assume cashflows occur at the end of an annual period, e.g. Excel's NPV function. In forest valuation, this generally leads to a conservative outcome. Careful examination of which cashflow timing convention might be applied is appropriate.

Cashflows

In conducting a DCF analysis using pre-tax cashflows, the revenue and cost streams must be just as the name implies – **cash** only. The exception to this may be the inclusion of a notional land rental, which may be included to apportion the NPV of future cashflows between the crop and the land. Capital Expenditure (CAPEX) should be modelled in the cashflow as and when it is expected to occur.

Outgoings such as depreciation or amortisation should be excluded. Pre-tax cashflows should not include interest servicing charges, since to include these may effectively represent discounting twice.

Leverage, as noted by Berk, DeMarzo, Harford, Ford and Finch (2011), refers to the extent to which a firm relies on debt as a source of financing. Debt may come in the form of (but is not necessarily limited to) bank debt issued by banking and lending institutions or debt-like instruments (e.g. promissory notes) issued by forestry investment vehicles to institutional investors who may have also made equity investments into these forestry investment vehicles. Leverage as it relates to this discussion includes all forms of debt and debt-like instruments, regardless of source.

In a levered post-tax cashflow model the effects of interest in reducing taxation (the so-called 'interest shield') can be included and interest payments deducted to give free cashflow. In an unlevered post-tax

cashflow model interest payments are not deducted and no 'interest shield' is recognised. Both levered and unlevered post-tax cashflow models recognise the impact of depreciation and amortisation in reducing the amount of tax, but these notional items should not be recognised in the post-tax cashflow that is the subject of discounting. The levered and unlevered cashflows are often referred to as:

- Levered Free Cash Flow (FCF_E) or Free Cash Flow to Equity – levered post-tax cashflow; and
- Free Cash Flow to the Firm (FCF_F) – unlevered post-tax cashflow.

It is important that cashflows are well defined, and that the discount rate applied to the cashflow has been derived in a manner appropriate to the cashflow to which it is applied.

Current rotation versus multiple rotation cashflows

Forest valuations prepared consistent with International Financial Reporting Standards (IFRS) for asset reporting purposes are guided by IFRS 13 (Fair Value). IFRS presents a similar overall target to contemporary valuation standards. In the absence of immediately comparable values, these encourage the valuer to follow the practices by which market participants arrive at an agreed transaction value.

Plantation forests

With plantation forests of sizeable scale, and where subsequent rotations are intended, most market participants are observed to prepare wood flow and cashflow projections on a multiple rotation basis.

Once the value of the plantation *forest asset* is identified, other IFRS standards specify that this value is to be apportioned between certain components. Two such components are the land value (specified under IAS16 – Property, Plant and Equipment) and the value of the current crop (IAS41 ¬– Agriculture). There is no clearly identified or straightforward location to declare the value associated with future rotations. This has generated some informed debate in the ranks of forest valuation clients and the forest valuers themselves.

In at least some quarters there has emerged reference to 'IAS41 forest valuations'. This has been unfortunately misleading; it is clear from the expression of IAS41 that it is a reporting standard rather than a valuation standard and that its scope is confined to the current crop. It is not a standard for valuing complete forests – this role falls to IFRS13 and its cohorts from the valuation standards.

IFRS does not in any way insist that a plantation *forest* valuation must be based on just the current rotation cashflows. Despite this, other motivations may encourage such an approach. These are addressed elsewhere in these standards, but include *inter alia* concerns with the amount of conjecture required in estimating the performance of future rotations. As a result, there is an accumulated body of practice

demonstrating valuations on both 'current rotation' and 'multiple rotation' bases.

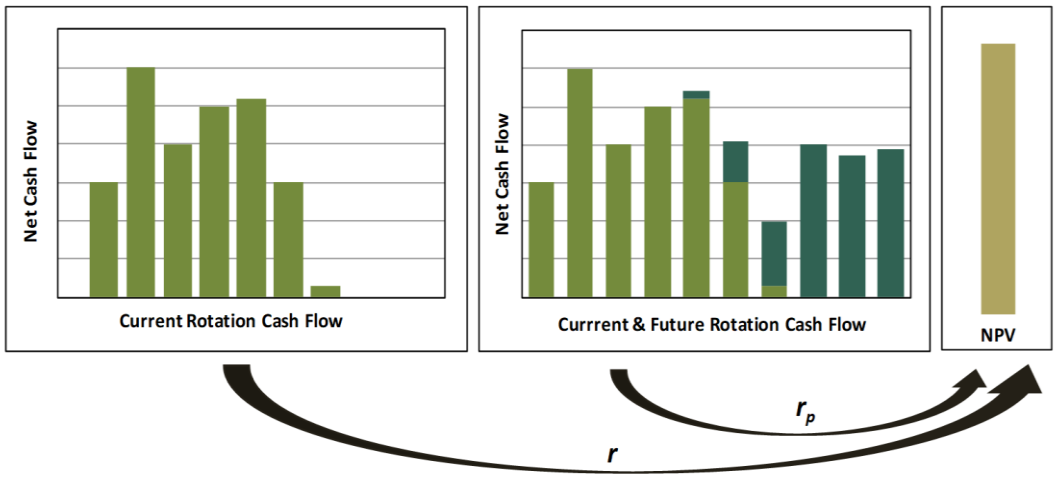
While various options exist as to the selection of the appropriate cashflow to be used for valuation purposes, there is a singular fair value for the forest estate.

Referring to Figure A4-1:

- For convenience, the series of revenues flowing from the plantation forest are all shown to be positive;
- For the one NPV result, two possible representations of the responsible cashflows are presented. The first is based on the cashflows associated with the current (existing) rotation, whereas the other corresponds to those associated with continued management of the forest; and

For each of the cashflow versions there is a corresponding discount rate, illustrated as **r** and $\mathbf{r_p}$ respectively, that give rises to an equivalent NPV. There is no single and universal adjustment between the discount rates. The differential between the rates may be influenced by a variety of factors, but in particular the rate of return generated by re-investment in forestry and the treatment of land.

Figure A4-1: Current and Future Cashflows



Natural forests

With natural forest management, current and future rotations may be undefined in situations where harvest and silviculture regimes result in or maintain a multi-age class structure. Examples of natural forest management regimes include:

- block clearfell used in even-age single species forest types. Variations may include leaving a widely spaced even distribution of seed trees for re-seeding;
- Australian Group selection (remove dominant plus surrounding trees) used in uneven-aged, multiple species forest types. Variations may include shelterwood silvicultural systems.
- single tree selection used in uneven-aged, multiple species forest types; and

- thinning from below or above to reduce stocking and promote growth.

In situations where the transition modelling from current to future rotations is practically infeasible (transitioning taking place at the individual tree level rather than the stand level), an appropriate discount rate should be applied to the cash flows associated with the harvesting of the existing forest, reportable under IAS41 ¬– Agriculture.

In determining the periodic (annual) allowable cut for long-term planning, forest recruitment and regeneration should be considered.

Multiple cashflows and multiple discount rates

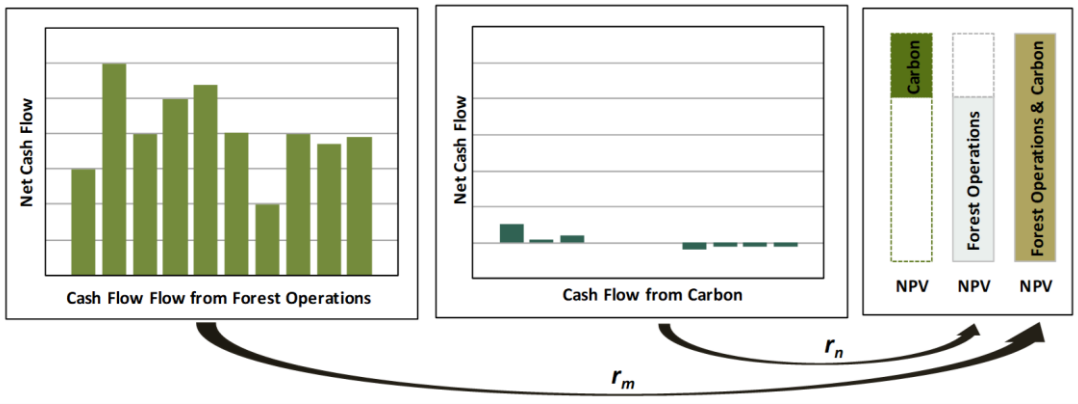
The differentiation between cashflows associated with current rotations versus investment models, and more recently those associated with the purchase and/or sale of carbon – in **Australia** under the Emissions Reduction Fund (ERF) or in **New Zealand** under the Emissions Trading Scheme (ETS), emphasises the point that multiple discount rates may be applied and assumed as part of forest valuations.

An example is the case where the carbon trading opportunity is being valued.

Referring to Figure A4-2:

- the discount rates applied to a set of cashflows associated with forest operations and those associated with carbon may differ; and
- For each of the cashflow versions there is a corresponding discount rate, illustrated as $\mathbf{r_m}$ and $\mathbf{r_n}$ respectively – the derivation of each discount rate may be completed independently.

Figure A4-2: Forest and Carbon Cashflows vs NPV



Pre-tax and post-tax cashflows

This aspect of discount rate terminology provides opportunity for confusion. A 'pre-tax discount rate', for instance, would generally be understood to imply a rate that ignores taxation effects. This rate will be applied to cashflows that similarly avoid any inclusion of taxation (the so-called pre-tax cashflows).

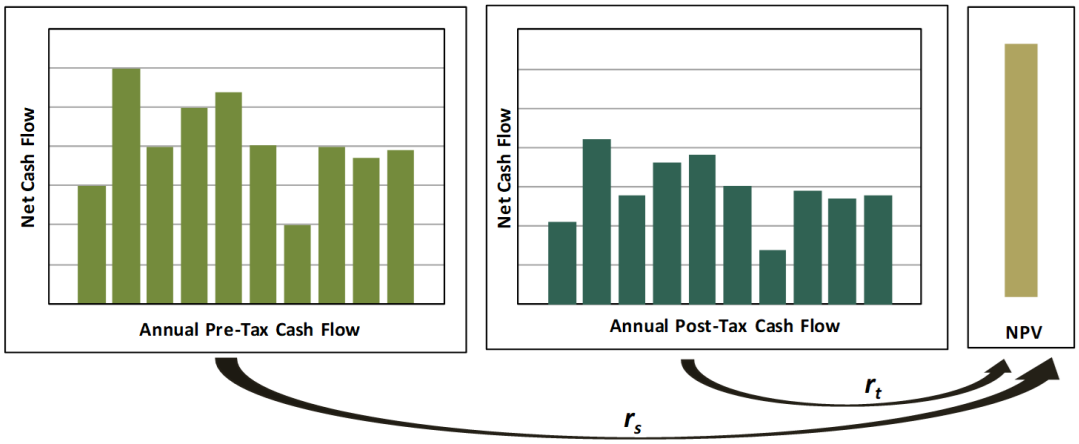
To some observers a ‘post-tax rate’ is that rate which would be applied to cashflows that explicitly recognise and net out taxation (post-tax cashflows). It is therefore a discount rate that is applied to ‘post-tax’ cashflows. To other observers, a ‘post-tax’ rate includes adjustment for the effect of taxation. When applied to pre-tax cashflows it is intended to provide the same result.

It is important, therefore, that the valuation commentary explains quite clearly just which rate is being used. The terms pre-tax and post-tax should not be applied to discount rates but rather to the cashflows modelled. The preferred terminology is that pre-tax cashflows ignore taxation effects, while in deriving post-tax cashflows taxation effects are explicitly modelled.

Referring to Figure A4-3:

- by discounting the cashflows the valuer arrives at the NPV of the forest, represented by the single block of value applying at the time of valuation;
- as explained in Chapter B12 of these Standards (Forest Valuation Method), in any attempt to estimate market value the valuer is trying to anticipate the price at which a forest would actually and willingly change hands in a fair transaction – there can only be one such value as the purchaser writes only one figure on their cheque);
- for the one NPV result two possible representations of the responsible cashflows are given below – the first (a) does not net off taxation obligations (the so-called pre-tax cashflow), whereas the other (b) does (the so-called post-tax cashflow); and
- for each of the cashflows represented there is a corresponding discount rate, illustrated as $\mathbf{r_s}$ and $\mathbf{r_t}$ respectively, that will give the same NPV – I n the case illustrated, $\mathbf{r_t}$ will clearly be less than $\mathbf{r_s}$ in order to derive the same fair value.

Figure A4-3: Pre and Post Tax Cashflows vs NPV



Which tax rate?

Construction of a post-tax model requires assumptions to be made about what tax rate to use. Possible alternatives for the marginal tax rate are:

- model the personal tax circumstances for potential individual purchasers whose tax status is known; or
- create a generalised construct for potential purchasers.

Modelling individual circumstances represents a more rigorous approach and, in some cases, may be appropriate ¬– we might expect that those with the least tax burden would be able to pay the most for a forest. Of course, if the best-positioned purchasers are commercially astute, they will not pay more for the asset than they need to in order to see off their competitors.

The generalised model may be adopted, but with the expectation that a careful forest valuer will identify where deviations might be expected. Two extremes could be where:

- the market may be set by active competition between buyers whose tax exposure is low; and
- the only likely participants may be those whose taxation exposure is comparatively high. Some offshore buyers, for instance, may not be able to fully exploit the safe harbour offered by related party debt due to unfavourable home country tax rates.

These standards acknowledge that at some levels of the market individual investors and their personal taxes may need to be recognised. A generalised taxation construct that establishes the assumed circumstances of a notional set of corporate and individual investors might be adopted to enable the preparation of 'base case' valuations. The procedure is further described in Chapters A5 and B11.

Pre- or post-funding (capital structure)

The capital structure assumed in a forest valuation will affect the NPV. In common with the pre-tax/post-tax position outlined above, the amount of equity, internal debt (e.g. corporate bonds), related party debt and external debt (e.g. third party bank debt) assumed in the total forest funding package interacts with both the tax position (the tax treatment of borrowings and equity differs markedly) and the appropriate valuation discount rates.

A number of recent forest transactions have demonstrated the application of comprehensive affordability models. These have been prepared by both the vendors and purchasers party to these transactions. The models are generally based on a leveraged post-tax cashflow basis. There is careful attention to the free cashflow with which to service borrowing. Any such model cannot ignore the expenditure imposition arising from the re-establishment of the next and succeeding rotations or the timing of capital expenditure required to bring the trees to market. Commonly such a consolidated model is called an Enterprise Model or Purchase Model.

Within such models the purchasers of large forest estates in Australia and New Zealand typically structure the ownership and financing of the enterprise in a manner that is most tax efficient for their circumstances. A thin-capitalisation financing structure is commonly utilised by foreign investment in Australia and New Zealand by way of a related party loan to achieve a tax efficient structure.

Australia

The current Australian company tax rate is 27.5% to 30% of net profit before tax. Interest charged on debt is tax deductible subject to thin capitalisation restrictions. Under Australia's current thin capitalisation restrictions, a 'safe harbour' debt level of up to 60% of assets (reduced by certain non-debt liabilities) is permissible. This broadly equates to a debt to equity ratio of 1.5 to 1.

Related party loans can provide tax efficiencies for investors as Non-Resident Withholding Tax (NRWT) is charged in Australia on interest payments at 10% compared with the Australian company tax rate of 27.5% to 30%. Franked dividends are exempt from NRWT, while unfranked dividends would typically be taxed at a rate of 5-30%, depending on the source of capital and relevant tax treaties.

New Zealand

The current New Zealand corporate tax rate is 28% on net profit. Interest charged on debt is tax deductible. Under New Zealand's current thin capitalisation regulations, a 'safe harbour' debt-to-asset ratio of up to 60% is permissible. Related party loans provided from a safe harbour can provide tax efficiencies for investors as Non-Resident Withholding Tax (NRWT), charged in New Zealand on interest payments at 10-15%, depending on where the related party loan is domiciled. NRWT charged on franked dividends are exempt, while unfranked dividends would typically be taxed at a rate of 5-15% (or more), depending on the source of capital and relevant tax treaties.

A generic representation of thin capitalisation could be used by forest valuers to represent leverage in their representation of the post-tax cashflows associated with the valuation of 'large' forest estates. In this representation, although all sources of acquisition capital are ultimately provided by the shareholders of the enterprise, 60% of the funds could be considered debt for the purposes of capital structure and interest deductibility. The interest rate set on the related party loan must be 'fair and reasonable' and represent an arm's length interest rate. Within such a model the debt-to-asset ratio must be monitored on an annual basis to ensure that the capital structure remains in compliance with thin capitalisation restrictions. In particular, to remain in compliance with thin capitalisation requirements, the model would generally need to reflect a reduction in debt levels over time as the standing timber is harvested and asset base diminishes.

A comprehensive model of this nature needs to incorporate estimates of the cost of standing timber deduction (**Australia**) or cost of bush depletion (**New Zealand**) and tax treatments. Given this, models of this nature are often formulated in nominal terms.

Increasing debt levels may raise the expected profitability of the project but can increase its risk. The risk must be reflected in the discount rate applied to the project, and an appropriate method of reflecting interest on the debt and debt repayment should be included.

Adoption of a model that assumes 100% equity funding and uses a post-tax approach that only includes the tax effects related to full equity funding (see Chapter A6) may, in some cases, provide for an appropriate starting point for a post-tax cashflow construct.

	It is noted that investors may use a number of different investment structures including trust structures (in particular to hold the forest and land assets).
Review of discount rate approaches	**Cost of capital derivations and the weighted average cost of capital** Cost of capital derivations are typically based on asset pricing models, such as the Capital Asset Pricing Model (CAPM) or Arbitrage Pricing Theory (APT,) to derive an expected cost of equity. Cost of equity derivations can then be incorporated within **Weighted Average Cost of Capital (WACC)** models, along with the cost of debt, to reflect the blended cost of both equity and debt capital. Such derivations are extensively addressed in corporate finance literature, e.g. Berk *et al*. (2011), Reilly and Brown (2012) and Brealey *et al*. (2014). Readers are referred to such literature for further detail. In its simplest manifestation, the cost of equity capital is multiplied by the assumed proportion of equity financing, and the cost of debt is likewise multiplied by the assumed proportion of debt financing. The results are added to give a composite rate. Adjustments have variously been applied to recognise attributes such as tax and liquidity.
	<u>Cost of equity</u> The framework most commonly used to estimate the cost of equity is the CAPM, which is used to estimate the required rate of return for an asset given its non-diversifiable (systematic) risk. When applied to equity capital the CAPM states: $Ri = R_f + \beta e\ (R_m - R_f)$ where: • R_i is the required rate of return for equity holders in shares of asset I; • R_m is the return to the equity market as a whole; • R_f is the rate that can be obtained from risk-free investments; • The quantity, ($R_m - R_f$), is the average market risk premium, assuming the risk of a portfolio of equity investments; and • The factor β_e (equity 'beta') is specific to each kind of equity stock or investment. If β_e is greater than 1.0, it indicates that the stock value fluctuates more than average, whereas values less than 1.0 indicate the stock has below average sensitivity to market movements. ***Risk-free rate (R_f)*** The risk-free rate is the rate of return attributable to an investment with no risk of financial loss. In practice,

Government bond rates are used as a proxy for risk-free rates. Gresham (1993) argues that since, in theoretical terms, the CAPM is a single period model, the short-term Government bond rate appears appropriate. However, he also concedes that since forestry is by nature a long-term investment, the long-term rate may be more applicable.

Beta (β)

β is a measure of the systematic risk of an entity, i.e. the non-diversifiable risk or that part of the risk of an asset that cannot be diversified away. β represents the tendency of a security's returns to respond to movement in the market as a whole. β is calculated by dividing the covariance of the security's returns and the benchmark's returns by the variance of the benchmark's returns over a specified period.

A key feature of β that deserves discussion is that given information on the market as a whole, and the trend in a particular stock price, □ can be derived with authority and precision. Different practitioners will get the same result. This escalates its attractiveness – it is a comparatively objective measure. Where professional opinion and insights come into play, however, is in understanding why certain stocks might behave differently and which ones might not belong in the pool.

Expression of β is not without complication, as βs may be specified on either an 'asset' basis (i.e. the total investment in the asset) or for just the 'equity' component of the investment. The more debt an entity has in its capital structure, the higher the levered or equity β of the entity. Synonyms for these terms are 'unlevered β' and 'levered β' respectively.

Conversion between the two forms is provided by the equation:

Asset β = equity β/(1 + (1 – tax rate)* debt/equity)

Use of CAPM analysis in forest investment valuation has encouraged various attempts to identify an appropriate β. Market information associated with pure-play publicly listed forest investment companies provides for the most authoritative source of statistics from which to derive β. However, the progressive shift in forest ownership from publicly held vertically-integrated forest product companies[6] and pure-play

[6] Market statistics associated with vertically-integrated forest product companies represent a less than perfect source of information from which to derive β for pure-play forest investments. The various parts of the integrated business might display differing market correlations and the β associated with the integrated business will therefore differ from that of pure-play forest investment.

forest investment companies towards institutional ownership has led to a paucity of information from which to derive betas in an Australasian context.

Betas by industry sector are regularly compiled and published by corporate finance professionals such as Aswath Damodaran[7]. A review of βs published in January 2015 incorporated estimates for 42,410 global firms, only 303 (0.7%) of which related to the paper and forest products sectors (Damodaran, 2015). A detailed review of the firms included revealed the existence of virtually no comparable pure-play forestry firms from which βs could be derived for Australasia.

Alternate approaches have used US data to derive betas, or estimate betas from the Security Market Line using expected returns derived from timberland indices incorporated within NCREIF (National Council of Real Estate Investment Fiduciaries) (Reilly & Brown, 2012). These have then been used with US risk-free rates and risk premia to derive US CAPM, which have then been adjusted to incorporate geographically derived risk premia.

Given the above, the resulting range of β estimates derived and disclosed in Australasian forest valuations over recent years has been broad.

The estimation of an appropriate β has invariably required valuers to exercise their professional judgement. Factors which impact on the β include, but are not necessarily limited to:

- nature of the industry;
- duration of contracts;
- type of customer;
- industry regulation;
- presence of real options;
- operating leverage; and
- market weight.

Market risk premium (R_m -R_f)

Market risk is non-diversifiable (systematic) component of the total risk on a specific investment an investor may face. The other component is diversifiable (non-systematic) risk.

Market risk describes how returns on an investment tend to move with the market as a whole. Some correlation is to be expected, since individual investments are likely to show some common response to such factors as interest rate

[7] See http://people.stern.nyu.edu/adamodar/

changes, general price level changes and fluctuations in economic growth rate.

Diversifiable risk defines that proportion of the total risk which is peculiar to a particular investment. Examples in forestry could include fire and wind damage, insufficient log value recovery at harvesting, or unforeseen restrictions on harvesting. Investors cannot expect to be rewarded for taking on non-systematic risk as it can be diversified away.

Portfolio analysis has demonstrated that non-systematic risks can be eliminated through the construction of a diversified portfolio of securities. Conversely, diversifying the portfolio offers no escape from systematic (market) risk, which is embodied in all investments. The CAPM is concerned with non-diversifiable (systematic) risk. An asset's β is a measure of the non-diversifiable risk of the asset relative to the risk of the market.

Equity cost of capital

To derive the equity cost of capital for an unlevered asset using the CAPM leads to calculations such as the following (example only):

Using $\beta = 0.75$	Using $\beta = 1.00$
$\mathbf{R_i = R_f + \beta\ (R_m - R_f)}$	$\mathbf{R_i = R_f + \beta\ (R_m - R_f)}$
$= 3.5 + 0.75(6.0)$	$= 3.5 + 1.00(6.0)$
$= 8.0\%$	$= 9.5\%$

The example assumes a risk-free rate of 3.5% and a market risk premium of 6%. The rates in this example include inflation. The effect of adjustment for an inflation rate of 2.5% gives a real cost of capital in the range of 5.4% to 7.1%.

<u>Cost of debt</u>

The cost of debt is the cost of funds attributable to the risk of the company's assets if the funds were borrowed on a non-recourse basis. The cost of debt will be at a premium to the Treasury or Government bond rates (Marsden, 2009).

<u>Weighted average cost of capital</u>

The WACC reflects the blended cost of both equity and debt capital. Subsequent to an estimation of each of the cost of equity and cost of debt, the WACC can be determined according to this formula:

$$\mathbf{WACC = (\mathit{E}/(\mathit{D}+\mathit{E}))\mathit{R_i} + (\mathit{D}/(\mathit{D}+\mathit{E}))\mathit{R_d}(1-\mathit{t})}$$

where:

- *E* is the value of equity
- *D* is the value of debt

- R_i is the cost of equity
- R_d is the cost of debt
- t is the corporate tax rate.

Assuming a cost of equity of 8.0%, a cost of debt of 5.0%, a debt-to-value ratio of 20% and a corporate tax rate of 28%, the WACC can be derived as follows:

WACC = (0.80) x 8.0%+ (0.20) x 5.0% x (1-28%)

= 7.12%

The rates in this example include inflation, and the resultant WACC is a nominal rate for application to nominal cashflows. WACC is typically applied to nominal post-tax cashflows – the so-called free cashflow to the firm[8].

In the example given, the effect of adjustment for an inflation rate of 2.5% gives a real adjusted WACC of 5.56% for application to real post-tax cashflows.

<u>Limitations associated with WACC derivations</u>

A variety of complexities exist which make the application of WACC-based derivations to forestry cashflows challenging. The WACC formulation presented above requires corporate tax be deducted. For forestry assets, this assumption can be too simplistic.

Specific to forest investments in New Zealand and Australia, the tax shield offered by the 'Cost of Bush' (**New Zealand**) and the 'Cost of Standing Timber Deduction' (**Australia**) means that the tax payable on income is close to 0% at acquisition where there is immediate harvest. However, the tax payable trends toward the corporate statutory rate over time as the 'Cost of Standing Timber Deduction' is depleted through harvest activities.

Furthermore, the actual post-tax position of a firm can be influenced by a variety of factors including asset specific tax rulings, the use of both internal and external debt, and changes in debt-to-equity ratios (capital structure) through time. The collective impact of these variables may make determination of the value of an asset difficult to estimate under a DCF valuation model. This is partly because of the relatively simplistic manner in which equity and debt are combined into the WACC. Damodaran (2006) notes that the exercise becomes increasingly complex as debt ratios change over time.

Given that the corporate rate can vary by entity and through time, applying the full corporate tax rate can result in an

[8] Free Cash Flow to the Firm (FCFF) – cash distributions available to both debt holders and equity holders after all expenses, taxes, asset maintenance and reinvestment.

inappropriate estimation of the WACC to be applied in a forest valuation.

While limitations and challenges exist with deriving discount rates using cost of capital-based derivations, this is not to imply that such approaches be abandoned. Rather, that forest valuers remain cognisant of such complexities, and exercise caution and discipline when deriving discount rates using a cost of capital approach.

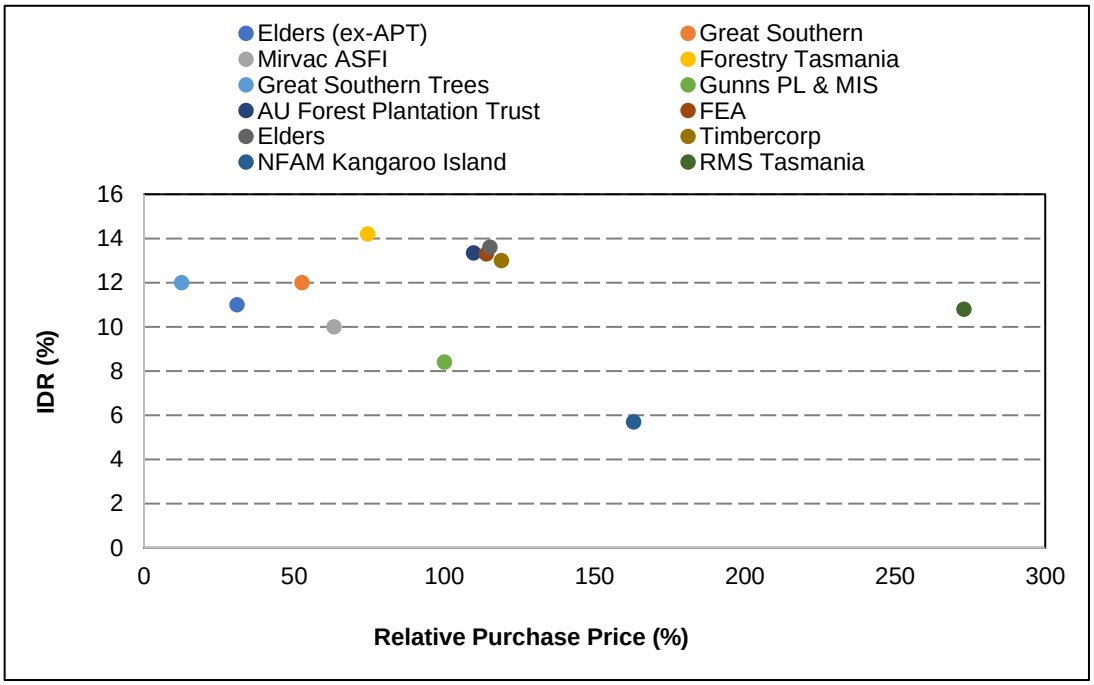
Implied discount rates

The IDR is a particularly useful metric which can be extracted from forest transactions. Its use can represent a sales comparison approach to valuation within a DCF construct. Derivation of the IDR involves the development of a credible cashflow projection for the transacted forest. The discount rate at which the DCFs match the purchase price is the IDR.

Given the heterogeneity of forest assets, a comparable sales approach using an IDR is often more credible than simpler attempts at comparisons based on factors such as $ per hectare.

A significant restructuring of **Australia's** hardwood plantation assets occurred during the period 2009 to 2019, initially triggered by the collapse of many management investment scheme (MIS) companies. Margules Groome, a forestry consulting firm, examined the announced sales prices in the context of information memoranda and other data at its disposal. This analysis work suggests that a possible range of implied discount rates can be demonstrated over the ten-year period. The correlation between relative sale prices and IDR appear to be weak. Variables as perceived by investors such as the level of distress, the outlook for Asian hardwood woodchip markets, foreign exchange and freight rates likely significantly influenced sales prices (Figure A4-4).

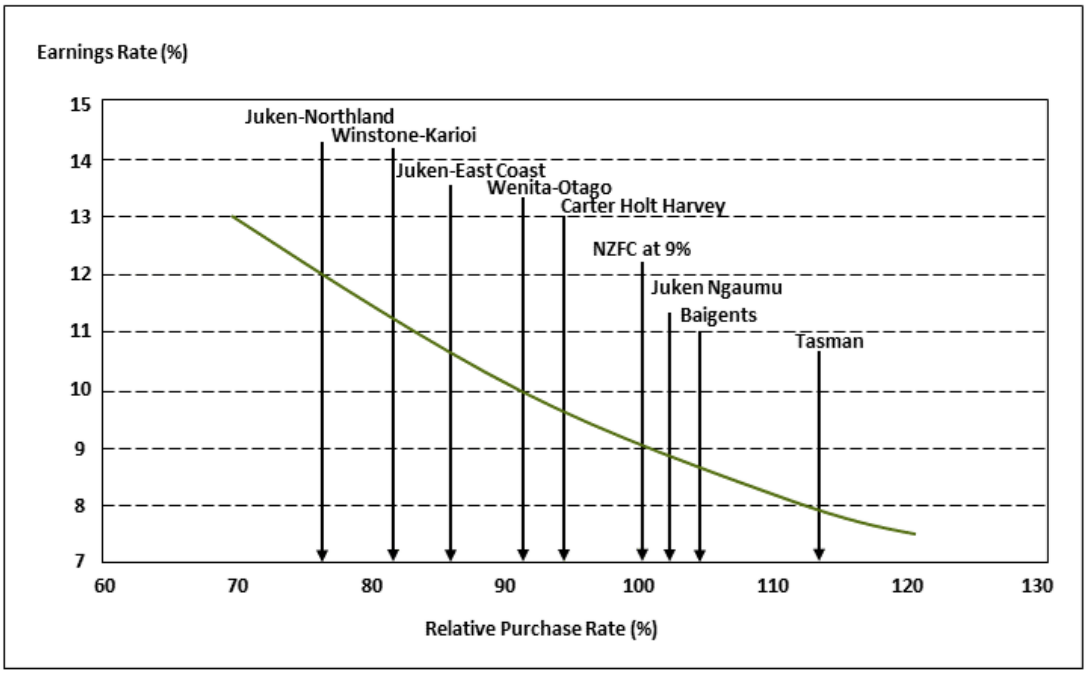
Figure A4-4: Earnings rate vs relative purchase price for 12 hardwood plantation Asset sales 2009 – 2019



Note: Differing perceptions of real price movements can significantly impact the IDR computed for the same asset.

The **New Zealand** Crown Forest Asset sales programme involved some 350,000 ha of plantation forest which was sold to private enterprise in 13 units over the period 1990-1992. Chandler Fraser Keating, a forestry consulting firm, examined the announced sales prices in the context of information memoranda provided by the Crown prior to the sale. Using their own estimates of log sale prices, they concluded that a range of discount rates had been demonstrated in Figure A4-5 (Keating, 1990).

Figure A4-5: Earnings rate vs relative purchase price for nine transaction in Crown Forest Asset Sales 1990 – 1992



Two members of the Crown Forest Asset Sales team published an analysis of the sale results (Manley & Bell, 1992). They explored four different models which incorporated the major variables that might be expected to influence forest value. The discount rate is treated as a solution variable. The two models which most effectively explain the variation in forest values are in Table A4-1.

Table A4-1: Discount rates for Crown Forest Asset Sales estimated by Manley and Bell (1992)

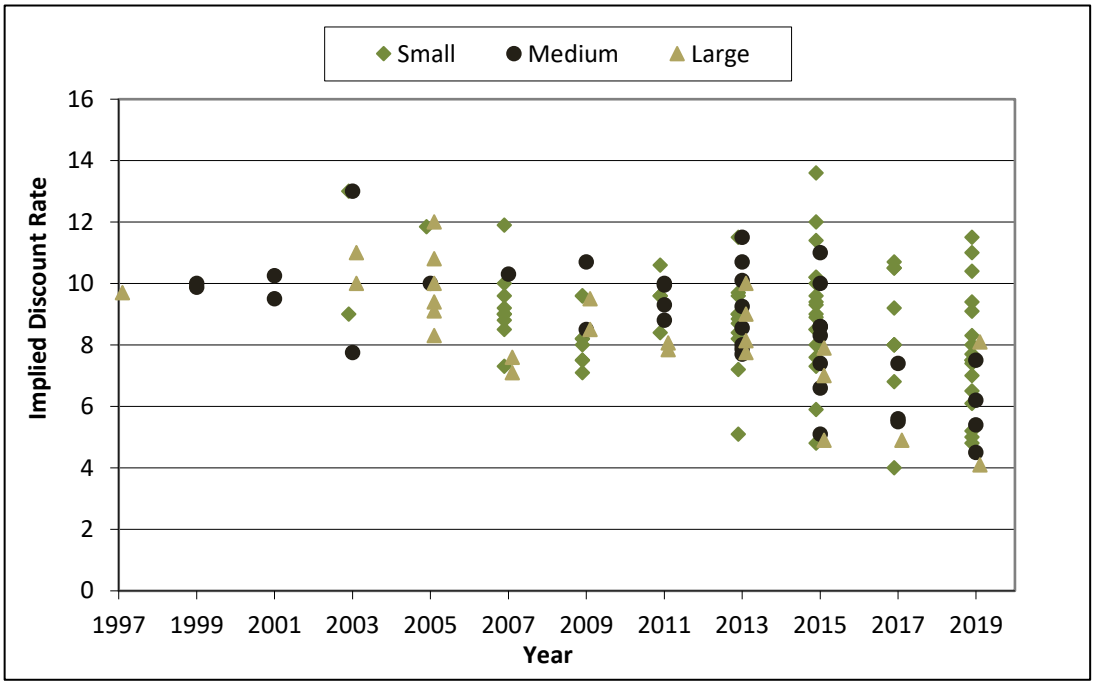
Model	Estimated real*	Model
2	10.1%	92.7%
4	8.8%	94.6%

*The analysis was carried out on pre-tax cashflows

After recognising standard errors associated with the estimates, Manley and Bell (1992) concluded from Model 2, that *'… [the] estimates imply that real pre-tax discount rates in the order of 9-11% were used in valuation of the State plantations. These estimates of discount rate are linked to the rotation age assumed and level of prices assigned*'.

IDRs derived by forest valuers have been historically published in Manley's biennial discount rate surveys (Manley, 1998, 1999, 2001, 2003, 2005, 2007, 2010, 2012, 2014, 2016, 2018, 2020). Historic IDRs derived by forest valuers for New Zealand and Australian transactions are presented in Figure A4-6.

Figure A4-6: IDRs (applied to current rotation pre-tax cashflows) for transactions reported in each of the discount rate surveys. Forests are identified by size class (small <1000 ha; medium 1000 to 10,000 ha; large >10,000 ha).



Source: Manley 2019

IDRs require very careful interpretation. The cashflow representation from which an IDR is derived is totally at the valuer's discretion. Discretionary choices include: current rotation, perpetual model, pre-tax cashflow or post-tax cashflow, log price and log price growth, wood flow assumptions etc.

In addition, not all IDRs are created equal:

- some IDRs are derived from a comprehensive analysis of transaction and associated cashflows;
- others are derived from a crude representation of cashflows; and
- others might have been lifted from discount rates reported in company accounts associated with a forest asset prior to a transaction occurring.

The selection of the appropriate IDR to apply to the subject cashflow needs to be drawn from IDRs associated with transactions that share similar characteristics with the subject forest, and that have been derived using a methodology consistent with the manner in which the IDR is to be applied.

More recent discount rate surveys (e.g. Manley, 2019) have been updated to allow for the separate reporting of IDRs applied to the current rotation and multiple rotation cashflows. Recognition of the existence of multiple IDRs assists in reconciling the various sources. The impact of forest size on discount rate has also been recognised.

Applied or declared discount rates

Discount rates employed in asset reporting

At the time of writing, publicly reported companies in Australasia have declared that the rates in Table A4-2 have been used in valuing their forest assets.

Table A4-2: Discount rates declared in financial reporting for Australasia-registered companies with annual reports in the public domain are shown in the table below (all rates are applied to real current rotation pre-tax cashflows).

Company	Report date	2014	2015	2016	2017	2018	2019
Australia							
WA Government – FPC pine plantations	30-Jun	9	9	9	9	8.6	8.8
WA Government – FPC sandalwood plantations	30-Jun	9.5	9.5	9.5	9.5	10.3	10.3
WA Government – FPC natural forest	30-Jun	9.5	9.5	9.5	9.5	9.5	9.5
New Forests – Forico	30-Jun						8.0
SA Government – ForestrySA	30-Jun	7.6	8.5	8.5	8.5	9.4	9.2
GFP – Hume Forest Industries	31-Dec					7.0	
HNRGA – HVP	30-Jun	7.5	7.5	7	7	7	7.0
HNRGA – Grandridge Plantations	30-Jun	7.5	7.5	7	7		7.0
HNRGA – HQP	30-Jun	10.9	10.2	9.9	8.8		8.4
KIPT	30-Jun					11.65	
Midway	30-Jun	8	8	8	8	8	8
NSW Government – FCNSW	30-Jun	8.5	8	7.5	7.5	7.5	
Tasmanian Government – STT	30 Jun	9.4	8.5	9.4	8.75	8.75	
Victorian Government – VicForests (nat. forest)	30 Jun	7.5	7.5	7	7	7.31	
New Zealand							
China Forestry Group	31 Dec	8.2	8.2	8.2	8.0	7.5	7.5
Greenheart NZ	31 Dec	8.5	8.5	8.5	8.5	7.5	7.5
GTI 8 New Zealand	31 Dec	8.5	8.5	8.0	7.5	7.0	7.0
Invercargill City Forests	30 June	9.5	8.5	8.0	7.5	6.75	6.5
Kaingaroa Timberlands	30 June	7.5	7.5	7.0	6.5	6.25	6.25
Matariki Forestry Group	31 Dec	8.5	8.5	8.0	7.75	7.5	6.5
Nelson Forests	31 Dec	8.5	7.5	7.5	7.0	7.38	7.5
Oregon Group (Ernslaw One)	30 June	8.5	8.0	8.0	8.0	7.5	7.25
OTPP	31 Dec	8.0	7.75	7.75	7.5	7.37	7.06
Pan Pac Forest Products	31 March		8.0	7.5	7.25	7.0	7.0
SunChang Forestry NZ	31 Dec	8.7	8.7	8.6	8.6	7.6	7.6
Taumata Plantations Ltd	30 June	8.5	7.5	7.5	7.25	7.25	7.0
Te Waihou Plantations	31 Dec	8.5	8.5	8.0	8.0	7.0	7.0
Tiaki Plantations	30 June	7.5	7.25	6.75	6.5	6.5	6.5
Timbergrow Plantations	30 June	9.0	8.5	7.5	7.5	7.5	7.25
Wenita Forest Products	31 Dec	7.5	7.5	7.0	7.0	6.5	6.5

Varying levels of disclosure concerning the valuation methodology and critical assumptions employed are reported in the company accounts. The level of disclosure covers the spectrum from little through to a relatively unambiguous and high level of disclosure.

Many of the disclosures made in the company accounts listed above assert that the asset has been valued on a 'going concern' basis. In most of these cases, while the asset may have been modelled on this basis the valuation has been confined to the current rotation cashflows. The reported discount rate pertains to just this portion of the 'going concern' cashflow.

For many readers valuation on a 'going concern' basis suggests the use of full operational or enterprise cashflows that include reinvestment in the asset base through ongoing reestablishment activities and the subsequent realisation of harvest revenues from these activities. Such ambiguity can lead readers to misconstrue that the discount rate used by forest valuer in valuing the tree crop represents a measure of the return on investment from the enterprise.

Despite the preparation of the company accounts by parties other than the forest valuer, it is incumbent upon the forest valuer to ensure unambiguous disclosure around the derivation of the tree crop and forest asset values.

<u>Disclosure of applied discount rates</u>

A framework for the preferred level of discount rate(s) and associated valuation disclosures is set out below.

Disclosure regarding such characteristics as the following afford forest valuers an improved basis on which they can assess discount rate evidence:

- The various discount rate(s) employed in valuing the assets and the specific asset value that were used in deriving them, e.g.
  - an estimate of tree crop value using a current rotation cashflow model;
  - an estimate of forest estate value using an investment/ purchase model; and
  - an estimate of carbon value;
- The cashflows to which each of the discount rates were applied including:
  - whether discount rates apply to nominal or real cashflows;
  - whether the cashflows were on a pre-tax or post-corporate tax basis; and
  - whether the cashflows include an explicit treatment of debt financing;
- The methodology and treatment used to recognise freehold land;
- The presence or absence of lessee of lessor interests where land is rented; and
  - a summary of key valuation assumptions including:
  - harvest profile and markets; and
  - a description of log prices employed in the valuation

Such levels of disclosure are fundamental in ensuring that discount rates drawn from different sources can be compared and applied appropriately.

Declared hurdle rates

Hurdle rates are primarily intended for use in investment decision-making. The declaration of such rates does not necessarily imply their suitability for forest valuation as they may not represent the market perception of the desirability of a forest investment.

State-owned forests in Australasia previously provided a useful source of hurdle rates. The privatisation of these estates is nearly complete. With a high proportion of these estates now under private ownership, publicly-declared hurdle rates have been scarce. Increased competition for capital to invest in forestry along with a scarcity of quality opportunities within which to deploy the capital raised has led Timber Investment Management Organisations (TIMOs) to be more circumspect in disclosing hurdle rates.

Despite the above, sporadic information does becomes available in the public domain. It can provide a useful benchmark for investor return expectations from investment in forestry.

Capitalisation rates and multipliers

Capitalisation rates are widely represented in the analysis of real estate investments, and in other real asset classes.

They are aligned with what the forest valuers refer to as discount rates, effectively being a subset of them. The distinction comes about because of their derivation and application. They are (mostly) based on the presumption of an equal annual earnings stream, such as is offered by the rent paid by a tenant. Because of the expectation of the even income flow, just one year's average income suffices for both the derivation of the rate and its application.

The rates are derived from market evidence and, as such, they are more aligned with IDRs than with WACC-derived or 'built-up' rates.

Just as with IDRs, it is necessary to address the nature of the rental stream, including whether it is the rent before or after inducements offered to the tenant, occupancy rate, review mechanisms etc.

<u>Potential application of capitalisation rates</u>

Capitalisation rates from real estate activity are not sufficient for direct application in forest valuations. However, they may deserve closer attention for the following:

- as an expression of wider investment market buoyancy;
- as a confirmation of the level of variability that can be encountered within other asset classes;

- as evidence of the differences that are evident between sub-classes of real estate;
- identification of influences on investor perception from markets with abundant evidence;
- evident trends;
- the opportunity cost to diversified investors of taking funds out of real estate and putting it in timberland;
- the beta characteristics of other forms of real estate compared to timberland; and
- the importance in defining the rent and purchase price consistently.

Example sources of capitalisation rates: www.cbre.com.au/research-reports/Asia-Pacific-Cap-Rate-Survey-May-2020.

Internal rate of return

There is general agreement that a forest project's own IRR is an inappropriate basis for its valuation. Since it is by definition an internal rate, it does not address the investor's alternate investment opportunities.

However, a market rate of return might be found from the minimum market acceptable IRR observed in a range of alternative forest projects. For example, offering documents for forestry schemes generally report an expected IRR. The offering documents generally give prominence to this parameter, and it could be concluded that their successful subscription demonstrates that the quoted IRRs either match or exceed the investors' required return on equity.

Discount rate surveys

A limited number of surveys are periodically compiled on timberland discount rates. Such surveys include those compiled by the James W. Sewall Company (www.sewall.com), IWC (www.iwc.dk) and Professor Bruce Manley of the University of Canterbury. These surveys typically seek to disclose discount rates relating to certain forest assets derived using one or a number of the approaches previously discussed.

The discount rate surveys compiled by the James W. Sewall Company are prepared internally and are typically made available to clients using them for appraisal work. The surveys compiled by the International Woodland Company typically report rates that are publicly disclosed.

Since the second quarter of 1997, Manley's biennial discount rate surveys have been published in the New Zealand Journal of Forestry. It is the most widely recognised survey referenced in Australia and New Zealand forest valuations and represents one of the most compelling tools at a forest valuer's disposal. Forest valuers employed by forestry companies and consulting firms are surveyed on the discount rates that they employ in valuing forests. The extent of the questions included in the survey has increased through time, with Manley's most recent 2017 survey (Manley, 2018) asking the following questions:

	1) What methods do you use to determine the market value of a tree crop (or forest)? 2) When using the income (expectation value) approach, what real discount rate do you use to estimate the market value of a tree crop (or forest)? 3) What is the basis for deriving this rate? 4) How do you determine the log prices used? 5) How do you account for the cost of the use of land in valuing a tree crop? 6) Do you include cashflows from only the current crop? 7) When do you assume that cashflows occur? 8) Do you apply a stand-based or estate-based approach? 9) What specific allowance do you make for risk? Do you adjust the discount rate for forest-specific risk? 10) What method do you use to determine the market value of the carbon trading opportunity? 11) What real discount rate do you use to estimate the market value of the carbon trading opportunity? 12) How do you determine the carbon prices used? 13) What carbon trading strategy is assumed? 14) How do you account for the cost of the use of land in valuing carbon? 15) What is your estimate of the discount rate implicit in the transaction price of recent forest sales in New Zealand and Australia? 16) What real discount rate do you use to evaluate replanting or new planting investments? 17) What is your estimate of the IRR on replanting or new planting? The increasing level of disclosures and background relating to the discount rates generated through these surveys provides an improving base from which to interpret and analyse these data. The results of Manley's biennial surveys are summarised in Implied Discount Rate Section.
Risk and the discount rate	Sources of risk and uncertainty associated with forestry include: • *catastrophic events*: For example, forest fires, windthrow, volcanic activity etc; • *other attrition*: For example, disease, snow damage, browsing damage, landslides etc; • *growth performance*: The closer to maturity the forest is, the less the uncertainty. However, at any age the future performance of the stand is inherently uncertain, being dependent on a complex combination of biological interactions; • *stand quality characteristics*: Not only is the growth in total recoverable volume uncertain, but so too is the composition by log type; • *market*: Historical evidence indicates considerable volatility in market prices for the forest's produce. Market risk can be broadly categorised in terms of depth and concentration. The increasing

dominance of export markets (in particular China and India) over recent years, combined with movements in exchange rates and shipping rates, makes the accurate forecasting of future expected log markets (and prices) challenging;

- *legislative institutions*: Notable examples of these include:

  Australia

  - As of 29 March 2020, and as part of the Federal Government's (temporary) COVID-19 response, all monetary screening thresholds triggering the requirement for Foreign Investment Review Board (FIRB) approval under Foreign Acquisitions and Takeovers Act 1975 (FATA) were lowered to $0. The effect of this change is that all foreign investments (other than those exempt by the FATA) will require FIRB approval. At the same time the statutory review period for assessing applications has been increased from 30 days to up to six months.
  - in 2011 in South Australia the Natural Resources Management (Commercial Forests) Amendment Act 2011 was assented to manage the impacts of commercial forestry through a forest water licensing and permit system.

  New Zealand

  - overseas investment regulations in the New Zealand context have given rise to an uncertain and protracted process in closing transactions that involve overseas investors
  - the introduction of National Environmental Standards for Plantation Forestry (NES-PF) under the Resource Management Act 1991 that prevail over district or regional plan rules except where the NES-PF specifically allows more stringent plan rules;
- *human factors*: Much as the forests themselves may be tranquil, this is not always the case with investment and management structures. Ill-will and mistrust may arise in joint ventures and partnerships, compromising the quality of forest management; and
- *cost of inputs*: The profitability of a forest may be more responsive to the level of costs incurred in administration and other overheads than to variation in 'direct' costs, e.g. those relating to establishment and silviculture.

Handling risk in the forest valuation

The earlier discussion of risk, when examining the concept of β, might be taken to imply that risk can be exclusively handled in the discount rate – a sort of convenient 'one-stop-shop' approach. Such thinking has been both pervasive and popular, but it is also crude and inappropriate.

A discount rate estimated directly or indirectly from market information can be expected to contain an element relating to the 'average' risk associated with forestry. Allowance needs to be made when valuing forests with greater (or lesser) levels of risk. The preferred approach in this situation is to adjust future cashflows, rather than the discount rate.

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CHAPTER A5 – TAXATION

REVISION HISTORY

Original Standard	NZIF released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • reformatted the 1999 Word version (as no 2019 Exposure Draft); • brought references to Australia to before references to New Zealand; and • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place.
Current Status	Further revisions required prior to draft release.

CHAPTER A6 – FUNDING AND OWNERSHIP STRICTURE

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • reformatted the 1999 Word version (as no 2019 Exposure Draft); and • minor editing for context.
Current Status	Further revisions required prior to draft release.

CHAPTER A7 – THE NATURE OF THE MARKETS FOR FORESTS

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • incorporated the Australian market; and • minor updates to dated text.
Current Status	Further revisions required prior to draft release.

2 PART B - FOREST DESCRIPTION AND VALUATION STANDARDS

CHAPTER B1 – DESCRIPTION OF LAND

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • including (in Standards B1.1 and B1.6) the status of the land in the NZ Emissions Trading Scheme (ETS) pursuant to the Climate Change Response Act (CCRA) 2002, the Permanent Forest Sink Initiative (PFSI) and the Afforestation Grant Scheme (AGS); • requiring (Standard B1.2) the forest description to verify that the position of the forest and cadastral reference are not materially different; • specifying (Standard B1.3, point 2) whether legal access could provide access to the entire property; • including (Standard B1.4) archaeological features or historic sites; • including (Standard B1.5 point 2) forestry-related activities that are permitted activities and do not require consent; and • requiring (Standard B1.5, point 3) the forest description to declare any known archaeological or historic sites and whether any authorities have been granted by Heritage New Zealand.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • including Australian climate change programs; • including reference to future planned infrastructure developments; • requirements to replant plantation forests or regenerate or re-seed natural forests; and • inclusion of native title references.
Current Status	Released as draft.

CHAPTER B1

STANDARD FOR DESCRIPTION OF LAND

Purpose	The purpose of this standard is to ensure that the forest description adequately documents the land on which the forest is located in terms of: • legal ownership and tenure; • location; • access; • physical attributes and characteristics; • limitations on use imposed by law and regulatory authorities; • status of the land in the NZ Emissions Trading Scheme (ETS) pursuant to the Climate Change Response Act (CCRA) 2002, the Permanent Forest Sink Initiative (PFSI) and the Afforestation Grant Scheme (AGS); • status of the land under any Australian carbon accounting scheme, such as the historic Greenhouse Challenge Plus™ Programme or their derivatives; and • other salient features (e.g. current social and/or environmental constraints impacting on the land use and planned future constraints, such as infrastructure development e.g. wind turbines, power lines).
STANDARD B1.1	For land and tree crop ownership and tenure, the forest description shall: • declare the ownership of trees, land and other rights and arrangements (e.g. carbon lease) pertaining to the trees and/or land to the extent necessary to support the use for which the forest description has been prepared; • note the existence of other tenures of land included within the apparent forest boundary (e.g. unformed legal roads, give-and-take boundaries, infrastructure (wind turbines)); • adequately reference all contracts and other documents affecting rights to or ownership of the land and/or trees, and include statements or evidence that such documents have been reviewed and that all titles and other instruments have been searched, noting any encumbrances or limitations that could have a material impact on the value of tree crop; • in the case where for **New Zealand** post-1989 forest land has been registered in the Emission Trading Scheme (ETS) pursuant to the Climate Change Response Act (CCRA) 2002, or for **Australia** under a climate change program where the tree crop is owned by way of a registered forestry right or registered lease, declare such participation for the purposes of the NZ ETS or Australia's Emissions Reduction Offset Scheme (EROS); and • declare what reliance has been placed on information provided by third parties.

STANDARD B1.2	For defining the location of the land and forest, the forest description shall: • provide the cadastral reference of the land; • describe the position of the forest with sufficient precision for its location to be unambiguous to all intended users of the forest description; • include a map(s) of scale and quality to show the location(s) of the forest to permit a user of the forest description to get to the forest to verify that it exists; and • verify that the position of the forest and cadastral reference are not materially different.
STANDARD B1.3	For defining the access to the land and forest, the forest description shall: • state whether the land is connected to the public roading network by legal access (including right of ways, easements or other arrangements); • state whether the legal access (if present) is or could be practically formed to a standard suitable for use for log extraction by a logging truck to provide access to the entire property; • in the case where the landowner is not the same entity as the tree crop owner, state any conditions or restrictions on access imposed on the tree crop owner by the landowner (e.g. conditions for use of right of way); and • state any assumptions made about access to the land and forest for the management and extraction of forest produce. Note: Ensure any costs associated with legalising access or forming practical access are included in the forest valuation cashflow.
STANDARD B1.4	For describing the physical attributes of the land, the forest description shall: • contain a narrative describing the physical features salient to the purpose for which the forest description is prepared, which shall be complete and not misleading; • describe the relevant aspects of: – archaeological features or historic sites – climate – drainage and catchment, including erosion or flooding – limitations – geomorphology – highest and best use – infrastructure (current roading system, bridges) – land classification – microclimate (e.g. frost hollows, swamp) – minerals and steam – rainfall – rocks (roading material)

	– site productivity – soils – topography – vegetation (non-forest, e.g. weeds, previous vegetation) – past land use (e.g. farm, native cutover) – planned future land uses (e.g. wind turbines, powerlines) – other features (e.g. altitude, aspect); • provide the basis for the impact of physical features on yields, costs and prices, based on the amplification of material in this narrative as specified in subsequent sections of this standard; and • ensure that any statements asserted as being factual are capable of verification (to authoritative source, if they exist).
STANDARD B1.5	For regulatory considerations, the forest description shall: • declare all management covenants, rights etc, pertaining to the land, its use, occupation or access that are pertinent to its use for the establishment, management, harvesting and removal of trees now or in the future; • any non-regulatory obligations and constraints arising from customary, 'community' interest and native title are to be declared (e.g. customary hunting rights, customary access rights); • declare any requirement to re-establish planted forests or regenerate or re-seed natural forests following harvest; • provide details of the operative district/local government authority and associated regional plans as they relate to the use of the land for forestry, which will describe: – **New Zealand** NES-PF (National Environmental Standards for Plantation Forestry) or **Australian** relevant state Codes of Practice risk assessment: erosion susceptibility classification, fish spawning indicator, wilding tree risk etc. – forestry-related activities (afforestation, pruning and thinning to waste, earthworks, river crossings, forest quarrying, harvesting, mechanical land preparation, replanting) that are permitted activities and do not require consent – consents required – consents obtained – likely consents conditions – any known violations/actions; • declare any known and non-confidential archaeological or historic sites and whether any authorities have been granted by Heritage **New Zealand** or by relevant state authorities / Codes of Practice requirements for **Australia**; • declare any known non-complying uses (e.g. sawmill dump, residential/industrial dump or quarry or chemical storage on forest land with and without a permit); and

	• declare any known requirement for action or works under statutes and regulations, that will have a material impact on tree crop value.
STANDARD B1.6	For the NZ Emissions Trading Scheme (ETS) pursuant to the Climate Change Response Act 2002 (CCRA), the forest description shall: • declare the status or eligibility of the land in the ETS (pre-1990, post-1989, pre-1990 offsetting or exempt forest land as defined in the CCRA and its registration status); • declare the dates (month and year) of harvesting for areas awaiting replanting that are subject to deforestation liabilities; • for registered post-1989 forest land, declare the details of any emissions returns filed with the Ministry for Primary Industries (MPI); and • state whether the post-1989 forest land tree crop is subject to Field Measurement Approach (FMA) participant-specific tables of carbon stocks. If applicable, provide details of obligations, liabilities and entitlements under the Permanent Forest Sink Initiative (PFSI) or Afforestation Grant Scheme (AGS). For the appropriate **Australian** scheme(s), the forest description shall: • if Australian Carbon Credit Units (ACCUs) have been issued against the forest, state whether the [insert appropriate year] forest land tree crop relied on the Australian Government's FullCam program or direct measurement to assign mass of carbon.
STANDARD B1.7	In addition, the forest description shall: • contain narrative describing features, not covered elsewhere, likely to be salient to the purpose for which the forest description is prepared; and • this may cover existence of reserves and specific features of: – flora and fauna – customary use, native title and public access arrangements – hunting rights

CHAPTER B2 – FOREST AREA

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • subdividing area (Standard B2.1) into potentially plantable area and non-productive area; • focusing Standard B2.2 on stocked area measurement; • including (Standard B2.4) the forest owner within the category of third party sources of area information; • including a new standard (Standard 2.7) and Guidance Note on Mapping Forest Land for the Emissions Trading Scheme (ETS); • allowing (Guidance Note – Legally occupied) for unformed legal roadways and river accretion areas to be included in the forest valuation; • updating (Guidance Note – Area measurement from maps or photographs) the list of sources to include LiDAR data and national datasets such as the LINZ Topo50 map series database; and • noting that in the Reliability Tables (Tables 1 and 2) photogrammetric includes the use of orthophotos, satellite imagery and/or LiDAR data.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place.
Current Status	Released as draft.

CHAPTER B2

STANDARD FOR DESCRIPTION OF FOREST AREA

Purpose	The purpose of the standard is to ensure that: • all area information relevant to the uses for which the forest description is prepared is disclosed; • area measurement and conventions are declared; • the reliance placed on the non-confirmed area measurement is declared; • the estimated accuracy of the area statement is declared, and the potential impact any lack of accuracy may have on information derived from the forest description is disclosed; and • area measurement is consistent with yield measurement.
STANDARD B2.1 **Declaration of areas**	The forest description shall declare the following areas: • in the case of land that is described on a Certificate of Title, the legal title areas upon which the forest is located; • in the case of land that is legally under the use of the forest owner and for which a surveyed area is known, but the land is not described on a Certificate of Title, the declared total land area and the source of that area information[9]; • total land contained within the forest description, including any land not included within the area legally occupied[10] and outside the property's external legal boundaries, as covered by the above; • a breakdown of areas within the forest description into classes relevant to the uses of the forest description - as a minimum this shall include: *Plantation forests* a) Potentially Plantable Area (PPA): – currently stocked (Net Stocked Area – NSA) – area prepared for planting – area not prepared but intended for planting b) non-Productive Area: – other area; *Natural forests* a) gross area: b) harvestable or utilisable area – categorisation by harvest history / intensity – areas to be scarified / seeded post harvesting c) conservation areas (stream buffers, riparian zones etc)

[9] In the case of Crown land this may include Crown records and/or Crown lease areas.

[10] There are rare instances in Australia where area is assigned for legal reasons but harvest volumes are pooled from larger areas, as is the case with ex-management investment scheme areas now converted to institutional or other private ownership.

	• a breakdown of, or reference to, areas that are not legally occupied, but are within the forest description and outside the property's external legal boundaries, into the above categories; and • where material, the likely changes in potentially plantable area from one rotation to the next including increases (e.g. replanting of previously failed areas) or decreases (e.g. increased setbacks).
STANDARD B2.2 **Stocked area measurement**	For describing the way in which the Net Stocked Area (NSA) was determined and checked, the forest description shall: • describe the method of area definition and measurement or source of area information, together with a description how those areas have been assessed.
STANDARD B2.3 **Area reconciliation**	For reconciling reported areas to known areas, the forest description shall: • declare whether or not measured areas have been reconciled by measurement and summation of all areas within a legal title or known surveyed area; and • declare whether or not areas have been reconciled with areas recorded in any forest record system upon which the forest description relies.
STANDARD B2.4 **Reliance on areas supplied by others**	Where reliance has been placed on area information sourced from third parties (including the forest owner), the forest description shall describe the procedures undertaken to verify such information.
STANDARD B2.5 **Statement of reliability**	An estimate of the accuracy of stocked area statements shall be provided, along with the source of that estimate.
STANDARD B2.6 **Consistency with yield measurement**	Forest area measurement conventions shall be consistent with conventions used for the estimation of yields.
STANDARD B2.7 **Mapping Forest Land for Carbon sequestration**	In **Australia** mapping for all projects under the Carbon Credits (Carbon Farming Initiative) Act 2011 should comply with the Carbon Farming Initiative (CFI) Mapping Standards produced by The Department of the Environment and Energy. In **New Zealand** all mapping of post-1989 forest land, as defined by the Climate Change Response Act (CCRA) 2002 for registration in the Emission Trading Scheme (ETS) must be completed in accordance with the Geospatial Mapping Information Standard, 'the Mapping Standard', issued under the authority delegated to the Chief Executive of the Ministry for Primary Industries (MPI).

GUIDANCE NOTES ON NET STOCKED AREA STATEMENT

Importance of area in forest valuation	Forest value is closely related to reported stocked area. There will be a trade-off between the value of having a more precise area statement and the cost of obtaining it. Thus, the purpose of the forest valuation and potential impact of not having precise areas must be known. An appreciation of the confidence that should be placed on any area statement can be extremely important to the user of a forest valuation.
Gross land area	Gross land area may be sourced from: • In **Australia**, the surveyed area as defined on a Certificate of Title, survey Plan approved by the respective State's Surveyor General or in the case of Crown land, Crown Leases or Crown Records; and • In **New Zealand**, from the surveyed area as defined on a Certificate of Title, Survey Plan approved by the District Land Registrar, Cadastral Record Map, or in the case of some Crown Land and Maori Land, from other documents.
Legally occupied	The term 'legally occupied' in the standard for declaration of areas means: *that area to which the forest owner has legal title or occupation rights of some form*. Areas that are not legally occupied would be stocked areas on, for example: • unformed legal roadways (in New Zealand belonging to the local District Council); • neighbouring property as a result of fenced boundaries that do not follow legal boundaries; and • accretion areas on river boundaries. In **New Zealand** areas not legally occupied, such as unformed legal roadways and accretion areas on river boundaries, are commonly harvested together with the adjacent areas without consent from the local District Council or the Crown. Thus, while not 'legally occupied' these areas may be included in the forest valuation and the stocked area statement. Tree crop areas situated on neighbouring property for which there is no legal agreement of ownership, such as a lease, forestry right or other agreement, must be disclosed and excluded from the forest valuation and the stocked area statement where material.
Wide variation in reliability	The determination of an NSA may range from extremely precise (photogrammetric survey) to extremely rough (eyeball estimate or measurement off uncorrected aerial photograph).

	Given the many factors that can influence the reliability of any area statement, it is impossible to provide any guideline that could be applied with confidence to individual cases. The safest approach is to seek advice from a qualified expert about the likely reliability of any area statement on a case-by-case basis. However, it is recognised that expert opinion will not be readily available in all cases. Experts who are working full-time in the field of forest area measurement can draw on their experience, using various mapping and measurement techniques, to provide some guidance. These notes give some background and the guidance provided by such experts.
Selection of method of determining area	The method selected for area determination will depend on the precision required, as well as the size, terrain, location, access and age class distribution of the block. The methodology used to determine the area should reflect the size and value of the stand and the purpose for which the forest description is being prepared. Consideration should be given to longer-term management requirements when deciding on mapping methods.
Area measurement conventions	The measurement of forest area needs to follow conventions that are consistent with the determination of yield. These conventions must cover, as a minimum: • inclusion or exclusion of stocking gaps (depending on yield conventions); • if excluded, the minimum size stocking gap recognised (usually 0.1 ha for stocked area mapping); • inclusion or exclusion of forest roads, reserves, or other unstocked areas; and • definition of stocked area boundary (stem, edge of crown, or some intermediate distance between the two). This must be consistent with forest inventory practice.
Area measurement from ground survey	The area may be determined directly from ground survey data without reference to a map. Ground surveys can be completed by a chain and compass survey, Global Positioning System (GPS) or a full theodolite survey. The accuracy of a ground survey is dependent on the method used.

Area measurement from maps, photographs or remotely sensed data	Maps can be produced using a variety of methods. For the purposes of measuring stocked areas, a map may consist only of stocked boundaries or of stocked boundaries transferred to accurate base mapping. Accurate base mapping uses one or more of the following methods or sources of information: • photogrammetric mapping, orthophotos or satellite imagery; • GPS survey; • LiDAR data; • national datasets; – **Australia** the data sets are organised at state level, resolution varies by state and location within states but range from 1:25,000 upwards – **New Zealand** the LINZ Topo50 map series database; and • conventional survey. • Maps showing stocked area boundaries only, or transferring stocked area boundaries to a base map, can be completed using one or a combination of the following methods: • photogrammetric mapping, orthophotos, remotely sensed data; • GPS survey; • ground survey; and • visual transfer. The accuracy of area measurement using these options will depend on: • the accuracy and content of the base map; • the accuracy of the method used to transfer stocked area boundaries to the base map; or • in the case of a map showing stocked area boundaries alone, the accuracy of the method used to produce the map. For most valuation purposes, geo-rectified aerial photography (as opposed to ortho-rectified aerial photography), enlarged small-scale maps and non-corrected aerial photography are not suitable for base map production or for direct area measurement without further controls to check accuracy. The use of these for area measurement should be limited to the purposes of valuation where the accuracy of the area measurement (and by implication the confidence the reader can place in the reported value) is not important.
Area measurement techniques	Measurement of areas on maps can be made using: • Geographic Information Systems (GIS) or other survey software; • digital electronic planimeter; or • dot grid.

	The accuracy of the measurement is dependent on: • the accuracy of the base map information; • the accuracy of the superimposed boundary (e.g. the forest boundary); and • the skill of the operator. There are no major differences in precision for each of the four methods, but a dot grid is not a practical solution for a large area.
Reliability tables	Tables B2-1 and B2-2 provide indicative estimates of the accuracy that could be attached to areas determined by a variety of commonly used base map and stocked area definition techniques. Note that the tables have no scientific basis, as the accuracy of a measured area can only be estimated on a case-by-case basis from the known accuracy of individual point locations. The tables have been derived from the experience of forest draughting practitioners who have been involved in forest area mapping on the same tract of land over time using different techniques. In most cases the range provided is necessarily wide, as many factors will influence accuracy. **Block size:** The percentage error will tend to increase for smaller blocks. **Scale:** Error of definition of stocked boundaries and area measurement will be relatively less (better) using remotely sensed data, aerial photography or mapping at high resolution (e.g. 1m pixels or small scale e.g. 1:10,000) and relatively greater (poorer) at low resolution (10m pixels or large scale e.g. 1:100,000). **Topography:** The potential for error is much greater on steep and/or broken terrain. In an attempt to remove the potentially large influences of these key variables, the following (block size, block shape, scale of mapping and slope) have been defined: **Table B2-1** 100 ha 1:10,000 photography and/or map scale Multiple slopes > 15° **Table B2-2** As for Table B2-1 except: Multiple slopes < 15°

Table B2-1: Accuracy of Area Estimates – Slope > 15°

		Base Map or Data					
		Photogram-metric (see note below)	1:50,000	Aerial photo	Ground survey — GPS (< 1m) (1)	Ground survey — GPS (< 10m) (1)	Ground survey — chain and compass
Super-Imposed Boundaries	Photo-grammetric	± 0.1% to 3% (2)	± 10% to 15% (3)	N/A	N/A	N/A	N/A
	Geo-referenced image (4)	± 2% to 15% (6)	± 10% to 30% (7)	N/A	± 2% to 20% (8)	± 5% to 25% (8)	± 2% to 20% (9)
	Field visual (5)	± 2% to 50% (10)	± 10% to 100%	± 15% to 100%	± 2% to 3% (11)	± 5% to 6% (11)	± 2% to 20% (11)
	Directly off photograph	N/A	N /A	± 15% to 100% (12)	N/A	N/A	N/A

Note: Photogrammetric includes the use of orthophotos, satellite imagery and/or LiDAR data.

Table B2-2: Accuracy of Area Estimates – Slope < 15°

		Base Map or Data					
		Photogram-metric	1:250000	Aerial photo	Ground survey — GPS (< 1m) (1)	Ground survey — GPS (< 10m) (1)	Ground survey — chain & compass (1)
Super-imposed boundaries	Photo-grammetric	± 0.1% to 3% (2)	± 10% to 15% (3)	N/A	N/A	N/A	N/A
	Geo-referenced image (4)	± 2% to 15% (6)	± 10% to 30% (7)	N/A	± 2% to 15% (8)	± 5% to 20% (8)	± 2% to 15% (9)
	Field visual (5)	± 4% to 60% (10)	± 10% to 100%	± 15% to 100%	± 2% to 3% (11)	± 5% to 6% (11)	± 2% to 20% (11)
	Directly off photograph	N/A	N /A	± 5% to 30% (13)	N/A	N/A	N/A

Notes to reliability tables

Every method used to assess areas that require image interpretation needs to be applied by a skilled and experienced operator or checked by such an operator. Poor image quality and/or poor image interpretation can lead to inaccuracies that exceed the estimated accuracy limits presented in the tables above.

The following notes refer to the tables above:

1) GPS or ground survey may be used to define external boundaries or control points and combined with aerial photo interpretation for internal boundaries. The quality of GPS instruments varies widely. Data point precision is typically ± < 1m to ± 10 m.

2) The accuracy limits provided presume adequate ground control. A relatively inexpensive option to get an excellent stocked area statement

is to request a professional mapping firm to undertake a planimetric survey of the stocked area without contours. However, such a survey will not serve the other management needs that a contour map provides. Also, delay times can be a constraint for valuation purposes.

3) This combination is not commonly used.

4) A geo-referenced image refers to an aerial photo or satellite image that is not ortho-rectified. This includes Small Camera Aerial Photography (SCAP).

5) The transfer of stocked boundaries is most accurate when trees are clearly visible on the aerial image. However, for new plantings visual field assessment is usually the only option (unless an image showing sprayed spots is available). The quality of this assessment, combined with experience on likely area losses, will have a significant impact on the reliance that can be placed on this estimate relative to areas subsequently measured off aerial images.

6) This is a commonly used technique for updating stocked areas on photogrammetric base maps in the forest industry. Precision will be greatest on easy contours with good control over alignment of photographic features with the base map.

   If the topographic information shown on the base map is insufficient to provide adequate control, this method could lead to errors substantially greater than 15%.

7) It is recognised as a quick and inexpensive method, but is potentially highly inaccurate, due to the compilation scale and generalised content of the base map.

8) GPS gives good control of external boundaries and potentially internal stocking gap boundaries. The main source of error is typically in the transfer of internal stocking gaps from aerial images that are not ortho-rectified.

9) Accuracy depends mainly on the quality of the compass, the skill of the field survey crew and the calibration of the tape or chain. The application of appropriate 'closing' techniques is also critical.

10) The main source of error using this technique is the performance of the person marking the stocked boundaries in the field, including internal stocking gaps. Influencing factors are the quality and detail of the base map, the state of the ground cover, and ease of access to and viewing of all stocked area boundaries.

11) A boundary survey combined with a visual assessment of stocked area boundaries is only suitable for smaller blocks where internal stocking gaps are insignificant.

	The error limits estimated are for external boundaries only (i.e. assumes full stocking to surveyed perimeter). 12) Accuracy depends on many factors: • ground contour; • scale of photo; • resolution of imagery; • position of forest relative to centre of photograph; and • tilt of camera. 13) Accuracy will be greatest on large-scale photographs that allow precise scaling. This is an inexpensive technique for relatively flat ground where the block is centrally located on the photo. 14) Scale may be determined by direct measurement on the ground (distance between features visible on the photograph) or from flight and camera specifications.
Differences between forest stocked areas and carbon accounting areas	In **Australia,** estimates of land suitable for registration under the Emissions Reduction Fund (ERF) are likely to differ from NSA estimates. When applying to register an area under the ERF, the mapping must be undertaken in accordance with the Carbon Farming Initiative (CFI) Mapping Standards produced by The Department of the Environment and Energy. In **New Zealand** estimates of eligible post-1989 forest land areas as defined by the Climate Change Response Act (CCRA) 2002 are likely to differ from NSA estimates. When applying for Carbon Accounting Areas (CAAs) for the Emission Trading Scheme (ETS) or assessing areas of deforestation in relation to pre-1990 forest land, the forest mapping must be completed in accordance with the Geospatial Mapping Information Standard, 'the Mapping Standard', issued under the authority delegated to the Chief Executive of the Ministry for Primary Industries (MPI).
Australian topographic map references	ACT: http://www.actmapi.act.gov.au/home.html NSW: https://www.spatial.nsw.gov.au/products_and_services/topographic_maps NT: https://denr.nt.gov.au/land-resource-management/info-systems/natural-resource-maps/nr-maps-information QLD: https://www.business.qld.gov.au/running-business/support-assistance/mapping-data-imagery/maps/topographic-maps SA: https://www.environment.sa.gov.au/topics/Science/mapland/maps/topographic-cadastral TAS: https://dpipwe.tas.gov.au/land-tasmania/tasmap VIC:

	https://www.delwp.vic.gov.au/maps/maps-and-services/vicmap-topographic-maps WA: https://www0.landgate.wa.gov.au/maps-and-imagery/topographic-maps

CHAPTER B3 – STAND HISTORY

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • requiring (Standard B3.1, point 1) the forest management system used to be named; • including (Standard B3.1, point 2) coppice year and month and foliar sampling as potential tree crop characteristics; • including (Standard B3.1, point 3) the need to describe the procedures used in the collection, as well as the recording and maintenance of the information contained in the forest records; and • including (Standard B3.1, point 5) in the audit a review of procedures for maintaining the information, as well as collecting and recording it.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • added revised header and footer; • minor edits for clarity; and • distinguish between plantation and natural forest.
Current Status	Released as draft.

CHAPTER B3

STANDARD FOR REPORTING STAND HISTORY

Purpose	The purpose of this standard is to describe the completeness and reliability of the stand records used as a source of information for describing the current condition of the forest and forecasting woodflows and cashflows.
STANDARD B3.1	For stand history, the forest description shall: • describe records (including the name of the forest management information system used) available for use and those which have been used in preparing the forest description (including the rationale for the selection or rejection of data from the records); • for *plantation forests*, describe the completeness of the stand records on tree crop characteristics: – species – genetics – establishment year and month – coppice year and month (if applicable) – irrigation, including volume applied and timing – initial stocking and establishment method – thinning history (age and residual stocking) – pruning history (age, pruned height, number of stems pruned, Diameter at Breast Height (DBH), Diameter Over Stubs (DOS)) – fertiliser application and foliar sampling – adverse events (fire, wind, drought, land movement, pests, disease) and – measurement data (stocking, height, basal area). • for *natural forests*, describe the completeness of the stand records and tree characteristics: – species mix – historic and current management approach, including applicable laws or regulations that prescribes management aspects such as the allowable cut – constraints and restrictions (e.g. conservation requirements, slope, threatened species) that impacts the management of the forest – harvest or thinning history (period and intensity) – enrichment or replanting activities (species, time [month and year], intensity, approach) – adverse events (fire, wind, drought, land movement, pests, disease) and – measurement data (stocking, height, basal area).

	• describe the procedures used in the collection, and the recording and maintenance of the information contained in the forest records; • describe the reliability of the information contained in the forest records which have been used in preparing the forest description; • describe the procedures followed to review and audit the reliability of the records; as a minimum the audit will: – review procedures used for collecting, recording and maintaining the information – undertake compliance testing depending on the results. note: audits should have regard to the materiality of the information or the purpose for which the forest description is prepared; and • describe the steps taken and assumptions made to address deficiencies in the information available in the stand records.

GUIDANCE NOTES ON REPORTING STAND HISTORY

Importance of stand history	Records of the physical events and measurements that have occurred in stands constitute an important part of the forest description. Stand history is a record of what has occurred and what presently exists, and is used in forecasting what will be in the future. This will likely be in respect to both quantity and quality and can have a considerable impact on forest value.
Form and substance	Like financial records, stand history may be kept on paper or a computer-based record system. Whilst the latter will allow easier retrieval and analysis, it is the substance and accuracy rather than the form of the records that is of importance.
What to report	Both crop and site characteristics should be reported. Guidance notes for crop characteristics are given below.
Crop characteristics	**Species** Influences growth, yield and value. **Genetics** Influences growth, yield, log quality and value. Original certificates or reference to records may allow genetic rating to be identified and adjustments made for growth. Any adjustments made for genetic gain should be supported. **Establishment year and month** Often available from planting records (alternatively from increment borer or ring count), this allows the calculation of current age. Some checks can be performed via height, age and site index comparisons. **Silvicultural history** These records allow for the modelling of silviculture and internal/external tree characteristics that impact on value. In the case of plantation tree crops, records of pruning and pruning height are important because these events can significantly impact on value, yet some years after the event they are difficult to verify by other than intensive destructive sampling. The emphasis should be on data derived from inventory/post-operational assessments rather than silvicultural prescriptions or intentions. **Fertiliser application and foliar sampling** Records of fertiliser applications and/or foliar sampling are important in areas where there are known growth limitations and responses to fertiliser. Any adjustments made for fertiliser gain of foliar nutrient levels should be supported.

	Adverse events and timing Events such as fire, wind, drought, land movement, pest attack, disease and physical damage (e.g. from production thinning operations) are important as they influence future growth, yield and value. **Measurement data** This can be in the form of quality control assessments, mid-rotation inventory or pre-harvest inventory.
Inventory	Where records are non-existent or incomplete some gathering of data or inventory will likely be required. The design of such an inventory will depend on the type of forest, specifics of the information sought and the purpose of the investigation. Whilst it is difficult to specify the level of precision in a general sense, inventory design should address the matter of confidence in the estimates that are produced.
Audit or verification	Because of their bearing on forest value, stand history records, like financial records, should not be accepted at face value. Rather, it is appropriate in most cases for the forest valuer to review/audit the reliability of the records. An audit is an objective systematic review process. It involves selecting and evaluating evidence for the purpose of ascertaining the reliability of the information contained in the forest records. Any audit should include a description of the procedures followed to audit the reliability of the records. As a minimum an audit of forest records will: • review procedures used for collecting, recording and maintaining the information; • undertake compliance testing, depending on the results of the review; and • state the valuer's opinion on the reliability of the information.
Disclosure	The valuation should clearly detail the basis of the information used (such as existing records and verification of these records), or independent inventory, and highlight any adjustments to stand history records or assumptions made where information is lacking.

CHAPTER B4 – DESCRIPTION OF AGGREGATION OF STAND AREAS

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • changing the emphasis from croptyping to aggregation. To reflect this, the title has been changed from Standard for Description of Croptyping to Standard for Description of Aggregation of Tree Crop Areas; • changing Standard B4.1 from Croptyping Procedure to Aggregation Procedure; and • deleting Standard B4.2 on Presentation of Croptyping.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • minor language improvements and include reference to Australia; and • changed aggregation of tree crop areas to stand areas to ensure terminology is compatible with the inclusion of natural forests.
Current Status	Released as draft.

CHAPTER B4

STANDARD FOR DESCRIPTION OF AGGREGATION OF STAND AREAS

Purpose	The purpose of this standard is to ensure that if the units of land area, as recorded in the stand record system or generated spatially from base GIS data, are aggregated for the purposes of analysis or forest modelling, then the aggregation process is described and declared and the aggregation actually undertaken follows that process and any loss of information due to aggregation is noted.
STANDARD B4.1 **Aggregation procedure**	For aggregation, the forest description shall: • state the purposes for the aggregation process; • describe the aggregation process, including the rules for: – determining the group membership of each base land unit – combining the attributes of the base land units into group attributes; • confirm that the membership rules are compatible with, and supported by, the attributes of the base land units; • confirm that all the area is accounted for and no area is omitted or double counted on aggregation; • ensure that the system that is used is capable of being audited to confirm the appropriate: – assignment of base land units to groups; – combination of their attributes; and • declare that the aggregation is fit for purpose without material loss of information and/or bias in the aggregation process.

GUIDANCE NOTES ON AGGREGATION

Formerly 'croptyping'	This chapter was previously titled 'Croptyping'. The term 'croptype' is used in the Australian and New Zealand forest industry to variously describe: • the development of planning units, including aggregation; • the identification of areas that are nominally uniform with respect to yield; • the identification of areas where the crop is uniform with respect to any attribute; and • inputs, and the development of those inputs, for some forest estate modelling systems e.g. Tigermoth plunits and Woodstock development types. To reduce the risk that the industry-specific, but overloaded, term 'croptyping' may distract from potential loss of information and bias during aggregation, the term has been replaced by the generic term 'aggregation'.
Background	This standard is about the aggregation of base units of land area (e.g. polygons or stands) for the specific purpose of reducing a forest estate model to a manageable size. Aggregation involves selectively losing non-critical information by grouping base land units and combining their attributes, such as area and yield, in a manner that serves the purpose for which the forest description is to be employed. Aggregation employs two distinct steps: 1) Assignment of each base land unit to a group. Examples may include: • assigning parts of multiple stands to a harvest planning unit (coupe) which will, for the purposes of planning have a single yield table and harvest year; • in New Zealand, assigning all intensively managed, Radiata pine stands in the Far North District to a single National Exotic Forest Description croptype; and • assigning all mature stands that are between 100 km and 150 km from a mill to a single planning supply source. 2) Calculation of group attributes by combination of the attributes of all the contributing land units, e.g.: • summing area; • averaging age or yield on an area-weighted basis; • averaging revenue weighted by volume and area; and • taking a modal category (e.g. using the clearfell year with the largest contribution to area). The outcome of aggregation is a smaller number of land units than in the base data set, with each of the resulting land units considered to be uniform in its attributes (e.g. uniform age, yield, cost and planning intent).

	Categorisation is a necessary prerequisite to aggregation, but is not the focus of this standard. Saying that two stands are in the same planning unit is categorisation. Averaging their yield tables so that the planning unit has one yield table instead of two is aggregation; it is the averaging that loses information. In addition to resulting in lost information, the aggregation of attributes can also introduce bias, particularly when time is involved, because of the non-linear relationship between the discount factor[11] and time. The classic example of the potential for bias is when young stands with high expectations of mature yield are combined with older stands with a lower expectation of mature yield. This results in an average yield table that at clearfell age overstates the yield of the older stands and understates the yield of younger stands. The total expected volume over a long period of time may be correct in this example, but the discounted woodflows and cashflows will be overstated.
Purposes of aggregation	The term 'manageable size' covers a number of basic needs, including: • ease of comprehension or communication; • acceptable solve-times for linear or integer programming solutions; and • fitting within finite resources such as computer memory. The business purpose for aggregation is usually associated with the development of planning units, often harvest-related and with greater spatial resolution for older stands. These planning units might not be suitable for valuation. The reason for requiring disclosure of the purposes of aggregation in the forest description is that information loss that is immaterial in one context may be very material in another. For example, aggregating all of the younger stands into a single group may have no material effect on a short-term clearfell plan, but could be quite inappropriate for a valuation that targets a specific class of ownership in younger stands. A forest valuer may not have control over the level of aggregation, but they should understand its consequences. It is useful to look at the process of getting from forest information through to forest estate model input as having four steps: 1) **Disaggregation.** Disaggregate the forest into a complete set of mutually exclusive units of land area, each of which is uniform in the information that is necessary for modelling purposes, in this case valuation. It used to be safe to call these units stands

[11] The discount factor ($/$/year) is not a linear function of time. Given a set of different time values (e.g. years until harvest for a group of stands), the discount factor calculated from the average time is not the same as the average of the discount factors calculated for each time.

because conventions and the technological limitations of the time meant that modelling information was stored against stands, which were defined in terms of adequate uniformity for most modelling purposes. Increasingly, the unit of land area that serves this purpose is the set of polygons that are the union of a number of GIS layers, each of which provides different information (e.g. ownership, site quality, harvest plan, inventory population etc). Attached to each land unit are categorical and continuous attributes representing the **base** information for the following steps.

2) **Derivation.** Attached to each land unit are attributes **derived** from the base information. For example, in a yield context one might determine that a distinct yield table should be used that reflects the existence of a past inventory operation, the intention to thin at some point in the future, and the location within a forest where a specific growth model and taper function are prescribed. The derived attribute in this case might be a yield table identifier and the base attributes might be obtained from many different base layers. Alternatively, one might derive a transport cost from the distance from wood catchment to market taken from a base layer.
3) **Subsetting.** Remove those land units that do not serve the purposes of this model (e.g. drop those that are not in the forest, ownership, productivity category or rotation that we are valuing based on base and/or derived information).
4) **Re-aggregation**. Aggregate the land units for the very specific purpose of reducing a forest estate model to a manageable size. The key points about this step are:
    a) A forest estate model can be 'run' against the entire set of land units because each has all of the necessary information. However, aggregation may be required to reduce the model run time.
    b) Re-aggregation does not attach new information.
    c) Existing information might be lost as a result of aggregation (e.g. using the average yield or the average planned harvest year instead of different values for each polygon).

In practice, it is rare to observe a process that strictly follows the four steps as described. For example, it is common for efficiency reasons to carry out different parts of No. 2 at different levels of disaggregation. However, this does not remove the general usefulness of thinking in four steps because the effect of intersecting, then classifying, then intersecting again, should be identical to the effect of intersecting all the way to the lowest common denominator land unit, then classifying.

We can identify key concerns of the valuation standards for each of these steps and the transitions between them, e.g.:

1) Not losing or gaining total area other than as intended by **subsetting**.
2) **Derivation** according to well-defined, documented and plausible standards.

	3) Not losing information in the **re-aggregation** step to the extent that we have a material effect on the outcome (i.e. the forest value).

CHAPTER B5 – YIELD ESTIMATION

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • focusing the standard on: (a) describing the base measurement data; and (b) describing the modelling process used to generate yield tables from the base measurement data; • requiring a description of all models and assumptions used, rather than requiring them only for specified models and assumptions; • requiring a description of the steps taken to ensure consistency of yield estimates with other components of the forest description; and • requiring the results of comparative analyses that inform about the quality of yield estimates.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • Amendment of Standard B5.1 to cover the basis for expressing yield in yield tables • Guidance notes addition addressing the difference between natural forest biological yield versus commercial utilisable volume.
Current Status	Released as draft.

CHAPTER B5

YIELD ESTIMATION

Purpose	The purpose of this standard is to ensure: • a description and disclosure of the basis for all estimates of the quantity and quality of current and future yield in the forest covered by the forest description; and • conformity of yield estimation with the overall forest description, including forest area, stand history, costs and log prices. Consideration of yields is required irrespective of the valuation approach.
STANDARD B5.1 **Yield estimation**	The forest description shall: • describe the base measurement data underpinning the yield tables, including: – a declaration of the area for which base measurement data: (a) comes from an inventory; (b) does not come from an inventory – where base measurement data comes from an inventory: • population age at time of measurement • sampling design and intensity • inventory procedures and execution • elapsed time since measurement • rules used to associate inventory populations with forest description area units • steps taken to verify that the inventory data is representative of the forest description land units to which it is applied. – where base measurement data does not come from inventory data: • where it does come from; • describe the basis of how yield is expressed in the yield tables – standing volume or harvest volume – basis for determining volume removed during thinnings – units • describe the modelling process that generated the yield tables from the base measurement data, including: – the models and assumptions used – rules used to select from amongst alternate models and inputs for forest description area units – references to supporting reports that justify the choices of models and their performance, with particular reference to the valuation context; • describe the steps taken to ensure consistency of yield estimates with other components of the forest description, including forest area, stand history, costs and log prices; and

	• provide the results of comparative analyses that inform about the quality of yield estimates and any adjustments applied as a consequence. Examples of comparative analyses include: – comparison with independent inventory – comparison with historic production data – comparison with reasonable expectations – comparison with yield tables used in previous valuations of the same estate – comparison of generic with subsequent specific yield tables – audit by re-measurement of a sample of recent inventory plots.

GUIDANCE NOTES ON REPORTING YIELD ESTIMATION

Background	This section is about the development of **base** yield estimates as opposed to the aggregated yield tables that might be presented to a forest estate model. Aggregation of **base** yield estimates to reduce the forest description to a manageable size is covered further in Chapter 4. A yield estimate is an estimate of the availability of one or more products at some specified point in time. In the commonest cases this means an estimate of the volume per unit area of each of a number of merchantable log grades at a point in time at or after the valuation date. It is common practice to prepare estimates for the same area at multiple future points in time, with each point representing a feasible time of harvest (i.e. a yield table). It is also common practice to define the points in time using an offset from the time of planting (age) instead of using calendar time. In a forest description suitable for valuation, each identifiable area (polygon or stand) that is considered to be productive will be associated with a yield table for the current crop and be treated as uniform with respect to yield. It may also have a yield table for future crops if the valuation spans multiple rotations. Multiple areas may share the same yield table. In a forest description suitable for forest planning, each identifiable area may have multiple yield tables representing different management options (e.g. thinning options) or mixes of products. Underlying most yield estimates are two key components: 1) Measurements of trees at a point in time. 2) Models that convert the tree measurements into yield estimates at future points in time. It is common for tree measurements to represent a sample within a pre-defined boundary, collected to estimate the yield within that boundary (i.e. forest inventory within a pre-defined inventory population).
Models	Models include, without limitation: 1) Imputation models to fill in unmeasured values (e.g. diameter/height regressions). 2) Statistical models (estimators) that incorporate auxiliary information such as remote sensing data with the tree measurements. 3) Growth models, including height models and mortality functions. 4) Thinning selection models for thinning events that occur after measurement. 5) Taper and volume functions.

	6) Breakage functions. 7) Log-making algorithms and associated log grade specifications. 8) Other product allocation models. 9) Wood quality models (e.g. basic density or pruned log index). 10) Conversions between units of measure (e.g. cubic metres to tonnes). 11) Adjustments to represent loss-in-process, including volume loss and/or value loss (downgrade). 12) Adjustments for losses due to natural events such as fire or wind. 13) Adjustments to allow for anticipated future changes (e.g. genetic gains or climate change). Models include adjustments made by the valuer. Some of these modelling steps can be handled in more than one place. For example, the tendency for some proportion of saw logs to be sold as pulp logs can be modelled as a reduction in saw log volume in the yield tables. A more transparent approach is to reduce the realised price of saw logs without reducing their volume. It is incumbent upon the valuer to ensure that they understand how this phenomenon is handled and that it is not handled twice. It is convenient before aggregation to consider the process of generating yield estimates as applying to the smallest unit of land area in a forest description process. The key decisions for such a unit are: 1) What tree measurements to use. 2) What models to use. It is important that the forest description documentation describes the decision processes that answer these questions.
Additional Concerns	Additional concerns for a user of a forest valuation that need to be addressed in the documentation can be broadly grouped into these areas: 1) Representativeness. 2) Model choice and performance. 3) Consistency. **Representativeness** Assuming that tree measurement data has been collected for the forest within pre-defined areas (inventory area) using a design or probability-based approach to sampling, then the following cases may occur: 1) The inventory area is the same as the forest description land unit and the tree measurements are fully ‘representative’ of that land unit. This is a good situation to have, but often only applies to older stands in a forest, woodlots and small stumpage sales.

2) The forest description land unit is a subset of an inventory area. The inventory area is 'representative' of a larger area than a single stand or polygon. Using a good average across multiple stands or polygons is good practice, but raises concerns in a valuation context in some specific cases:
    a) the valuation applies to a subset of the whole inventory area, with the subset possibly differing in an unknown way from the average (e.g. a single stand with a yield table based on the sampling of an entire age class); or
    b) a non-random subset of the inventory area has been removed since measurement. The inventory was once an unbiased sample for all of a large area but, e.g., the best parts have already been harvested and replanted.
3) There are no forest inventories that apply directly to the forest description land unit, or a superset that contains it, and tree measurements have instead been chosen from inventories that represent other parts of the forest (or even other forests). This is often best practice when applied to stands that have not reached an age where measurement makes sense (i.e. before the available models produce good estimates and for the unplanted crops of future rotations). However, the following concerns can arise and should be noted where they occur:
    a) where the existing inventory is not 'representative' of the unmeasured areas (e.g. when failed stands are not measured because there is no intention to manage them, but they instead receive the average for normal stands);
    b) when the future is not the same as the past (e.g. when site productivity or silviculture are different in unmeasured stands); and
    c) when selection from existing data is likely to produce a biased estimate for unmeasured areas because it makes inappropriate use of area weighting and/or fails to recognise auxiliary variables that are correlated with yield (e.g. altitude).

The outcomes of cases 1 and 2 are often referred to as 'specific' inventory or 'specific' start points because the tree measurements are specific to identifiable areas. The outcome of case 3 is often called a 'generic' start point to distinguish it from the 'specific' cases. It is good practice in documenting a forest description to provide a summary of the area by age to which the specific and generic cases apply.

Appropriateness of model choice

It is rarely possible in a valuation context to check that a model component (e.g. taper function) is correct. There is little pragmatic alternative but to turn to documentation from existing studies that justify a modelling approach and choice of model components.

It is good practice to document the decisions that are used to choose between alternative models for each forest description land unit.

	It is good practice to document the modelling approach, to critically appraise reports of the studies that support or refute the approach and the choice of model components, and to cite these in forest description documentation. **Consistency** Forest description is a minefield for consistency issues. It is not possible to provide an exhaustive list because these factors depend on the source of measurement data and the modelling approach. The following are likely to occur in the context of yield estimation if insufficient attention is applied: • yield estimates using different units of measure to prices (e.g. $/m^3 c.f. $/tonne); • prices based on different standards of value recovery than recognised in modelling (e.g. the 'optimal' grade mix versus market uptake); • yield estimates calculated for Net Stocked Area (NSA) that are applied to the total area; • timing conventions that differ between the yield tables and the cashflow discounting convention particularly when yield tables are provided in one-year steps, which is common practice, then there is only one point in any calendar year when the yield estimates are correct and that point may not coincide with the point in the year when cashflows are assumed to arise; • inconsistency between the assumptions used to build a calibration model and the assumptions used to apply that model (e.g. an implied discount rate model); and • inconsistency between assumptions about the effect that future silvicultural events will have on yields and on future costs (e.g. estimating pruned volume without recognising the cost of pruning). One important role of forest description documentation is to assure the reader that these and other consistency issues have been appropriately addressed. The process of documenting how they have been addressed is an important step in ensuring that they have actually been addressed.
Comparative Analysis	In cases where the valuation does rely on the magnitude of the predicted future cashflows, it is good practice to provide the results of comparative analyses that provide information about the quality of the yield estimates. These can include: • comparison with independent inventory where a sample of locations (plots) forest valuation yield estimates are compared with new estimates from new tree measurements; • this approach provides information about potential bias in the forest inventory that underpins the yield estimates in the valuation although it does not validate the choice or

	performance of models - because the new measurements are costly, this approach is only warranted in some cases; • comparison with historic production data which is primarily useful for assessing value recovery assumptions because recently harvested areas tend to have very good inventory data that was updated just prior to harvesting; • comparison with reasonable expectations which can be based, e.g., on: – experience with the productivity of similar forests – national production figures and/or site productivity surfaces – mathematics (e.g. trees have well-known shapes that set an upper limit on the proportion of pruned volume for known pruned height and tree height); • comparison with yield tables used in previous valuations of the same estate; • comparison of inventory process with industry best practice; • re-measurement of a subset of recent inventory plots although it should be noted that this can only provide information about recent measurements; and • comparison of yield tables within the same description: – generic versus specific – young versus old stands. It is not enough to compare. The valuer must also interpret results in order to inform about the quality of yield estimates and any adjustments applied as a consequence.
Natural forest yield considerations	For *natural forests* there may be a distinction between yield projections (biological yield) which may be used to support the calculation of the annual allowable cut and the actual commercial yields. The commercial yields may be a modification of the biological yield due to regulations and need to be considered when determining commercial harvest volumes.

CHAPTER B6 – STANDARD FOR DECLARATION OF VALUE OF LAND (AUSTRALIA)

REVISION HISTORY

Original Standard	NZIF, released in May 1999 for New Zealand.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • Reworked to be consistent and compatible with relevant Australian federal and state laws and industry practices.
Current Status	Further revisions required prior to draft release.

CHAPTER B6 – STANDARD FOR DECLARATION OF VALUE OF LAND (NEW ZEALAND)

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • None
Current Status	Revisions required prior to draft release.

CHAPTER B7 – DESCRIBING COSTS

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • Standard B7.1 now requires that: (i) costs should adequately represent the overheads and administration costs associated with the forest asset; and (ii) the valuation should clearly indicate if a provision has been made for working capital; • Standard B7.2 now requires that: (i) any assumed changes in future real or nominal costs are declared; and (ii) valuation costs are compared with current actual costs; • the addition of Standard B7.4 that requires a statement on the applicability of the costs for the purposes of the valuation; and • the addition of Guidance Notes.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • Minor edits for clarity
Current Status	Released as draft.

CHAPTER B7

STANDARD FOR DESCRIBING COSTS

Purpose	The purpose of this standard is to ensure the completeness, reliability and consistency of all costs specified in the forest description.
STANDARD B7.1 **Completeness of costs**	The forest description shall ensure that: • costs are declared for all operations implicit in the description of the forest, which are relevant for the purpose of the forest description; • costs include all forest level costs of being in business (such as rates, land occupation costs, salaries and associated costs, consultants or management fees, buyer's margin as applicable in stumpage sales, indirect operations, e.g. protection and animal control); • costs should adequately represent the overheads and administration costs associated with the forest asset. Consideration should be given to the extent to which corporate costs are related to the forest or are associated with other activities; • Costs associated with investment structure (e.g. fund management and trustee costs) should not be included ; • costs are calculated in such a way that accurately reflect expected future costs - particularly pertinent to overhead costs which can be represented on the basis of $/m3 (or tonne), $/ha, a percentage of operational costs or as a single fixed cost; and • the valuation should clearly indicate if a provision has been made for working capital.
STANDARD B7.2 **Reliability of costs**	The forest description shall: • identify the source of costs; • describe models of cost (e.g. logging cost/piece size model); • note the relevance of externally sourced costs; • describe any assumed changes in future real or nominal costs; • compare current actual costs with those assumed in valuing the asset and describe the rationale for any differences; and • provide a reconciliation to independent sources.
STANDARD B7.3 **Consistency of costs**	The forest description shall ensure: • consistency of costs with other sections of the forest description; • internal consistency with no double counting (e.g. treatment of supervision costs); • external consistency (e.g. with land value or capital value. Does the land value include road formation but exclude road gravelling (NZ: metalling) and culverts); and • the currency and GST status of the costs is declared.

STANDARD B7.4 **Disclosure of cost movements**	The forest description shall describe: • assumed future real cost changes (including zero change); • the results of any analysis that has been done including: – method of forecast movement – statistical analysis showing forecast trend and – sensitivity analysis; • any assumed movements in factors impacting on future costs.
STANDARD B7.5 **Applicability**	The forest description shall contain a statement describing the author's view as to the applicability of the costs for the purposes of the valuation. The statement shall include the rationale for using the costs adopted in the valuation.

GUIDANCE NOTES ON COSTS USED IN FOREST VALUATION

Background	The current management of a forest will have specific costs associated with it. These are likely to provide useful guidance to the valuer as to the appropriate costs to use when valuing the forest. However, the valuer should also look to wider evidence to determine the costs to include.
Objective	The objective is to look at costs from the perspective of the market.
Approach	The valuer needs to consider what costs would be recognised by the market. In the case of young stands, where a cost compounding approach is being considered, costs such as a return on the land value or the overhead costs associated with the current owner may or may not be included. Likewise, in developing cashflows for the forest, the valuer need not use current costs if it is possible the forest might be managed differently. Examples might include a more efficient management structure, or differences in costs that might occur through outsourcing various operations (e.g. in-house harvesting crews versus contracting). Conversely additional costs may be required for the business to operate effectively.
Working capital	A first inclination in preparing cashflow projections for forest assets is to assume that funding flows will coincide with the dates that produce is sold, or costs are incurred. To consider some examples: • a load of logs from the forest crosses a weighbridge, promptly generating an invoice on behalf of the forest owner to the sawmill buying the logs; or • the same weighbridge details are the basis for an invoice from the harvesting and cartage contractors to the forest owner, requiring payment for their services. In practice, although the invoices may be submitted promptly, neither leads to an immediate flow of funds. The credit policies of the respective parties determine when the payments are actually made. Thus: • the invoices to the sawmill are summarised in a statement at the end of the month and once this is received by the customer, they have 20 days in which to make payment; and • likewise, the harvesting and transport contractors may summarise their accumulated invoices, and for the sake of demonstration it is assumed that these are submitted fortnightly (once again with 20 days to pay). When modelling the cashflows of a collective business, the gap between when the obligation to pay is incurred and the corresponding funds are actually received can be material. Discounted cash flow (DCF) analysis is based on the premise that there is a time value to money. If there is a delay in receiving

money, this represents an opportunity cost because had the funds been received they could have been put to other productive use.

There are several possible approaches to addressing this:

- a detailed representation of actual amounts and timing of operations (on a daily, weekly or monthly resolution rather than annual basis);
- a generalised formulaic treatment designed to proxy the need for additional cash (see example below); or
- to change the timing of the cashflow components of the DCF model to reflect cash in/out rather than invoicing, e.g. if payments to contractors are made on a 30-day basis, rather than assuming mid-year occurrence, the values could be discounted from a point equivalent to mid-year plus 30 days.

A simple format that recognises working capital requirements is shown below. In this case the calculation is only based on changes in the revenue line.

	A	B	C	D	E	F	G	H	J	O	P	Q	R	S	T
1															
2															
3			Y.e. 30 June												
4			2014	2015	2016	2017	2018	2019	2025	2026	2027	2028	2029		
5	**Revenue**		1 316	3 698	4 565	4 565	4 565	4 565	4 565	4 565	4 565	4 565	-		
6	Production costs		472	1465	1924	1924	1924	1924	1924	1924	1924	1924	-		
7	Other costs		294	613	649	644	644	64	644	644	644	644	-		
8	Stumpage		-	-	-	224	484	48	484	484	484	484	-		
9	Working capital	144	-	261	95	-	-	-	-	-	-	-	(500)		
10		=C5/365*40			=E5/365*40-SUM($B9:D9)								=R5/365*40-SUM($B9:Q9)		
11	**NET CASH FLOW**		550	1 358	1 897	1 773	1 513	15	1 513	1 513	1 513	1 513	500		
12															
13															
14															

Overhead costs

Note:

- in this case, it is assumed that the cash from revenues is not actually received until 40 days (on average) after invoices are raised;
- amounts appear in the working capital row as the quantity of revenue increases from one year to the next and, if the revenue remains the same, no working capital event appears;
- a final negative entry appears in 2029 when the accumulated working capital amount is released; and
- entries in the working capital row are included with the other costs that are deducted from the revenue line to produce net cashflow.

A more refined example can use a similar formulation but consider additional items such as changes in payables and inventory levels.

Overhead costs

Overhead costs are typically represented on the basis of $/m³ (or tonne), $/ha, a percentage of operational costs or as a single fixed cost. The valuer needs to consider the most appropriate means of modelling overheads for the forest in question. For example, in the case of an even age-class forest, the total cost applicable to the

	current crop derived from a $/m3 calculation, will remain relatively constant over the entire rotation. Conversely the total cost calculated from a $/ha rate will decline as the current crop is harvested (when considering just current crop cashflows).

CHAPTER B8 – DISCLOSURE OF PRICES

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • Standard B8.1 now requires disclosure of other price points; • the addition of Standard B8.3, which requires the disclosure of market assumptions; • Guidance Notes include a section on benchmarking, an example of disclosing future price movements, and an expanded example showing price disclosure at different common price points; and • The section on log marketing costs has been removed.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • Inserted Australian specific examples; • brought references to Australia to before references to New Zealand; and • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place.
Current Status	Released as draft.

CHAPTER B8

STANDARD FOR DISCLOSURE OF PRICES

Purpose	The purpose of this standard is to provide for the full disclosure of product prices, their source and applicability for the use to which the valuation will be put.
STANDARD B8.1 **Disclosure of prices**	The forest description shall disclose: • tree species or species mix; • prices for each log grade at point(s) of sale (exclusive of GST if applicable) - the log grades should be the same as those in the yield tables; • units of sale (e.g. m^3, tonnes, JAS m^3); • currency in which the price was negotiated; • exchange rate to convert price to (if applicable); • point(s) of sale; • other price point(s) disclosed in the valuation model; • costs from point of sale back to other price point(s); • conversion factors used to convert units of sale to units in yield tables (if applicable); and • any specific adjustments to derived forest description prices.
STANDARD B8.2 **Disclosure of sources of price**	The forest description shall describe: • log grades from which prices are derived; – name – location of market(s) or port(s) – specification – any material specification (e.g. length, small end diameter, knots, form, straightness, density, ovality, eccentricity, nodality, defect core, age, rot) – the yield table grade to which each market grade applies (if applicable) – the relationship between the log pricing information and the yield table grades, and any adjustments that were made to align prices with the yield table grades and – purpose or end use; • Any market information used in support of prices for source grades including (where relevant); – sources of data – reliability of data – volumes traded – price volatility; • The derivation of price at point of sale by grade including: – the timespan over which the data was collected – the scope and depth of the data and – any analysis undertaken (time series analysis, method of smoothing).

STANDARD B8.3 **Disclosure of market assumptions**	The forest description shall describe: • any material wood supply agreements; • the markets where harvest volumes are envisaged to be sold; and • the limits on volumes sold in each market.
STANDARD B8.4 **Disclosure of price movements**	The forest description shall describe: • assumed future real price changes (including zero change); • the results of any analysis that has been done including: – method of forecast movement – statistical analysis on forecast trend – sensitivity analysis; and • any assumed movements in factors impacting on future log prices, such as shipping costs, port costs and currency exchange rates and components of any agreed log price indexing mechanisms e.g. CPI, APLPI, MGP10 price etc.
STANDARD B8.5 **Applicability**	The forest description shall contain a statement describing the author's view as to the applicability of the prices for the purpose of the valuation. The statement shall include the rationale for the pricing philosophy and methodology adopted and some comparison with the practice used by others.

GUIDANCE NOTES ON LOG PRICES

Marketing assumptions	Forest valuations are typically sensitive to log price assumptions. It is important to provide details of the pricing philosophy used and any assumptions about pricing points. The log marketing scenario used must be realistic and well described. For example, all prices may be based on parity with current export log prices. Alternatively, some grades may be assumed to be sold to domestic processors and other grades exported. Currently, in some locations there may only be limited marketing opportunities for some log grades. However, there is a strong likelihood of new processing facilities being built in the short term which may offer higher returns to the forest owner. The valuer often has to make arbitrary decisions about the markets into which logs will be sold in the future. A full discussion on any assumptions should be provided. Examples of price disclosures at different common price points are available in Tables 8-1 to 8-2. Table 8-3 provides an example of disclosure of future price movements.
Benchmarking	Sales of mature forests, and cutting right (stumpage) sales in particular, provide market evidence of implied log prices, an outlook of log prices for the short and medium term that resulted in a sale, and purchase prices that satisfied both the seller and the buyer. These implied log prices provide an indication of the combination of discount rate and log price outlook held by these market participants. In instances where historic and current log price information has been provided for the forest being valued, the valuer should (where possible) benchmark the log prices provided with other publicly available information and data supplied by other entities selling similar log grades.

Table 8-1: Australian examples of price disclosure at different common price points

Softwood

Price point	Description	Calculation	Grade	Class 1 sawlog	Class 2 sawlog	Export sawlog	Export Sawlog
			Market	Domestic	Domestic	Export	Export
			Point of Sale	AMG	On Truck	CIF	FOB
CIF price (US$/JAS m³)		**A**				105	
	Shipping including insurance ($/JAS m³)	B				20	
FOB price (US$/JAS m³)		**C=A-B**				85	
	Exchange rate	D				0.75	
FOB price (AU$/JAS m³)		**E=C/D**				113	83
	Port (AU$/JAS m³)	F				20	20
	Export marketing fee (AU$/JAS m³)	G				2.5	2.5
At wharf/mill gate price (AU$/tonne, AU$/JAS m³)		I=E-F-G-H		115		90.5	60.5
	Conversion $/JAS $/tonne to m³	J		1		1	1
At wharf/mill gate price (AU$/m³)		**K=I*J**		115		90.5	60.5
	Cartage	L		10		20	20
On-truck price (AU$/m³)		**M=K-L**		105	90	70.5	40.5
	Log/load	N		12	12	12	12
	Roads/ landings	O		1	1	1	1
	Harvest management	P		2.5	2.5	2.5	2.5
STUMPAGE (AU$/m³)		**Q=M-N-0-P**		89.5	74.5	55	25

Hardwood

Price point	Description	Calculation	Hwd Pulp log
FOB Price US$/BDMT		A	175
	Exchange rate	B	0.75
FOB Price A$/BDMT		C=A/B	233
	Conversion GMT to BDMT	D	53%
FOB Price A$/GMT		E=C*D	123.49
	Stockpile/screening losses	F	5%
	Chipping loss	G	2%
	Processing cost	H	18
AWG price A$/GMT		**I=E*(1-F)*(1-G) -H**	**97.0**

Table 8-2: New Zealand examples of price disclosure at different common price points

Price point	*Description*	*Calculation*	*Grade*	**Pruned**	**A export**	**S1 domestic**	**Pulp**
			Market	**Export**	**Export**	**Domestic mill**	**Domestic mill**
			Point of sale	**FOB**	**CIF**	**On truck**	**At mill**
			Sale price	**US $136/ JAS m³**	**US $135/ JAS m³**	**NZ$100/ tonne**	**NZ$50/ tonne**
CIF price (US$/JAS m³)		**A**			135		
	Shipping including insurance ($/JAS m³)	B			31		
FOB price (US$/JAS m³)		**C=A-B**		**136**	**104**		
	Exchange rate	D		0.8	0.8		
FOB price (NZ$/JAS m³)		**E=C/D**		**170**	**130**		
	Conversion $/JAS to $/m³	F		0.97	0.97		
FOB price (NZ$/m³)		**H=E x (F or G)**		**165**	**126**		
	Port (NZ$/m³)	I		15	15		
	Export marketing fee (NZ$/m³)	J		2	1		
	De-bark/ spray	K		15	0		
	Conversion $/tonnes to m³	G				1.03	1.06
At wharf/mill gate price (NZ$/m³)		**L=H-(I+J+K)**		**133**	**110**		**53**
	Cartage	M		20	20		20
On-truck price (NZ$/m³)		**N=L-M**		**113**	**90**	**103**	**33**
	Log/load	O		30	30	30	30
	Roads/ landings	P		5	5	5	5
	Harvest management	Q		5	5	5	5
STUMPAGE (NZ$/m³)		**R=N-(O+P+Q)**		**73**	**50**	**63**	**-7**

Table 8-3: New Zealand example of disclosure of future price movements

Year	*1*	*2*	*3*	*4*	*5+*
Log grade	*(NZD/m³ AWG/AMG)*				
P35	136	136	136	137	137
S40	107	107	108	108	108
S30	106	107	107	107	108
S20	94	94	95	95	95
A – export	111	108	105	105	105
K – export	98	96	94	94	94
KI – export	92	90	89	89	89
Pulp	59	58	58	57	56

CHAPTER B9 – CONTINGENCIES

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • included the words New Zealand in front of New Zealand specific references i.e. acts, standards or examples; and • revised minor text to use terminology that could generically apply in Australia and New Zealand.
Current Status	Further revisions required prior to draft release.

CHAPTER B10 – STANDARD FOR DISCLOSURE OF DISCOUNT RATES

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF April 2019 revisions: • Standard B10.1 has been expanded to require more explicit disclosure of cashflows including capital structure assumptions, timespan of cashflows and terminal value assumptions, and treatment of risk; • Standard B10.1 now includes the case where different discount rates are applied to different cashflow lines; • Standard B10.1 now requires disclosure of the compound rate under a compounded cost approach; • The original Standard B10.2 Source has been removed which required that '*the forest description shall declare where the rate was source*d' - this was considered to be a duplication of original Standard 10.3 Rationale, which required the method derivation to be described, noting this latter standard has been retained as new Standard 10.2 Rationale; • Guidance Notes on cashflows and sources of discount rate have been extended; and • Guidance notes on pre-tax or post-tax cashflows in the original Standards suggested that '*Generally, post-tax cashflows should be used to ensure the effects of taxation are correctly incorporated'* noting this preference has been removed from the revised guidance notes where '*The widespread adoption of pre-tax cashflow constructs*' is noted.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • None
Current Status	Released as draft.

CHAPTER B10

STANDARD FOR THE DISCLOSURE OF DISCOUNT RATES

Purpose	The purpose of this standard is to ensure that discount rates included in the valuation are disclosed, including the rationale for their selection and a description of the cashflows to which they apply. Different discount rates may apply to the tree crop, land, carbon, roads and other durable assets.
STANDARD B10.1 **Disclosure**	With respect to disclosure, the valuation report shall declare: • all discount rates applied in the valuation; • the cashflows to which the discount rates apply including, but not limited to, a disclosure of: – cashflow timing conventions – whether they apply to real or nominal cashflows – whether they apply to pre-tax or post-tax cashflows – capital structure assumptions – timespan of cashflows and terminal value assumptions – treatment of risk – whether cashflows include 'notional' costs such as those associated with the opportunity cost of land; • where specific discount rates are applied to specific cashflow lines, the rates and the cashflow lines to which each rate; and • the compound rate applied under a compounded cost approach.
STANDARD B10.2 **Rationale**	The valuation report shall provide a rationale for the discount rates including: • methods of derivation; • assumptions (consistent with methods); • risk treatment; • specific allowances (buyer/seller etc); and • transaction evidence.

GUIDANCE NOTES ON DISCOUNT RATE

Real or nominal	By convention, discount rates are generally applied to real cashflows, and so the discount rates are also expressed in real terms. In the wider financial arena, interest rates and discount rates are commonly expressed in nominal terms. The valuer should be alert to the capacity for misunderstanding. This may require not only indicating whether the cashflows and discount rates assumed are in nominal or real terms, but also a description of what the difference between these involves.
Period conventions	In conducting discounting, different results arise depending on whether the cashflows are assumed to arise at the beginning, middle or end of each period. In principle, the derived value of the forest should not change if market value is the target outcome. Cashflows generated with a particular timing convention should have a correspondingly configured discount rate.
Cashflows	In conducting a Discounted Cash Flow (DCF) analysis, it is important that the cashflows to which the associated discount rates apply are clearly defined. The valuation report should include, but is not limited to, a description of: • whether cashflows are confined to the current rotation or if they include costs and revenues associated with subsequent rotations; • what real price and cost projections have been incorporated; • whether the cashflows incorporate notional costs such as those associated with the opportunity cost of land; and • what risk elements are recognised in the cashflows. The cashflows should be described using conventional financial terminology such as Earnings Before Interest and Tax (EBIT), Earnings Before Interest, Tax, Depreciation and Amortisation (EBITDA), Net Profit After Tax (NPAT), Free Cash Flow to the Firm (FCFF), Free Cash Flow to Equity (FCFE) or variations of these, e.g. EBIT less cost of re-establishment and management of subsequent rotations and less notional cost of land use. Specific discount rates may be applied to specific cashflow lines. For example: • cashflows associated with carbon may warrant a different discount rate a to that applied to cashflows relating to commercial timber production;

	• the valuer needs to be mindful of the interaction of the discount rate and value attributed to carbon cashflows, with higher discount rates sometimes leading to a higher Net Present Value (NPV) due to the devaluation of future liabilities; • cashflows associated with the re-establishment of future timber assets may attract a different discount rate to that applied to existing timber assets; and • the valuer may determine that the use of both income and cost-based approaches is appropriate when valuing an asset which may result in a specific discount rate being applied to a set of assets valued using an income approach, and a different compounding rate being applied to a set of assets valued using a cost approach. The capital structure of forestry assets can often be complex. Any capital structure assumptions incorporated in the cashflows must be disclosed.
Sources of discount rates	Sources need to be consistent with the purpose of valuation and cashflows. Reliable and relevant transaction evidence may be used to provide an Implied Discount Rate (IDR). In practice, the information used to derive IDRs is scarce, and interpretations are correspondingly equivocal, which justifies consideration of additional sources. There is a body of opinion that argues that the IDR is a manifestation of the comparable sales analysis rather than the income approach. Under such a construct, this then invites the question of what rate might be assumed within an income approach. A popular candidate (as it applies to investment expectation cashflow models) is the Weighted Average Cost of Capital (WACC), within which the cost of equity may derived using the Capital Asset Pricing Model (CAPM). Potential sources of discount evidence include: • cost of capital derivations; • implied discount rates; • capitalisation rates and multipliers; • internal rates of return; and • actual discount rates use in acquisitions. It is imperative that discount rates derived via any of the above approaches adequately address any inconsistencies between the cashflows they have been derived from and those they are intended to be applied to. Potential inconsistencies include: • real or nominal cashflows; • pre- and post-tax cash flows; • capital structure; and

	• current rotation only or perpetual cash flow. Discount rates derived under each of the above approaches may vary substantially. The valuer should be prepared to rationalise any variations, if not provide a full quantitative reconciliation between the discount rates evident in sources such as those outlined above and those adopted as part of the valuation.
Pre-tax or post-tax cashflows	The widespread adoption of pre-tax cashflows in estimating forest value is in part due to the unknown tax circumstances of transaction participants. This has led to IDRs being derived by some forest valuers from representations of pre-tax cashflows. The various parties to a transaction may be the subject of differing tax circumstances. While a 'vanilla' taxation regime could be assumed, expediency and simplicity has seen pre-tax cashflow constructs finding favour amongst valuers, but such favour does not place the choice of cashflow construct above scrutiny. Institutional investors routinely construct post-tax cashflow models when developing bid models. Post-tax cashflows incorporate the effects of taxation. If post-tax cashflows are being discounted, the discount rate should be that applicable to post-tax cashflows. When justifying the selected discount rate(s) used in valuing assets, the valuer needs to recognise that there is no constant relationship between the discount rates applied to pre-tax and post-tax cashflows (see Manley, B. R. 2002. Relationship between discount rates to be applied to before-tax and after-tax cashflows. *New Zealand Journal of Forestry*, 47(1): 28-32). When assessing discount rate evidence, the valuer should consider and justify the basis of any assumed relationships between discount rates applied to pre-tax and post-tax cashflows.
Consistency	When using IDRs as the unit of comparison for extending transaction evidence, the valuer will consider whether the rates they cite have used the same cashflow format as that developed for the subject forest. If there are evident or suspected differences, the valuer will document these. They should discuss the implications if the IDRs were to be brought onto a like-for-like basis.
Systematic and non-systematic risks	Discount rates estimated directly or indirectly from market information can be expected to contain elements relating to systematic and non-systematic risks.

	Systematic (non-diversifiable) risks relate to those risks which affect the entire market or an entire market segment. Non-systematic (diversifiable) risks relate to those risks which affect a specific company. The valuer needs to ensure that the systematic and non-systematic risks incorporated in market information is clearly understood when deriving and applying discount rate(s) in a forest valuation. Allowance needs to be made when valuing forests with greater (or lesser) levels of non-systematic risk. The preferred approach in this situation is to adjust future cashflows rather than the discount rate. The valuer should ensure that their assumptions relating to the treatment of systematic and non-systematic risks, and any associated adjustments to both discount rates and cashflows, are clearly disclosed.

CHAPTER B11 – TAXATION EFFECTS (AUSTRALIA)

REVISION HISTORY

Original Standard	NZIF, released in May 1999 for New Zealand.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • Reworked the standard to be consistent with Australian tax law.
Current Status	Further revisions required prior to draft release.

CHAPTER B11 – TAXATION EFFECTS (NEW ZEALAND)

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • None
Current Status	Revisions required prior to draft release.

CHAPTER B12 – FOREST VALUATION METHOD

REVISION HISTORY

Original Standard	NZIF, released in May 1999. NZIF June 2012 revisions: • the use of a market-based land rental as the opportunity cost of land in the valuation of a tree crop; and • the use of the cost approach to value young stands. NZIF April 2019 revisions: • requiring the valuer to consider the sales comparison approach, the income approach and the cost approach as the standard is no longer prescriptive about giving precedence to a particular approach; • the classification of different approaches in Figure 1 of the Guidance Notes; • addition of a section in the Guidance Notes on contribution from subsequent rotations and reconciliation (for financial reporting purposes) of valuation of the current rotation and valuation of multiple rotations; • including an example in the Guidance Notes on the land value/tree crop value interface; • removing the section on land market value versus land expectation value from the Guidance Notes; • addition of a section in the Guidance Notes on the treatment of other durable assets; • addition of a section in the Guidance Notes on estate modelling versus stand-based modelling; and • addition of guidance on valuing different types of plantation forest.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place.
Current Status	Released as draft.

CHAPTER B12

STANDARD FOR DESCRIPTION OF FOREST VALUATION METHOD

Purpose	The purpose of this standard is to describe the method for establishing the market value of a forest or a tree crop. The distinction between these entities is based on the following terminology: Tree crop value *plus* *Future crop value (2R+)* *plus* Land value *plus* Other sources of value *equals* Forest value
Standard B12.1 Method of Valuation	In estimating the value of a forest or tree crop, the valuer shall consider the three most commonly recognised approaches: • the sales comparison approach; • the income approach; and • the cost approach. The valuer shall use their professional judgement in applying a credible weighting to each to produce an estimate of market value. Should it be evident that one or more methods is of low relevance, the valuer may dispense with such method(s) in the interests of concentrating productive effort. It is nevertheless the valuer's responsibility to explicitly declare where they have dispensed with the method(s) and provide their reasoning. Given that the purpose of the exercise is to produce a market value, the valuer should attempt at all times to see the assets through the eyes of market participants. This encourages emulation of the methods by which such participants have arrived at agreed transaction values. In estimating tree crop value and future crop value, the opportunity cost of land shall be included using market rental, regardless of land tenure. If the land is leased there may be a land tenure differential when the actual land rent differs from the fair market rental. This land tenure differential shall be reported separately from crop value as the lessee's interest in the land or the lessor's interest in the crop (as the case may be). In estimating forest value (or the value of a bundle of assets including tree crop value), the valuer shall ensure that there is

	compatibility in how the values of the different components have been estimated. Among the distinctive features of forest valuation, the following may especially influence the result. The valuer must accordingly document their assumptions in relation to: • the number of rotations recognised in the cashflows on which the valuation is based; • identification of whether tree growing is considered compatible with the highest and best use of the land; • the land value/tree crop value interrelationship – this includes confirmation of consistent assumptions in valuing the land and trees; • treatment of forest roads and other durable assets; and • whether the modelling of the forest is estate-based or stand-based. The valuation approach can potentially be either estate-based or stand-based. However, in both cases there needs to be an underlying management and harvesting strategy which is realistic for the forest (or tree crop) being valued. This strategy should reflect what an 'economically rational' owner would do taking into account wood supply commitments as well as logistical, marketing, social, political and environmental factors. The need to include these factors means that, in practice, a stand-based approach is only suitable for small forests.

GUIDANCE NOTES ON THE VALUATION METHOD FOR FORESTS OR TREE CROPS

Terminology	The standard begins with a terminological framework. This identifies the forest value as comprising the values of the *tree crop*, the value of future tree crops (2R+), the value of the land occupied by the trees[12] and values attributable to *other components (e.g. carbon)*. Note that this is a simplified representation. The point of the classification is to reinforce the role of assigning '*forest value*'. The professionals to whom these standards are primarily directed could conceivably keep their brief simpler and less demanding by just attributing a value to the *tree crop (and future crop value)*. To this could then be added an estimate from a land valuer, conceivably providing the total forest value. Experience has confirmed that unless one valuer takes responsibility for combining the parts, the process is readily capable of producing an incoherent result. To ensure (as required by this standard) compatibility, one party will need to visibly assume the duty of ensuring additivity. Without this, the respective parties should document their individual responsibility for contributing to the valuation of a *forest*.
Market value as the target	The focus of this standard is the estimation of the market value of a tree crop or forest or bundle of assets. In estimating market value the forest valuer is estimating the 'amount of the cheque' given by the purchaser to the seller. Selling costs are not deducted. This contrasts with financial reporting standard IAS 41, which requires a forest asset to be measured at its fair value less costs to sell.
Discounted cash flow analysis	Forestry characteristically involves long investment timeframes. Discounted Cash Flow (DCF) analysis is correspondingly pervasive. In other types of asset valuation, the application of DCF is commonly treated as synonymous with the income approach. Forest valuers may be more inclined to apply DCF methods within each of the three common approaches. Thus: • the *income* approach explicitly applies a DCF methodology in accordance with its expressed definition; • in applying the *sales comparison* approach to forestry, it has become increasingly common to turn to the Implied Discount Rate (IDR) as the most convincing unit of comparison noting the IDR is inherently applied within a DCF framework; and • when the *cost* approach is applied to forest valuation, it is generally proposed that the entitlement to a return on invested fund should be considered noting when incorporated in the form of notional compound interest, such a return is also an expression of DCF methodology. One case where DCF is seemingly not applied is where the value of a tree crop is based on the currently realisable value of its standing

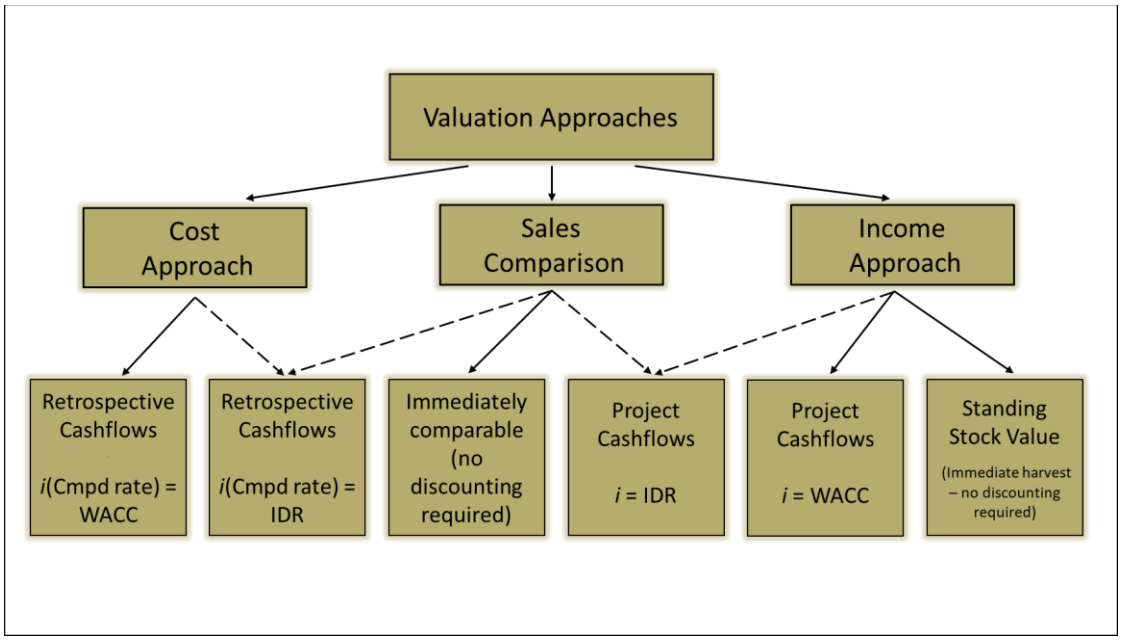
[12] Land tenure circumstances may commonly lead to a distinction between the freehold value of the land versus the value of an entitlement to occupy the land. This distinction is addressed later in these Guidance Notes.

content (a 'standing stock' approach). This still fits within a DCF framework by recognising that the discounting period is zero years.

A diagrammatic representation of the methods is shown in Figure 12-1. The figure acknowledges that opinion varies on the extent to which methods that employ IDR can be described as manifestations of *sales comparison*[13]. They are accordingly linked by dotted lines to both the sales comparison and income approaches.

Figure 12-1 also recognises that if compounding (the reverse of discounting) is applied to costs, the rate might come from a 'first principles' derivation or from IDRs. If the latter, this provides the case for a methodology that combines the principles of both the *cost comparison* and *sales comparison*.

Figure 12-1: Classification of DCF-based valuation approaches



Forest valuers are encouraged to avoid using such terms as DCF and Net Present Value (NPV) incautiously. Forestry's multi-period investment profile means that all three primary methods may ultimately rely on a DCF framework. Loose reference to a 'DCF approach' or an 'NPV approach' may potentially mislead those from other areas of business practice where DCF analysis is confined to the income approach.

Common or distinct cashflows

A potential implication of a ubiquitous DCF framework is that all valuation approaches might be based on the same set of cashflows.

[13] There are some valuers who would argue that at any reference to 'discount rate', the associated process can only possibly be an income approach. Others respond by questioning whether the IDR is truly a discount rate at all. It might just as readily be called an Implied Discount Factor, they argue, providing a link between the derived cashflows for a transacted forest and its sales price. Those of an inclusive disposition are encouraged by the observation of Ackerson (Ackerson, C. B. 2009. *Capitalization Theory and Techniques: Study Guide*, Appraisal Institute) who suggests that, in practice, the three approaches may be inextricably intertwined.

	This is not axiomatic. The analytical procedures may be sufficiently distinct that differences extend beyond a difference in discount rate selection to a difference in cashflow derivation as well. At first impression it could appear unlikely that more than one system of cashflow projection could or should prevail. In practice, there are several reasons including: • the treatment of risk in the cashflows; • the duration of the cashflow projections; • whether the cashflows are pre- or post-tax; and • how the cashflows acknowledge debt-leveraging effects. A Weighted Average Cost of Capital (WACC)-based approach typically employs the Capital Asset Pricing Model (CAPM) as the basis for estimating the cost of equity. It is the textbook recommendation that while the CAPM formulation implicitly acknowledges certain types of risk, the discount rate should not be regarded as a catch-all location for a whole basket of risk factors. It is technically better practice to factor certain types of risk into the projected cashflows to which the discount rate is applied. Indeed, the empirical market evidence on which key inputs to the WACC/CAPM is based may be effectively predicated on an expectation that cashflow projections are risk-adjusted. Forest valuers are not observed to apply much sophistication in risk-adjusting the cashflows. One influential reason may rest with practical difficulties. However, provided the forests being compared have generally similar risk characteristics, then the lack of cashflow adjustment need not disqualify an IDR procedure. IDRs can be extended from the referenced forests to the subject if the cashflows for all have been estimated on the same basis. On the basis of risk treatment, two forms of discount rate may co-exist, each with a corresponding form of cashflow: • WACC/CAPM rate, to be used in conjunction with risk-adjusted cashflows; and • IDR, to be used with conventionally represented cashflows. It is therefore possible to have IDR and WACC/CAPM estimates of the discount rate that differ without them being contradictory.
Market valuation versus client valuation	Market value is the amount for which the tree crop or forest should exchange: • on the date of the valuation; • between a willing buyer and a willing seller; • in an arm's length transaction; • after proper marketing; and • wherein the parties had each acted knowledgeably, prudently and without compulsion.

	The underlying benchmark of crop or forest valuation as defined here is the estimation of the market value. In applying DCF analysis, there needs to be an underlying management and harvesting strategy which is realistic for the tree crop or forest being valued. This strategy should reflect what an 'economically rational' owner would do taking into account wood supply commitments as well as logistical, marketing, social, political and environmental factors. The appropriate 'client' valuation for a particular situation will depend on the circumstances, but any departure from the underlying market value conventions should be noted. The client valuation (or valuation for intended purpose) may differ from this estimate of market valuation because of certain factors which relate to the circumstances of the particular situation and the purpose of the valuation. For example, the client may require: • a valuation which assumes managing a forest with five years of planting for a non-declining yield over a 30-year rotation; • a valuation based on a rotation length which is a significant departure from the optimum; • a valuation as a seller or a buyer of a forest, using a set of inputs specific to the client, in order to commence negotiations; or • the client may be forced to sell the forest into an illiquid market. When the client value differs from the market value, it is important that assumptions are stated, any departure from economic rationality is justified and sensitivity analysis is carried out. The client value should be presented as market value minus (or plus) the cost of incorporating economically irrational elements. That is, market value (economically rational value or 'highest and best' value) should also be disclosed. The value for the current entity for the described purpose then represents the market value plus or minus a difference. Market value ± market difference = value for purpose The market difference can reflect factors such as: • assumed management and harvesting for a particular owner; • assumed supply commitments not covered by a binding contract; • assumed price and discount rate; or • a buyer's discount or a seller's premium (in the case of a sale).
Duration of the cashflows: current rotation versus perpetual	The financial reporting standards require: *IFRS13 fair value for Forest = Land value + Tree crop value*

The immediately available reporting standards for the respective sub-components are IAS 16 (Property Plant & Equipment) and IAS 41 (Agriculture).

Financial reporting standard IAS 41 (Agriculture) covers the valuation of biological assets. Paragraph 22 states:

> *'An entity does not include any cash flows for financing the assets, or re-establishing biological assets after harvest (e.g., the cost of replanting trees in a plantation forest after harvest)'*[14].

In the market, however, buyers are observed to be acquiring forests with every expectation that they will be perpetuating them. For larger resources, the 'purchase models' include long-term cashflows from multiple rotations. These are often derived on a levered post-tax basis.

However, it is necessary to recognise that IAS 41 is not a standard for valuing forest assets – or at least not 'forests' as defined in these standards. IAS 41 is the standard that applies when reporting the value of the current tree crop within a forest. The fact that it is confined to the current tree crop is eminently sensible, given that IAS 41 is a standard for reporting biological assets. While a next tree crop may come to exist (and that prospect may have a value), such a tree crop is not alive (yet). Being alive is the defining characteristic of a biological asset.

IAS 41 has been widely misread to imply that forest valuations must be based on the current rotation, and yet that is not the case.

The contribution from 2R+

The requirement to observe IAS 41 has brought to the fore the value of the next and succeeding rotations (herein referred to as 2R+). Within some situations there will be no 2R+, or not at least belonging to the current investor. Tenure arrangements may see them exit the venture at the completion of the current rotation.

Should the investor continue, the raw results of a DCF-based analysis of 2R+ will generally produce a non-zero value. It may be positive or negative. Only in the exceptional circumstance that the Internal Rate of Return (IRR) of the next rotations exactly matches the discount rate would the NPV of 2R+ be zero.

Positive values

A positive value for the future rotations would clearly be encouraging, but market dynamics could render it temporary. If the

[14] It is noteworthy that IAS 41, along with its other IAS standards, is now on the verge of substantial adjustment. This arises with the introduction of IFRS 13 (*Fair Value).* The latter provides an umbrella statement on issues relating to valuation. Potentially contradictory or redundant references that had previously appeared in subsidiary standards are scheduled for removal. No change to paragraph 22 is proposed.

valuer's perception of the inputs to the calculation is matched by the market perception, then in an informed, rational and frictionless market, the upside should in due course migrate into the one scarce resource within the investment, which is the land.[15]

An increase in the price of the land (or the rent to use it) would then reduce the IRR of 2R+, bringing it back closer to the discount rate. The NPV of 2R+, which relates by definition to just the future tree crops, would ultimately be extinguished.

Although such a theoretical model is simple, it does not make reporting a positive value for future rotations straightforward. Cautious accountants and auditors can justifiably ask that if that is the way the market is meant to work, why has it not done so already? Why is the land valuer not ready to absorb the upside in land value?

The land valuer's response could well be that the market evidence for land for planting is scant and difficult to interpret. Both tend to be the case. Without some activity and depth to the market they cannot propose that the tree crop valuer's result is indeed an increment that could be classified as market value as opposed to just an investment value.[16]

Negative values

The application of a perpetual analysis may demonstrate a negative value (or lower return) being associated with future rotations.

An example situation is shown in Exhibit 12-1.

[15] For a discussion of the principles prepared in a New Zealand context see Turland, J. 1990. Quantifying the Effects of Changing Log Prices on Land Values for Forest Valuations, *New Zealand Journal of Forestry,* 35(2): 22-26.

[16] The definition of investment value identifies it as a value that might be perceived by a particular investor, but not necessarily the value seen by the market as a whole.

Exhibit 1: Valuing in a multi-rotation environment

Cashflows	Discount Rate	Net Present Value ($ m)	Reported Value(s) ($ m)
Current rotation 2R+	7.5% 7.5%	336.5 -6.4 330.1	336.5 -6.4 330.1
Current rotation 2R+	7.7% 7.7%	330.1 [-8.6]	330.1 [2R contribution ignored]
Current rotation 2R+ Multiple rotations	7.7% 7.0% 7.5%	330.1 0.0 330.1	330.1

The example involves a forest estate modelled on a multi-rotation basis. At a discount rate of 7.5% applied to the full extent of projected cashflows, the forest value would be $330.1 million. If the cashflows from the current and succeeding rotations are distinguished, it is evident that the first rotation is contributing a positive value whereas the contribution from 2R+ is negative.

The second panel shows that the same forest value could be attributed to just the current rotation if the discount rate was raised to 7.7%. Of course, if this rate were to be applied to 2R+, the latter may become more negative still.

The third panel indicates that the rate would need to be 7.0% for 2R+ to have an NPV of zero.

The rate of 4.46% at which the next rotation has an NPV of zero is described by foresters as the Internal Rate of Return.

Possible pathways

These guidance notes suggest two possible procedures for those forests whose valuation models involve full or partial contributions from future rotation cashflows:

<u>Procedure 1: Multiple rotation starting point</u>

This case would be applied where the IDR is considered to best serve its role as a basis for comparison when expressed at the multiple rotation level.

1) As indicated in the table, a value for the tree crop has been based on cashflows which are modelled for multiple rotations. The contributions from the respective rotations (1R & 2R+) may be identifiable within internal analysis.

Cashflows	Discount Rate	Net Present Value ($ m)
Current rotation 2R+	7.5% 7.5%	336.5 (6.4) 330.1

2) For reporting purposes and for assigning the cost of bush, the valuer calculates a discount rate at which the collective tree crop value corresponds to the NPV of just the current rotation cashflows.

Cashflows	Discount Rate	Net Present Value ($ m)
Value derivation if confined to current rotation	7.7%	330.1

3) The sensitivity analysis accompanying the report should, for completeness, offer further examination.

Component of NPV(2R+)	Level	Net Present Value of 2R+ ($ m)
Log prices Production costs Growing costs	+5% -8% -27%	0.0
Discount rate	7.0%	

The first two tables facilitate the comparison of the multiple rotation discount rate with the single rotation equivalent that would provide the same value result. The comparison is a worthwhile form of disclosure.

The sensitivity analyses in the third table are for the purpose of testing whether a null hypothesis that 2R+ can 'earn its keep' can be rejected. It might emerge that only relatively small changes in single inputs or a combination of inputs were required to bring the NPV(2R+) to a very low value. The valuer might then conclude that the contribution of 2R+ could be neutralised.

<u>Procedure 2: Current rotation starting point</u>

This case would be applied where the IDR is considered to best serve its role as a basis for comparison when expressed at the current rotation level.

1) In this case, the value for the tree crop has been based on just the cashflows arising from the current rotation. The 1R value of $330.1 million is reported in the Statement of Financial Position under Biological Assets (as per IAS 41).

Cashflows	Discount Rate	Net Present Value (AUD or NZD m)	Reported Value(s) ($ m)
Current rotation	7.7%	330.1	330.1

2) The valuer should complete internal analysis, to calculate the single rate at which the same tree crop value may be obtained from multiple rotations.

Cashflows	Discount Rate	Net Present Value ($ m)
Value derivation if based on multiple rotation cashflows:		
Current rotation	7.7%	330.1
2R+	7.0%	0
Multiple rotations	7.5%	330.1

3) The sensitivity analysis accompanying the report should, for completeness, include further sensitivity analysis similar to that demonstrated in the previous procedure. These are shown in the table below:

Component of NPV(2R+)	Level	Net Present Value of 2R+ ($ m)
Log prices	+5%	
Production costs	-8%	0.0
Growing costs	-27%	

The third table is the same as that demonstrated in the multiple rotation IDR approach. The same type of sensitivity analysis as demonstrated in the earlier procedure could be used to demonstrate what change in variables would be necessary for the replanted resource to earn its keep. The breakeven rate in such analysis would be 7.7%, the discount rate associated with the current rotation model.

The emphasis of Procedure 2 is on reporting the return associated with the 2R+, as this is likely to be the metric that investors are most concerned with.

IFRS13 does place emphasis on two reporting matters:

- disclosure; and
- whether the current use of the assets represents a highest and best use.

A responsible appraiser should use these as a justification for examining the IRR that the 2R+ rotations are demonstrating. For the example resource the IRR associated with the 2R+ is 7.0%.

Poor NPV(2R+) results

Under any of the demonstrated procedures, the performance of 2R+ might seem so intractably bad that active steps are warranted to avoid re-investment. If there is a contractual obligation that compels the forest investor to plant subsequent rotations, the contribution of 2R+ might be reported as a liability, with the sum of the parts (asset value [reported under IAS 41] + liability [reported under IAS 37]) equating to net asset value. In the example given above this would be represented as AUD/NZD336.5 million [IAS 41] less AUD/NZD6.4 million [IAS 37], giving a net asset value of AUD/NZD330.1 million.

	Positive NPV(2R+) results Although the example provided above is for the situation of a negative NPV for 2R+, the same general procedures are applicable to the situation where the NPV for 2R+ is positive. ***Meeting all the financial reporting standards*** Either of the procedures provides a value for the tree crop that could appear within IAS 41 and IAS 37. If these values are added to the land value (reported under IAS 16), they should add to a market value for the forest (subject to including other applicable contributions from carbon etc). The resulting forest value should be consistent with general valuation standards, this forest valuation standard and the overarching financial reporting standard, IFRS 13 *Fair Value*. Just as importantly, by addressing the procedures involved in the sensitivity analysis, the reporting is adhering to other requirements of IFRS 13 *Fair Value.*
Land value/tree crop value interrelationship	Separation of land and tree crop values. Although, from a biological perspective, trees and land are inseparable, there are a number of reasons for partitioning forest value: • land and trees are often owned by different parties; • when an immature forest is sold in certain jurisdictions (including Australia and New Zealand) the components of value attributed to land and trees have different tax treatments; • financial reporting standards also require a partitioning of value between land and trees; and • separating the respective values is instructive in confirming that the land and tree crops are being managed according to best commercial interests. **Cost of land for tree crops** This standard requires that the *opportunity cost should be calculated as the market-based land rent*. Even if there is no rent for the land, there is no practical or conceptual obstacle to assigning a notional rent. The cashflow projections for the forest are appropriately parsed. Rather than occupying the land at no cost, the tree crop is charged a rent and its value is accordingly reduced. The land asset receives the notional rent and its value is correspondingly bolstered. If the rent is equivalent to market rental levels it might be proposed that the land's market value can be sustained. There is accordingly no 'encumbrance'. The estimation of a market-based land rent requires consideration of the attributes of the specific piece of land and its alternative land uses. Market rent is the rental that might be expected to be paid:

- on the date of the valuation;
- between a willing lessee and a willing lessor;
- in an arm's-length transaction;
- after proper marketing; and
- where the parties had acted knowledgeably, prudently and without compulsion.

A way in which the question can be most conveniently framed is, '*What rent would result if land, in cutover state, was offered to the marke*t?'

Note various Australian Government plantation privatisations involved the sale of the existing tree crop and the rights to use government land for a defined period for future tree crops, and no ongoing obligation to pay the titleholder of the land (i.e. the government) for the use of the land. In these examples, the purchase price included the access rights to the land to conduct forestry activities for existing and future tree crops. At present, common practice is that the market value is assumed to recognise the cash arising from the existing and future tree crops for the period remaining relating to the access right, inclusive of any value relating to the access right.

The better approach is to recognise the lessee's interest in the land through a notional land holding cost (notional land rent), reportable under IFRS 16. Note the valuer will need to consider an appropriate representation of land value, land rental and expected discount rates to the land and tree crop, and the combined asset. In the event the land and tree crop cashflows are assumed to expect the same discount rate the net balance sheet difference between the two methods should be negligible, and the latter approach will provide a fairer representation of the economic reality of the situation, for example when tree crop values are compared to 'similar' tree crops on adjacent freehold or leasehold land.

Augmenting the Rent Database

The scarcity of pure market evidence for forest land rents does raise the question of whether other rent evidence has any possible relevance. It is suggested that grazing land rentals can usefully be introduced as a basis for comparison, provided that they are kept distinctly identified. They serve as a useful reference point on the basis that:

- they are empirical evidence;
- in Australia and New Zealand, broad acre grazing activity is arguably the closest counterpart to forestry in terms of competing land-use. If the rent levels were to be substantially different it would suggest that something was awry in the assembled evidence; and

- grazing rents can be expected to show some broadly similar behaviour to forest land rents in respect of several key site characteristics, including fertility and terrain.

If used to augment the forest land rental evidence, grazing rentals need to be adjusted to reflect land in a cutover state. Adjustments need to be made for factors such as:

- the presence of stumps;
- improvements; and
- the rental term.

The most appropriate grazing land rentals would be those of a long duration. In contrast, if grazing is being presented as a potential higher and better use (HBU), then whatever tenure term provides the highest returns can form a legitimate comparison.

Rent and tax

The land rental should be treated as being tax deductible when valuation is based on after-tax cashflows. It is assumed that the parties in the rental market set rentals with knowledge of the tax deductibility.

Worked example

The following page provides an example of using the land rental approach in valuing a tree crop. The example highlights the need for the forest valuer, in determining the market rental, to consult with the land valuer to ensure that there is consistency in the assessment of prevailing rentals and the determination of land market value.

Reconciliation with land-in/land-out approach

The land-in/land-out approach is an alternative approach for estimating the cost of land in the valuation of a tree crop. Land is assumed to have gone in at the starting year of the cashflow calculation (i.e. the starting year of the investment or the current year for a valuation) and come out at the end of the rotation. Discounting of the land value at the end of the rotation should be at the appropriate discount rate for land. The crop value generated can be reconciled with that produced using the land rental if an appropriate adjustment is made for land appreciation before the end of the rotation.

Example

Assumptions	
[1] Assessment of market value of land by a registered land valuer	$2,500/ha
[2] Assessment of prevailing rentals for the same land	$110/ha/year
[3] Discount rate (forestry)	8.0%
[4] NPV of the tree crop with the cashflows incorporating the rental	$7,955/ha

Proposed report format		
	$/ha	$/ha
Tree crop value		7,955
Land value		
[5] Attributable to revenue earning activity (capitalised @ 5%)	2,200	
[6] Attributable to real capital appreciation expectations and other less tangible factors	300	
		2,500
[7] Forest value		10,455

Notes

[1] For illustrative purposes, it is assumed in this case that the land is equally attractive to either graziers or forest investors. In valuing the land, the registered valuer can therefore turn with confidence to prevailing market evidence from recent transactions.

[2] This assessment should ideally involve the input and endorsement of the registered valuer, which should then ensure that the professionals are talking using common terms.

[3] The discount rate is the forester valuer's assessment based on sources such as IDRs and WACC/CAPM analysis.

[4] This value is obtained by deriving a projected net cashflow for the balance of the current rotation. The cashflow includes annual rental at the agreed level.

[5] This is the straightforward capitalisation of the rental obtained by dividing the annual rental by the discount rate appropriate for land (rather than forestry) – here assumed to be 5%.

[6] This amount is obtained as the difference between the land market value and the value attributable to revenue earning activity. Note that there is no expressed implication as to what the discount rate might be for deriving the present value of the future anticipated gains. Nor is there any attempt to try to distinguish the value attributable to expectations of appreciation and the value arising for other less tangible reasons (spiritual, amenity, recreational, strategic etc).

[7] There might be some understandable preference to express this as enterprise value. This would provide a means of confirming that the combined value of the tree crop and land assets arises from the simultaneous business operations of at least two different but compatible activities. These activities are the operation of a commercial forest and the holding of the land for real capital appreciation.

Forest on rental land rather than freehold land	The same basic principles apply for both freehold and rental land (whether a lease, licence or forestry right is involved). On leasehold or in New Zealand the Crown Forest Licence (CFL) land the actual rentals paid should form the starting point in determining the market-based land rental. However, if these rentals are materially different from market rentals then separate analysis is required to calculate: PV (open market rentals) = PV (actual rentals) ± land tenure differential The PV of future obligations of rental payments below open market value represents the lessee's implied interest in the land. Conversely, if the PV of rental payments on the leasehold land were above the open market value the difference would represent the lessor's implied interest in the trees.[17] Land tenure differential is institutionalised by the land occupation contract (e.g. lease, licence). To the extent that land tenure differential does not equal zero, the value will transfer from the lessor to lessee or vice versa. As it is a real transfer and recognised by the rights given to each party under the lease, it should be reported as the lessee's interest in the land or the lessor's interest in the trees.
Treatment of other durable assets	Subject to the below qualifications, other types of assets may also figure in an overall forestry venture. Examples include: • improvements on the land including roads, bridges, fences and dams; • buildings used as office premises, worker accommodation, equipment shelter and maintenance, and for storing chemicals; • fire-fighting equipment; and • mobile plant and equipment. If such assets are already owned by the forest venture, then they potentially provide the benefit of an avoided future cost. For example: • if a roading network already exists, future capital cost may be avoided; • if a tractor and set of discs used in land preparation are already owned by the venture, then the projected cashflows do not have to make provision for their future hire or purchase; and

[17] May need to consider cases in AU where, with the purchase of the asset, the land rental was paid up-front, that is the grower has 'rent free' use of the land.

	• if vehicles for transporting workers to the forest are already owned, the future outlay on buying or renting them is averted, at least until the end of their useful life. The scale of these assets might be small and not material and they may already be covered as an overhead cost. Where material and not already covered, the valuation of these assets can be on the basis of avoided costs (see Standard B6). In estimating the tree crop value using DCF the ongoing costs should be included. For example: • in the case of roads, ongoing costs of maintenance costs should be included as well as the cost of upgrading existing roads or building new roads; and • in the case of plant and equipment, ongoing operating costs of fuel, tyres, repairs and maintenance as well as capital costs to replace the equipment (offset by the salvage value of the equipment being replaced) should be included. The cost of the existing asset should also be included in the cashflows. Two possible approaches for doing this are: • value-in/value-out – the initial 'value-in' is the current value while the 'value-out' would be the depreciated value (such analysis needs to be run with the appropriate discount rate for the asset type); and • notional rental – the tree crop should be charged with a notional rental based on the market rental or hire charge for the asset. Care needs to be taken with depreciation. Generally, it should not be included as it is not a cash cost, but the tax effect of depreciation needs to be included if post-tax cashflows are modelled. In some cases, it may be included as a proxy for ongoing capital costs.
Estate modelling versus stand-based modelling	Forest estate models can be described as providing a 'top-down' approach to managing a resource. They simulate the behaviour of the collective forest resource at once, manipulating its woodflow, cashflow and other attributes within overall constraints. Because management of the collective estate is the target, the fate of individual stands is subservient. In contrast, stand-based modelling effectively treats each stand in isolation, ignoring the extent to which its woodflow complements or supplements the output from others. The results from all the individual stands can then be summed together, providing a 'bottom-up' approach. There have been attempts to develop estate models within spreadsheets, but these have generally not provided an

adequately compact and efficient structure. For larger resources, appraisers turn to purpose-built software. Within Australia and New Zealand, the pioneering packages dominant from the mid-1980s were RMS2020 and FOLPI. At the time of writing, two of the state-of-the-art packages are Woodstock and Tigermoth.

As a general rule, valuations based on forest estate modelling will provide a lower value than those derived from stand-based modelling. The explanation lies with the concept of the optimum economic rotation age. In principle, this age is the one at which the marginal rate of value growth matches the discount rate. It is at this age that the NPV of the stand is maximised. Felling the stand either earlier or later results in a lower NPV.

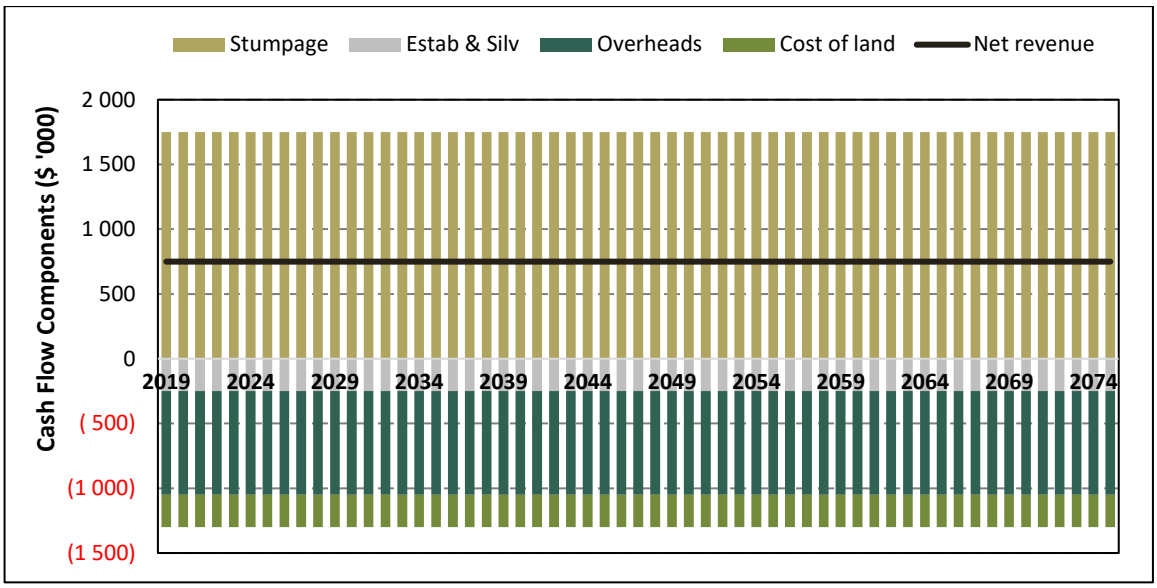
The distinguishing feature of forest estate models is their capacity to vary the age of harvesting in order to manage the woodflow and cashflow profiles. The constraints that estate models impose will inherently lead to departures from the optimum rotation age and they correspondingly result in a reduction in value. However, if the forest estate model constraints are realistic this version of the forest value is more authoritative. The stand-based alternative can be treated as an interesting but impractical ideal.

An estate model version of the forest can be regarded as the general and most realistic basis for valuation. Situations involving small or simplified forests that can be modelled on a stand basis represent special cases. The default position, therefore, is that the forest should be modelled as an estate and an explanation provided if this is not considered necessary.

Disaggregating the estate model

Within a stand-based model it may be amply clear which costs are incurred in generating which ultimate revenues. Each is readily itemised at the stand level and can be apparent before any process of aggregation. With forest estate-based models, the typical cashflow output is aggregated to an extent that masks which costs relate to which revenues. A simplified example of the effect is illustrated in Figure 12-2.

Figure 12-2: Long-term real cashflows for an example balanced forest

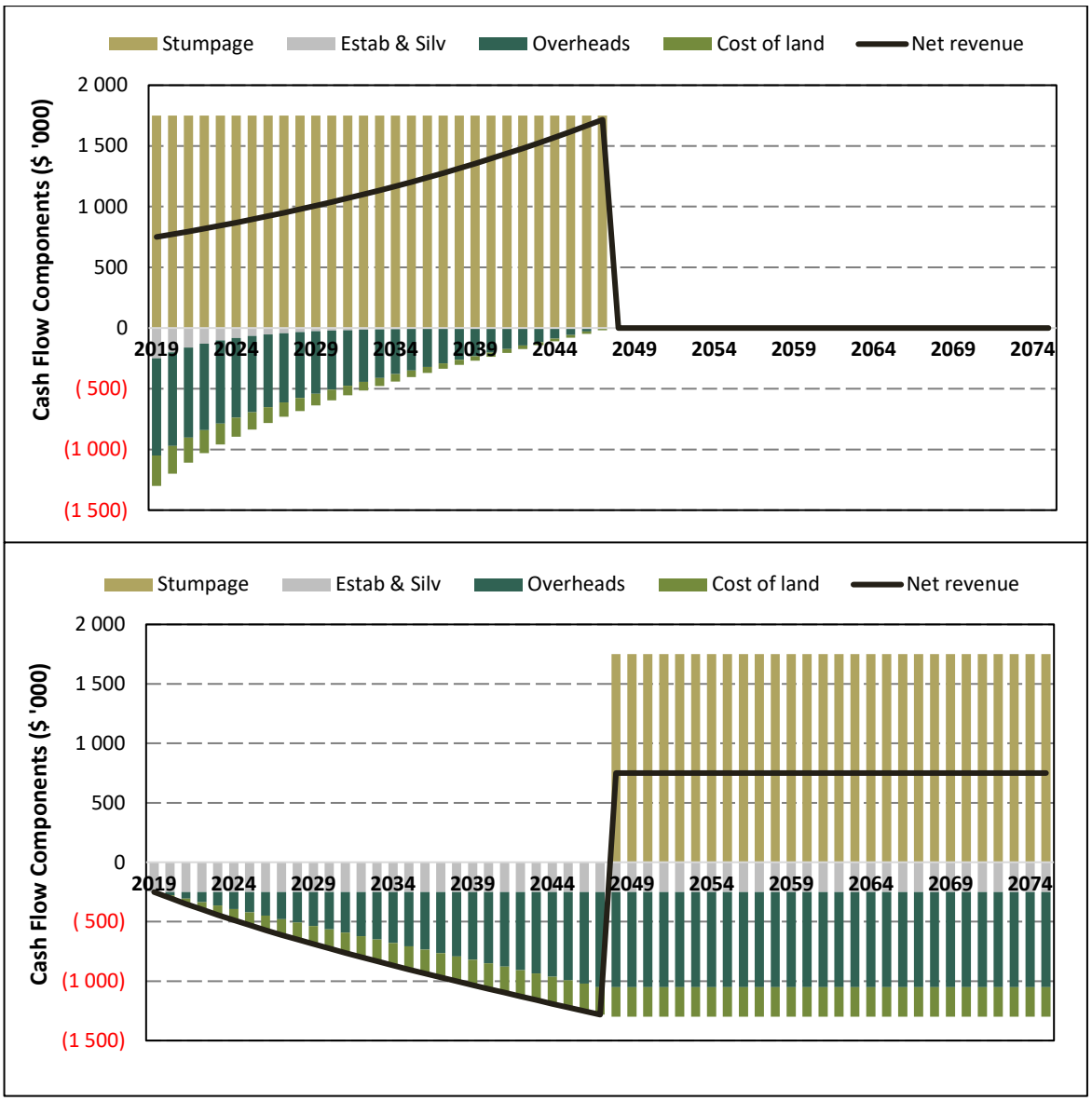


A financial analyst examining Figure 12-2 might conclude that engagement in forestry is an especially desirable type of business. The net revenue profile for the project shows an endless positive margin, so whatever the discount rate employed, the NPV remains positive. On closer examination, however, it is apparent that many of the costs incurred in any year do not relate to the revenues obtained in that same year. The establishment costs, for instance, are not recovered until the end of the rotation.

If the cashflow shown in Figure 12-2 was to be parsed into the components attributable to the current rotation and 2R+, these might look like those shown in Figure 12-3. Now it emerges that 2R+ will have a negative value at all discount rates that exceed the constituent stands' IRRs.[18]

[18] The IRRs that apply at the stands' harvest ages as constrained by the estate model.

Figure 12-3: Cashflows parsed into current and subsequent rotations



	Given the capacity of the aggregated cashflows to mask the underlying investment performance of the resource, it is best practice to distinctly identify the contributions from the current rotations and those that follow. The available software packages support this capability.
Valuing different types of plantation forest	Within the emphasis being given to assessment of fair value, practitioners are advised to emulate the processes followed by buyers and sellers. The practices are seen to vary, depending on forest size and age-class distribution. *Small forests, confined age class distribution, old* Primary attention is given to standing stock valuations. To rigorous vendors and purchasers there is justification in testing the hold or sell decision, which leads to the application of DCF-based concepts.

Small forests, confined age class distribution, young

Primary attention may be given to a cost-based approach, but there is also a need to confirm future viability and this invokes the discounting approaches. There is, therefore, a role for DCF based concepts in both discounting the future projected revenue stream and in assigning accumulated returns on investment.

Small forests, confined age class distribution, mid-rotation

Such forests are uncommonly traded for a combination of reasons. In the absence of comparable sales evidence this leads to a heavy emphasis on the income approach. There may need to be an added overlay recognising the thin nature of the market and the lack of debt finance.

Medium forests, some spread to age class distribution, but predominantly young

Such forests are less commonly traded because of the delay in receiving sizeable cashflows and limitations on debt servicing capability. The main emphasis is on discounting approaches and reference is made to comparable sales wherever these are evident. There may need to be an added overlay recognising the thin nature of the market and the lack of third party debt finance.

Medium forests, some spread to age class distribution, and with a significant component at and approaching harvest age

Valuation of these is likely to involve DCF approaches that reference both the IDR (sales comparison approach) and the WACC (income approach). The forests may be beneath the value threshold at which TIMOs will engage and this needs to be considered in addressing the universe of potential buyers.

Big forests, distributed age class distribution

At the time of writing this class of forest is of interest to TIMOs, other institutional investors and industrial interests. Purchasers may fund part of the purchase price from debt to obtain leverage benefits. The financial models that the purchasers and their advisors apply in deriving their bid values involve multi-rotation, post-tax, post-leverage cashflows.

Despite the increasing sophistication of the purchase models, there is still a legacy of reporting of market evidence based on single rotation and/or pre-tax cashflow models. If forest valuers are to adequately emulate market practice, they will be required to produce the following versions of the valuation model:

- current rotation model;
- perpetual model; and
- purchase model.

All versions must be reconciled to the same value result.

GUIDANCE NOTES ON YOUNG FORESTS

Young forests	When valuation discount rates are higher than the Internal Rate of Return (IRR), the expectation value approach can give unrealistically low (including negative) 'values'. Conversely, when discount rates are lower than the IRR, unrealistically high 'values' may be derived. In such cases, an approach to valuation that includes consideration of replacement cost is necessary. The small amount of transaction evidence on young forests indicates that, in some cases, the sellers are satisfied with getting their development costs ('replacement cost') back. Further, they may be willing to recover only the direct costs incurred (i.e. excluding indirect costs and land use costs with or without compounding). Where a young forest is valued periodically (say annually) over a number of years (during which time it becomes an 'old' forest), the valuer can expect a discontinuity in value if they switch from 100% reliance on current replacement cost method to 100% reliance on the expectation value method at a fixed age. If transaction evidence were to support the view that market value jumps up or down at a specific age, because buyers and sellers are want to switch their view of value at that age, then a discontinuity is justifiable. Otherwise, and this is more likely the case, a discontinuity is symptomatic of incomplete consideration of the weights that should be given to expectation value and current replacement cost and how those weights change with age. Some valuers progressively increase the weight given to expectation value evidence and decrease the weight given to current replacement cost evidence as age increases, in order to reduce the likelihood of a discontinuity in valuations. Such an approach is acceptable. The key requirement of a forest valuation is that it passes the reality test, i.e. is the value struck likely to result in a transaction (should the forest actually be marketed) given all the evidence available to the valuer?
Consistency	An important consideration is one of consistency. If a subset of stands in a large forest were to be valued on a stand-alone basis, would the value be similar to the apparent value of those same stands when valued as part of the large forest? The scope for inconsistency of values exists, particularly where different valuation methodologies may be applied, depending on the disposition of the subset of stands. Particular care is therefore required in valuing young stands. The potential for arbitrage may exist where forests are valued and exchange hands, with the subsequent on-sale of a subset of stands. It

	may not be necessary to avoid the potential for arbitrage, but the valuer should be aware of its existence and draw the client's attention to it.
Forests with bi-modal age structure	Some forests comprise near-mature stands and young stands with no or few stands of intermediate age. They can arise when a forest established over just a few years reaches maturity, harvesting commences, and young stands start to appear as replanting proceeds. These forests thus comprise a 'young forest' and an older forest. Applying the income approach alone to such a forest may result in an unrealistic assessment of value. An appropriate valuation approach may be to value the young stands as a young forest and to value the older stands using a method appropriate to those stands (i.e. income approach). The test to apply is: '*Is a potential purchaser likely to regard the forest as essentially two forests, each valued using a different method? Is the value struck likely to result in a transaction*?' A wide range of forest age class structures is present in the national estate and it is constantly changing. A particular instance has been described and a wide range of variations exist around it. In some cases, a particular judgement call will be required as to the best approach to valuing a subject forest with such an age structure.
Young forest taxation effects	When valuing young forests, the taxation situations of both the owner and the hypothetical buyer will need to be considered. The following example shows that taxation effects can create a gap in value expectations between seller and buyer. Example Seller spends $100 developing a young forest Seller earns tax deductions of $33 Net outlay of seller is $67 Seller wants to recoup net outlay upon the sale of the forest Seller is taxed on the proceeds from the sale Seller therefore wants to sell at: **$100** Buyer has to place purchase value in a cost-of-bush account Buyer therefore has no immediate tax relief Buyer has the option of developing its own young forest at a net outlay of $67 Buyer expects to purchase the forest for: **$67**
Aspects of applying the compounding approach	The application of the compounding approach invites questions about how the following should be treated: • compounding rate; • direct cost assumptions; • assumed overhead costs;

	• land cost; and • taxation. A generally observed feature of the method is the application of a comparatively low rate of compounding. This is believed to primarily reflect the concern that undue reliance on compounding can lead to a high-cost forest being valued more highly than it should. Valuers are aware that forests that are expensive to establish may not be ultimately the most productive. The acknowledgement of this concern results in the selection of compounding rates that are less than the discount rate. Some valuers indicate that when considering a compounding rate they also perform a cross-check and calculate the Internal Rate of Return (IRR). Their premise is that it would be unreasonable for a value produced by compounding to rise at a faster rate than the IRR. Generally observed compounding procedures use direct costs and overhead costs that are at industry-standard levels and are consistent with achieving a forest of the standard represented. The costs are expressed in current-day values. In this respect, the value obtained by compounding differs from the accumulated book value that may appear in accounting reporting (as described in Section A3). The latter is more likely to use historic actual costs, with no indexing to adjust for inflation. By and large the compounding process is meant to provide the reverse procedure to discounting. Consistency suggests that there is recognition of land use charges, whether actual or notional.
Application of professional judgement	The adjustments do rely on the valuer applying their professional opinion, but are not without some rationale. At all times the guiding principle is to picture a hypothetical negotiation between buyer and seller, and attempt to consider how the two parties would offer and counter-offer. Factors to consider include: • the tax position of the two parties (see above); • that the seller's perception of value is likely to be driven by what has been spent on the forest; • the sum of direct costs incurred is likely to shape the seller's 'reserve price'; • there may be more latitude over compensation for overhead costs, the cost of the crop using the land and the time cost of money; • buyers are likely to be influenced by what it would cost THEM to develop a replacement crop rather than what it cost the seller to develop the crop being valued; • buyers may argue that they could develop a replacement crop that was better through improved genetics or establishment practices; • the seller might counter that because the trees are already in the ground there is less risk to a buyer and in addition, the rotation is already advanced.

GUIDANCE NOTES ON OTHER FOREST REVENUES

Introduction	Other Forest Revenues (OFR) relate to outputs from the forest, other than logs, that have economic value. They should be considered with the forest valuation and included where they are material and meet certain criteria. In certain circumstances, the OFR should be the subject of a separate valuation by the forest valuer or an appropriate specialist.
Examples of Other Forest Revenues (OFRs)	Outputs from the forest that fall into OFR may include: • grazing; • recreation; • hunting; • nectar; • berries; • fungi; • honey and other apiary products; • nuts; • understorey vegetation; • carbon sink capacity; and • water catchment. This list is not exhaustive.
Inclusion of OFRs	The revenue generated by these outputs that can be directly associated with the forest can be considered in the forest valuation. OFRs often tend towards social values. To qualify for an assignment of market value three criteria need to be met: **1) Measurability** Measurement of market value needs to be based on the expectation of a future cashflow. The expected future cashflow stream should be based on current transactions arising from the subject forest or like forests. **2) Certainty** OFR may be uncertain or subject to extreme seasonal, year-to-year, or crop age dependent fluctuations, so appropriate conservatism is especially important. **3) Beneficial interest** The forest grower must have the right to benefit from the OFR.
Treatment of cashflows	The scale and nature of the OFR will indicate the appropriate treatment in the valuation process. Broadly, the two possible treatments may be characterised as the 'separate enterprise' approach and the 'bundled' approach. If the Net Present Value (NPV) of the OFR exceeds about 5%[19] of the present value of the future cashflow of the tree-growing enterprise, the former approach is indicated. The approach selected requires a

[19] Indicative measure of materiality.

	judgement call of materiality and utility and the valuer should consider these factors (as well as scale) in making it: • is the venture inextricably associated with the presence of the tree crop? (if so, a bundled approach is required); • is the venture able to be carried on through the whole rotation? (bundled); • is the capital and management best provided by the forest owner? (bundled); • are the costs joint with other forest operations? (bundled); • is the venture amenable to legal separation? (consider the potential to separate); • are the OFRs a necessary part of the economics of the forest enterprise? (probably separate but a bundled analysis may be required if a failure of the OFR will have a crucial effect on the forest enterprise and hence its value or vice versa); • is the venture in the subject forest actually a separate enterprise at the date of valuation and the rules of separation nullifies the management of one enterprise affecting the other? (separate); • is the continuation of the OFR venture discretionary to the forest management? (bundled); • is the continuation of the forest venture discretionary to the OFR management? (separate); • does the venture provide values to the forest that are difficult to quantify and isolate such as public relations benefits, staff interest, soil fertility? (bundled); and • are the costs and revenues relatively certain and continuous, and would a prudent person undertake a business venture based on them? (separate).
Separate enterprise	The separate enterprise approach presumes the existence of two business opportunities and requires the separation of all costs and revenues between the forest and the OFR business. Appropriate arms-length transaction values for services and assets provided by each business to the other will be derived and used in each valuation. A valuation for each business will be derived from the separate cost and value streams. The enterprises may be valued with different discount rates and/or funding assumptions. If the business of the OFR is outside of the competence of the forest valuer, and particularly where legal commitment to it is required, its valuation will require outside assistance. An example of the treatment of land rent, which is a typical transaction between a forest and a separate enterprise OFR, is shown below. If the OFR actually pays (or alternatively can on reasonable grounds be imputed to pay) a rent to the land, this can be considered a value of the OFR to the forest enterprise and reported separately. In the sum of both enterprises the rent will cancel out.

	If costs not allocated to the OFR fall on the forest venture (say skinning of trees by trail riders), the unallocated costs are best viewed as a forest cost borne to achieve an outside income (rent) to the forest. If the forest business and the OFR business are in one ownership, the decision to continue with the OFR business rests on the worth of it less/plus any unallocated costs/benefits identified and valued in the forest business. The separate business (and the value effects on the forest) are assumed sheddable by the land /forest owner's decision. If there is separate ownership or legal commitments (either way) between the forest business and the OFR business, the decision is subject to these and can only be exercised when the commitments have expired or are to be reviewed.
Bundled	No appreciation of the separable value of the OFR business is directly indicated by the bundled approach. The stance is that small items of cost and revenue are inextricably part of the forest enterprise. The effect of the OFR is expressed as the costs and negative costs of growing trees on that site and is subject to management control in the ordinary course of the forest business. Continuation of the OFR business is discretionary to forest management. It is of small importance to the success of the tree crop or the economics of the whole venture and may be regarded as a 'by-product'.
Example	The example below assumes a true arms-length relationship between the forest owner and the proprietor of the OFR, i.e. a separate enterprise.

Imputed (or actual) entity		OFR ($)		FOREST ($)
Annual costs and returns	Rent paid	(500)		
	Other costs	(100)		
	Sales income	1,000	Rent received	500
Annual OFR flows and forest effects	Value of OFR	400	Value of OFR to forest	500
Total value of OFR enterprise to owners(s)			900	

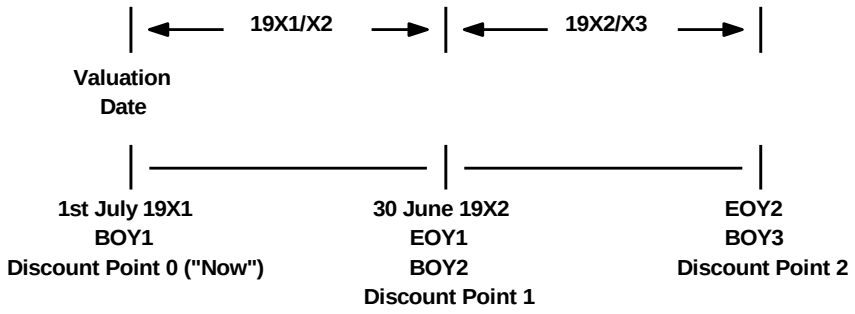
OFR land not separable from forest land	In the foregoing example neither the forest owner nor the OFR proprietor would wish to discontinue their respective enterprises. However, this assumes that the forest owner does not allocate a land-holding cost to the OFR enterprise area. This assumption is consistent with an assumption that land ownership cannot be shed from the forest enterprise to the OFR business. The forest enterprise bears the ownership cost of the land because there are no other options for the main business and this business is not affected by the existence or otherwise of the OFR.

	Say the allocated holding cost of the unsheddable land asset is $600 per annum. The complete value statement for the landowner is that he or she bears unsheddable costs of $600, but is able to gain a return of $500 by also using the land for the OFR business.
OFR land separable from forest land	If the OFR land is separable from the forest land then the landowner is justified in allocating a land-holding cost: Say sheddable land-holding cost (600) Rent from OFR 500 Net value of OFR to landowner (100) If the landowner does not own the OFR business, the logical course is to sell the land at any price greater than capitalising $500 at the forest discount rate. If the landowner also owns the OFR, the decision to sell the land and the OFR business rests on the sum of annual income ($900). This indicates the landowner would keep the OFR business and the land if the price obtainable for the land and business is less than $900 annual income capitalised at the discount rate of the OFR business.

GUIDANCE NOTES ON FOREST VALUATION CONVENTIONS

Purpose of conventions	A valuation is a communication based on an underlying calculation. Any calculation and communication require consistent conventions to control the information and the process. The conventions adopted must also meet the needs of the recipient. There is clearly little utility in a valuation having an internal crop age convention different to the age conventions applied to the yield table and the discount intervals. Neither is there utility in presenting a valuation with an internally consistent set of conventions that does not match the realities of the client's position. For example, stumpage values applicable to a large corporate forest owner when the client has a small forest remote from markets. There are many possible, and valid, internally and externally consistent convention sets for any one valuation. The following set is designed to be consistent with the abbreviations and definitions set out in the Glossary. Its use will help to limit the number of differences between valuations. Some of the conventions may seem surprising and pedantic, but they are nevertheless consistent with widely accepted valuation treatments and are necessary.
Disclosure of conventions	The convention set outlined in these Guidance Notes is recommended for adoption (but is not mandatory). The valuation document should include a note of the convention standard adopted.

	[*This valuation uses the standard set of conventions as recommended by the Institute of Foresters of Australia or New Zealand Institute of Forestry] or [This valuation uses the standard set of conventions prepared by YYYY as described in Appendix Z*.] The most appropriate place to make this disclosure is in the 'Method' section of the valuation.	
Definitions	Refer to Chapter E2, Glossary of Forest Economic Terms for definitions of: • valuation event; and • discount point.	
Time conventions	**General conventions:**	
	T1G	Even though time is continuous, valuation events are deemed to occur at, and statistics are recorded at, discrete instants.
	Specific convention (example):	
	T1S	The valuation year runs from 1 July 20X1 to 30 June 20X2.
	T2S	A stand experiences its annual growth increment (yield indicated at age B minus yield indicated at age A) at 11pm on 30 June. Yield tables are indexed so that 'Yield at Age 17' indicates the yield at the 17th birthday (<u>including</u> the increment over the immediately previous year all notionally added at 11.00pm on its 17th birthday).
	T3S	Age – seedlings and cuttings are deemed to begin life (age 0) on 30 June of the calendar year of planting. A stand has its birthday at 11.30pm on 30 June. Implication: All trees planted in calendar year 20X1 are aged 0 until 11.30pm on 30 June 20X2 when they become age 1.
	T4S	The discount point in year 20X1/X2 is at 12.00pm on 30 June 20X2.
	T5S	12.00pm (midnight) on 30 June 20X1 is the Beginning Of Year ('BOY') 1 or point 0 in a discounted cashflow. 12.00pm on 30 June 20X2 is BOY 2 and End Of Year ('EOY') 1 or point 1 in a discounted cashflow.
	T6S	A value stated to be 'at 20X1' is at 12.00pm on 30 June 20X1. Implications: – A valuation required to be placed at 31 December 20X1 will be initially made as at 12.00pm on 30 June 20X1. Any valuation events that actually occurred between this time and 31 December 20X1 (i.e. possibly some 20X1/X2 scheduled operations) will be adjusted at cost (or return). Interest and discount on the investment at 12.00pm on 30 June can be adjusted to 31 December if required. Adjustments may be made for reductions in stocked area due to clearfelling or other reasons (e.g. fire, wind loss). An

		adjustment may also be made for any volume increment/decrement after 30 June 20X1; and – A stand aged 17 as at 30 June 20X1 will not have had 'age 17' costs expended on it (see specific conventions T7S).
	T7S	Operations with costs or revenues described as taking place in valuation year 20X1/X2 take place at 12.30am on 1 July 20X1. Implications: – A valuation event in 20X1/X2 will not be discounted. – A valuation event in 20X2/X3 will be discounted one year to 12.00pm on 30 June 20X1. – 'Operation at Age 17' means 'operations carried out while the tree is aged 17 years and before it is aged 18 years'. – Note that other convention sets may assume operations occur at mid-year or end-of-year rather than at start-of-year.
	Note 1 For ease of explanation the conventions are expressed as examples, and the conventions apply similarly at all ages and years. **Note 2** Hours of the day are adopted for convenience to indicate the sequence of events. The Figure 12-4 below illustrates the use of the above convention set. **Figure 12-4: Time convention**  	
Cost conventions	**General conventions:**	
	C1G	The accounting rules applicable to the calculation of costs as promulgated by the Chartered Accountants Australia and New Zealand will apply.
	Specific conventions:	
	C1S	Future operations and their associated costs included in a market valuation are those that on the evidence available at the time are likely to add value to the existing forest at the chosen discount rate.

		Implication: – The costs included in a market valuation are to be those that an economically rational investor would apply to an existing forest to maximise its NPV. Valuations undertaken for different purposes may use a different convention with the reason for the departure explained (e.g. the conscious decision of the owner to grow the forest for mainly pulpwood production).
	C2S	Operational costs are at levels likely to be achieved by a competent manager of the subject forest operating at arms length from the forest owner. Costs shall be those that apply at the date of the valuation on ruling terms of trade from contractors skilled in the operation and operating in the area of the forest. Implication: – A contractor's overhead may be assumed to contain a travel time/cost component appropriate to the subject forest.
	C3S	All costs associated with valuation events are expended at the same time as the scheduled valuation event, along with all owner's overheads associated with them. Implication: – Even though non-operational costs (such as administration charges) are continuous through the year, they are regarded as associated with a valuation event and timed accordingly.
	C4S	Tax deductions/liabilities associated with expenditure and income fall due at the same time as the associated cost/revenue. (NB: This is a conservative convention for most valuations).
Area conventions		**General conventions:**
	C1G	True area means the area as stated on a Certificate of Title, survey plan, block sheet or other plan prepared by a registered surveyor.
		Specific conventions:
	C1S	Tree area of the stand in terms of 'stocked hectares' is the area occupied by tree canopy to the outside edge of the crown and excludes: a) each canopy gap of more than one-tenth of a hectare within the stand boundary; and b) all roads and service areas outside the tree canopy boundary.
Market conventions	**Specific conventions**	
	M1S	Prices for logs/stumpage/cutting rights are at levels likely to be achieved at the time of maturity:

		• by a competent sales agent; • at arms length; • using ruling terms of trade; • in the available and practical market(s); • to give the highest total net stumpage; and • for the on-truck outturn indicated.
	M2S	Prices are to be converted to the net stumpage available to the forest owner. Implications – all selling costs, costs between the stump and the applicable price point, and marketing costs and commissions are to be netted off the buyer price; – the applicable quantity for pricing is 'on-truck' with realistic allowances made for unmerchantable produce, breakage etc deducted from the indicated yield table outturn; and – the market price applied is not necessarily that to give the highest <u>theoretical</u> stumpage but the highest <u>practicable</u> return. It is not likely in practice, for example, that a small parcel of logs would achieve the same stumpage as indicated by export prices paid for large continuous supplies of similar specifications, even with all the costs applicable to the subject forest netted off.
	M3S	Prices are valid as at 30 June 20X1. (This convention requires a statement in each valuation.)
Discount rate conventions	**General conventions:**	
	D1G	The discount rate i_r is real and derived from a current required nominal rate of i_n% and a current inflation rate of d%: $i_r = \left(\frac{1+i_n}{1+d}\right) - 1$ where i_r, i_n and d are percentages expressed as decimals e.g. 4% = 0.04
	D2G	The discount rate is applicable to post-tax cashflows.

CHAPTER B13 – CHANGE IN VALUE OVER TIME

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • reformatted the 1999 Word version (as no 2019 Exposure Draft); • brought references to Australia to before references to New Zealand; • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place;
Current Status	Further revisions required prior to draft release.

CHAPTER B14 – VALUATION FOR INSURANCE, COMPULSORY SALE, COMPENSATION

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • minor editing for context and addition of 'New Zealand' and 'Australia' in appropriate place.
Current Status	Further revisions required prior to draft release.

3 PART C – PRESENTATION STANDARDS

CHAPTER C1 – SOURCES AND REFERENCES

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • Added 'New Zealand' and Australia where appropriate • Standard C1.2, added scope requirement to declare weather a physical forest inspection was undertaken or not
Current Status	Released as draft.

CHAPTER C1

SOURCES AND REFERENCES

Purpose	The purpose of this standard is to ensure that the valuation document adequately discloses the purpose, scope and origins of the document to assist any reader to: • independently verify its data, scope, methodology and conclusions; • make judgments as to the applicability and reliability of the document; and • request further data from the valuer or the property owner in terms consistent with the document.
STANDARD C1.1 **Commission**	With respect to the commissioning of the valuation the document shall: • state the name and address of the person/company commissioning the valuation; • state the nature of the instructions received from the client in specific terms to indicate the client's intended final use, for example: – Market price valuation – Statement of Financial Position (Balance Sheet) valuation for inclusion in the (annual) financial reports of XYZ – Valuation for mortgage lending – Valuation for the purposes of sale/purchase of the forest; and • state the purposes for which, in the valuer's opinion, the valuation is appropriate.
STANDARD C1.2 **Scope**	With respect to the scope of the valuation the document shall: • state what is being valued by reference to the Forest Description and any additions or deletions; • state the valuation methodology adopted and the rationale leading to its adoption with reference to the Institute of Foresters Australia and New Zealand Institute of Forestry Forest Valuation Standards; • report any departures from the Institute of Foresters Australia and New Zealand Institute of Forestry standards of forest description and appropriate valuation, giving reasons for the departures and the likely effect(s) on the valuation; • refer to any previous valuation of essentially the same forest asset undertaken by the current valuer and state any changes in methodology between the valuations, the reasons for them, and the likely impact of these changes within the subject valuation; and • state whether a physical inspection of the forest was undertaken or not.

STANDARD C1.3 **Disclosure of data sources**	With respect to any published data or analytical methods (including computer software and data) on which the valuer has placed material reliance, and not personally verified, the valuation document shall state: • a reference to the data sufficient for its discovery and verification; • the nature of the major analytical processes used with a reference to the software identity; and • any copyrights and similar intellectual rights used within the presentation.
STANDARD C1.4 **Disclosure of Practitioner(s)**	The valuation document shall state: • the company or firm or sole practitioner undertaking the valuation; and • in the case of a company or firm the name of the lead valuer and any other employee/partner having a material input into the valuation.
STANDARD C1.5 **Date and document reference**	The valuation document shall be dated and otherwise referenced in such a way that clearly identifies it uniquely from earlier drafts or any other document.

CHAPTER C2 – PRESENTATION AND LIMITATIONS

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • added 'New Zealand' and Australia where appropriate • C2.2, included requirement do state if value includes or excludes estimated costs to sell; • C2.2, include requirement to state valuation currency and applicable exchange rates; and • minor updates of outdated references.
Current Status	Released as draft.

CHAPTER C2

PRESENTATION AND LIMITATIONS

STANDARD FOR PRESENTATION OF VALUATION	
Purpose	The purpose of this standard is to ensure that the valuation document is an adequate and clear archival reference and that it stands as an integrated document without later additions or removals.'
STANDARD C2.1 **Document presentation**	With respect to the presentation of the valuation document to the client, the valuation document shall: • be typed and either printed or provided in electronic form; • be able to be copied and retain information in the copy (e.g. where, for example, colour is used in the original document); • if printed, be bound by a robust form of binding, either openable or permanent; • have each page numbered by a logical numbering system and any seemingly illogical page insertions (e.g. graphics) and sequence breaks shall be referenced; • have an index or table of contents; and • be signed personally by the valuer on his/her own behalf or on behalf of the valuer's firm or company or be accompanied by a similarly signed covering letter that references the valuation document.
STANDARD C2.2 **Value statement**	With respect to the stated value, the valuer shall: • state the asset value of the forest according to the opinion of the valuer; • state that the value does not include Goods and Service Tax (if any); • state if the value includes or excludes estimated costs to sell; • state the valuation currency and applicable exchange rates; • clearly refer to the variable factors that have a material bearing on the quoted asset value by reference to the discussion part of the document; • give a preferred level (consistent with the uses of the valuation) for each variable factor where a range of variable dependent values are provided; and • give the date at which the valuation is applicable.
STANDARD C2.3 **Material errors**	Every forest valuation report shall be free of material errors: • the valuer is obliged to put in place systems of review and checking which assure freedom from material errors.
STANDARD FOR DISCLOSING LIMITATIONS	
Purpose	The purpose of this Standard is to ensure that:

	• any reservations or limitations that the valuer wishes to place on the valuation results are clearly disclosed in the correct context; and • any reservations of copyright or distribution of the document are clearly indicated.
STANDARD C2.4 **Use of disclaimers**	With respect to any disclaimers: • all disclaimers and limitations of use must be written in the document; • each disclaimer must be categorised as between a factor inherent in the valuation and the use of the valuation; • a disclaimer due to an inherent factor must further distinguish between a factor due to a limitation imposed by the commissioner and a limitation imposed by the absence of data which was not able to be rectified; • a disclaimer as to the use of the valuation document must not be inconsistent with the valuers instructions; and • a valuation cannot disclaim all liability to the client. It may however help limit financial liability of the valuer to only the client and only for the purposes for which the valuation was undertaken.
STANDARD C2.5 **Copyright**	Copyright to a valuation may be retained by the valuer except in respect of bona fide copying by the commissioner for uses consistent with the commission.

GUIDANCE NOTES PRESENTATION AND LIMITATIONS

Introduction	The valuation document is the major means of conveying the valuer's conclusions to the client. The law will in many circumstances infer that any other verbal advice given to the commissioner of the valuation by the valuer, in appropriate circumstances, is part of the valuation. It may also infer that the valuer has responsibilities to other persons using the valuation. It is therefore important that the valuer states with clarity, by whom and for what the valuation was commissioned, and the limits placed on its scope in accordance with the valuer's judgment. The valuer may want to specifically exclude any verbal advice from all liability to the extent that it varies from the written document. The IFA and the NZIF are concerned to see however that practising forest valuers retain a reasonable level of professional liability to their client for the standards of their work in terms of the commission. This may be stated in any contract between the parties. The name of the valuer must therefore be stated. A reference to any previous valuations of the subject property made by the valuer and the means of justification between the different approaches is of importance where a continuity of treatment between (say) successive Statement of Financial Position (Balance Sheet) valuations is required. It should be recognised that a valuation is not applicable in all circumstances and uses and the valuer should therefore ensure that the document is viewed and considered in its entirety. Document integrity through page numbering, indexing and binding, if printed, is therefore necessary for more than cosmetic appearance and ease of use. Published data and analysis methods (i.e. computer programs) may be subject to copyright. If they are the valuer must obtain the appropriate permissions. In all cases published data must not be used without acknowledgment of source - both for the purposes of verification and courtesy.
Materiality	A statement, fact or item is material if it is of such a nature or amount that its disclosure, or method of treatment, given full consideration of the circumstances applying at the time the forest valuation is completed, is likely to influence users of the valuation report in making decisions or assessments. Determining the materiality of an item is essentially a matter of judgement. Materiality is concerned with assessing whether omission, misstatement, or non-disclosure of an item of relevant

	and reliable information could affect the perceptions of valuation report users. Consideration should be given to the likely users of the valuation report and to the information needs of those users. Materiality may be agreed between the valuer and the client.
Liability	Issues of legal liability are complex, and the law is continuously evolving in this area. Even stated limitations and disclaimers may not be sufficient to absolve the valuer from liability in all circumstances. Litigation is increasingly designed to shift the risks of commercial decision making from the seller or buyer to the professional advisor. Where a dissatisfied buyer cannot trace the seller the likelihood that the buyer will take action against the valuer is increased. A cautious approach to this issue is therefore required. Valuers are advised to protect the assets of their companies and themselves through correctly designed liability insurance. Legal advice in all matters of liability should be taken and updated regularly.
Example of disclaimer	The following is an example of a disclaimer: *This forest valuation has been commissioned by [client] The purpose of the valuation is to indicate the likely market value of the forests.* *The information on which this valuation has been based includes forest descriptions supplied by [name of supplier]. This information has been partially checked and supplemented by other data collected by [valuer] and is believed adequate for the purposes of this valuation.* *[Valuer] has not conducted on-ground surveys to confirm that the boundaries of the stocked areas do indeed lie within the legal boundaries. [Valuer's] inspection of aerial photographs and/or remotely sensed data and the available mapping does not indicate that any trees are outside the titles but final assurance on this point is not possible without ground survey, or detailed photogrammetric mapping coupled with legal assessments.* *[Valuer] does not state any opinion with respect to the value of the underlying land and the other non-forestry improvements to the property. The advice of a Registered Land Valuer should be sought and must be sought in Australia. {The quoted land value is sourced from [Land Valuer]}.*

	Consistent with the principles of forest valuation employed the results of any formal land valuation should be added to the 'Value of Forest Crop and Forest Improvements' as here set out to give the total value of the property. This report is only for use by [Client] and solely for the purposes stated above. [Valuer] shall have no liability to any other person in respect of this valuation. Nothing in this valuation is, or should be relied upon as a promise, representation, opinion or forecast of the future. *The valuer has no obligations to update the value for subsequent events unless contracted to do so.*
Copyright	Any author retains copyright in his/her original work. Where the author is an employee, the employer is the first owner of the copyright (Australian Copyright Act 1968, New Zealand Copyright Act 1994). In **Australia**, the Commonwealth or a State retains copyright if the material was created for, or first published by, a Commonwealth or State government department or agency[20]. Use of duly licensed computer software for fee generating purposes and provision of data files in proprietary formats (i.e. .pdf, .xls) is generally permissible but it is generally not permissible to provide software to clients for their use in conjunction with a valuation. Acknowledgement of published data and software sources is part of the verification trail of a valuation and may be a legal requirement on the valuer. Assertion of copyright is useful in retaining any form of intellectual property disclosed in the valuation by the valuer and will also form a protection against liability on the valuer for irregularly copied and used information taken from the report. Where a person commissions a photograph, drawing, diagram, map, chart, plan, etc, but not apparently a written report, the commissioner retains the copyright (see **New Zealand** Copyright Act 1994 S21 3(a)). As a valuation will often contain maps and drawings, the assumption that the client or valuer retains copyright in all the document may be countered by an agreement to the contrary (Ibid, S21 4). The copyright reservation should appear in the valuer's Letter of Commission as well as in the valuation itself.
Example of copyright statement	The following is an example of a copyright statement. [Name of Valuer] All rights reserved

[20] Australian Copyright Council
https://www.copyright.com.au/about-copyright/ownership/

	All rights of copying, publication, storage, transmission and retrieval in whole or part by any means and for all purposes except for bona fide copying by the commissioning party as set out on page [y] are reserved.
Value statement	The statement of the forest value is the most important part of the document. A natural tendency is for 'the value' to be accepted by the client or other readers without the reservations and amplifications placed on it by the valuer. The statement of value therefore requires great clarity. Where a value range is presented (e.g. varied by the discount rate used or the market value of the log assortment) it is generally undesirable to leave the matter hanging on these points. The valuer should therefore indicate the preferred level for each of these bearing in mind the expected use of the valuation as described by the client. Reference to a discussion of the major factors bearing on the choice is also desirable. Placement of the valuation statement on the first page or an 'Executive Summary' page is useful, but in that case reference to the most important factors having a bearing on the valuation should also be given. The valuer has the responsibility not to lead any reader into a misconceived idea of what the valuation implies through a poorly considered sequence of presentation.

4 PART D – VALUATION CHECKLIST

CHAPTER D1 – PREFACE TO PART D

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • added 'New Zealand' and Australia where appropriate; and • minor text updates.
Current Status	Released as draft.

CHAPTER D1 - PREFACE TO PART D

Introduction	This checklist covers the key points that should be considered in the preparation of any forest valuation. It is not intended as a guideline on how to do a forest valuation. The checklist should be read in conjunction with the full Institute of Foresters of Australia and New Zealand Institute of Forestry Forest Valuation Standards.
Terms of engagement	Prior to accepting any professional engagement to undertake a forest valuation, the forest valuer should: • declare and resolve with the client any potential conflict of interest; • draw attention to the existence and nature of the IFA / NZIF Forest Valuation Standards and applicable financial reporting standards; • identify any perceived lack of information on which to base an accurate forest description; • identify and resolve any time limitations; • if the valuation is to be independent or have some inputs directed by the client; • quantify the resources required to complete the forest description to the IFA / NZIF Forest Valuation Standards and to the level of precision that is appropriate for the intended use; and • obtain a clear written brief which outlines the purpose for which the valuation is to be used, any time constraints and the inputs that will be provided by the forest owner or its agent. A letter of acceptance of a commission will usually refer to a Terms of Engagement or, outline the valuer's understanding of the terms that have been agreed, including: • purpose of the valuation (intended uses); • standards of forest description that will be achieved; • inputs of person commissioning the valuation; • resources (or cost) required to complete the work to the agreed standards; • time for completion and delivery of the valuation report; • audience (i.e. who to send to); and • number of copies of report required. **Reference:** Chapter C1, Sources and References

CHAPTER D2 - INTRODUCTION

Background	Where applicable, the below information would be included in the introduction to the valuation.
Commission	State clearly: • the person or entity for whom the valuation is being prepared; • the nature of the instructions received from the client; and • the intended use of the valuation - (This statement may also draw attention to the unsuitability of the valuation for purposes other than the intended purpose). **Reference:** Standard C1.1, Commission
What is being valued?	The value of standing trees as an asset may be significantly different from the value of shares in the entity that owns the asset, for example, whose only asset is those trees, or of one entity's interest in a tree crop. Explain exactly what the stated value applies to. If the valuation includes anything other than trees (e.g. land or land improvements) make this clear.

CHAPTER D3 – FOREST VALUATION METHOD

Standard Method	Describe the methodology used. The use of transaction-based sales evidence should be described. Where transaction evidence is not available or suitable the 'Expectation Value' method that is the IFA / NZIF standard should be explained and used. If the Expectation Value method is not appropriate, a cost based approach may be appropriate. Note that the standard method involves the modelling of tax effects under a set of taxation conventions. **References:** Chapter B12, Forest Valuation Method Chapter B11, Taxation Effects Chapter B14, Valuation for Insurance Cover, Compulsory Sale and Compensation
Departure from standard	Where other methods are used to suit specific client requirements, departures from the standard methodology and economically rational assumptions should be disclosed. Sensitivity analysis should be carried out to show the relationship between the client valuation and market value as estimated using the standard methodology. **Reference:** Chapter B12, Guidance Notes For Forest Valuation Method
Disclosure of key elements	Reference should be made to the following key elements applying to any method other than transaction evidence: • assumptions about: – forest management (e.g. species, silviculture, regeneration strategy, treatment of untended stands); – harvesting strategy (e.g. rotation age); – linkage to downstream processing vital legal contracts or company policy; • treatment of inflation effects in future cash flows; • treatment of tax in the cashflows (refer to standard convention set); • source of discount/compound rate applied and rationale for its selection, including the relationship between the tax treatment of the cash flows and the discount/ compound rate (see below);

	• treatment of land value and/or lease payments and/or share of stumpage to landowner (whichever is relevant); • timing, area, cost and price convention sets; • treatment of other forest revenues (if applicable); and • state of land/forest at closing date/s. **References:** Chapter B12, Forest Valuation Method Chapter B10, Discount Rate Chapter B11, Taxation Effects Chapter B6, Value of Land
Discount rate	The source and rationale for the selection of any discount rate should be fully disclosed, including the relationship between discount rate and the tax treatment of cash flows. Disclosure: • the rate; • the discounting convention (e.g. mid-year, end-of-year); • applied to real or nominal cash flows; and • applied to pre- or post-tax cash flows. Source and rationale: • source of rate or how the discount rate was selected; • treatment of any special risk by adjustment to the discount rate; • specific allowances (buyer/seller); and • relationship to transaction evidence. Explanation of the choice of discount rate may include reference to: • implied discount rates used in other forest sales; • implied discount rate derived from the share price of publicly listed forest companies; • the minimum market acceptable IRR observed in a range of alternative forest projects; • use of the Capital Asset Pricing Model (CAPM) and Weighted Average Cost of Capital (WACC) approaches; and • declared asset reporting rates. Note: When referencing alternative earnings rates, care must be taken to exclude expected inflation from any earnings rate that is expressed as a rate including inflation rather than a 'real' rate. **References:** Chapter B10, Discount Rate Chapter A4, Discount Rate (Background Issues)

Other forest revenues	If there are outputs from the forest, other than logs, that have economic value, decide whether these outputs are material and measurable. If they are then the treatment of the cash flows and land value associated with these revenues must be decided and disclosed. **Reference:** Chapter B12, Guidance Notes On Other Forest Revenues
Valuation conventions	Take care over the internal consistency of timing, discounting, area, cost and price conventions. Simple errors can have a significant impact on the value. **Reference:** Chapter B12, Guidance Notes On Forest Valuation Conventions.

CHAPTER D4 – FOREST DESCRIPTION

Introduction	By addressing each of the elements of a complete forest description the reader will be in a position to make judgements on the confidence he/she can place in the valuation.
Land	The forest description should document the land on which the forest is located: • with consideration to the purpose of the valuation (e.g.) due diligence work, the ownership and tenure of the land, and of the trees, including any encumbrance on the title or other rights or documents affecting rights to the trees or land needs to be determined. This may mean carrying out a title search if necessary unless specifically assigned to land valuers and/or lawyers to address. • forest owner have obligations to advise forest valuers of known encumbrances; • existence of other tenures within forest boundary (unformed legal roads, give-and-take boundaries); • location (map and cadastral reference); • physical attributes; • limitations on use imposed by local and other regulatory authorities; and • other features (e.g. customary use, native title, public access, hunting rights). **Reference:** Chapter B1, Description Of Land
Forest area	The method used to determine stocked areas must be described. A statement that gives the reader a reasonable estimate of the precision of the area statement is required: • declare the areas; – legal title; – total land area including non-title area; – stocked area; – area prepared for planting; – area not prepared but intended for planting; – other area. • method/s of area measurement; • reconciliation of areas (to title or other known area); • reliance on areas supplied by others; and • probable accuracy of stocked area statement. **Reference:** Chapter B2, Forest Area

Land value	The value of land contained within a forest description will be supported by: • source of the land value and value of improvements; • what is included in the value of land (vegetation, roads); • date of land valuation; • statement of the relationship of the land value used in the forest description to land value derived from external sources; and • applicable market land rental rate(s) estimate(s) and the source(s) of such estimate(s) **Reference:** Chapter B6, Value Of Land
Stand history	The forest description needs to draw upon existing stand records or other sources to classify stands for existing condition, growth and yield prediction, future management or harvesting. Describe: • available records; • completeness of records; • reliability of inputs to forest records; • steps taken to audit the reliability of records; and • how deficiencies in the available information have been addressed. **Reference:** Chapter B3, Stand History
Aggregation of tree crops	Any aggregation of stands into crop types for purposes of analysis should be accompanied by: • the purpose of aggregation; • the rules for aggregation; and • articulation with stand records, costs, area, yield and other forest description components. Where crop types are aggregated, a breakdown of stocked area into crop types shall declare the age-class distribution and yield for each crop type. Where crop types are aggregated, the contributing yield tables and age-class distributions for contributing crop types should be declared. **Reference:** Chapter B4, Description of aggregation of tree crops

Yield estimation	An inventory that is taken close to the harvest date will give the best estimate of yields. Where stands are being valued at any date other than harvest date, it will be necessary to project yields by means other than inventory. The basis of all yield estimates shall be disclosed: For inventory: • method; • intensity; • confidence limits around means of measured parameters; • qualification/skill level of inventory crew/s; and • yields by log grade for each crop type, and precision of these estimates where practical;. For derived yields: • rationale for method of deriving yield estimates; • regime ascribed by crop type; • source of starting points for projection; • forecast age range and treatment of age-classes outside range; • projection model (detail of components); • basis of allocation of yield into defined log grades; • degrade or other loss allowances; • yield validation procedures and results of validation; and • yields by log grade for each crop type where practical. **Reference:** Chapter B5, Yield Estimation
Costs	To ensure completeness, reliability and consistency of all costs specified in the forest description the following elements need to be addressed. **Completeness:** • direct costs; • forest level costs of being in business (rates, land occupation costs, access formation, management costs, protection costs, overheads); and • the costs from stump to price point, including overheads. **Reliability:** • source; • relevance of externally sourced costs; and • reconciliation to independent sources. **Consistency:** • costs expressed in current local dollar values;

	• no double counting (e.g. treatment of supervision costs); and • timing of all costs consistent with forest description (including pre-harvest roading). **Reference:** Chapter B7, Costs
Prices	The valuation should disclose prices used, the sources of those prices and comment on the fitness of the prices used for the purpose of the valuation. Disclosure of Prices: • prices for each log grade (use the same grades as in the yield table) at the point of sale; • points of sale and price points; • conversion of prices from points of sale to price points (units, currency, costs); • log grade prices at price point in $/m³ (excluding GST) underbark on roundwood basis; and • specific adjustments. Sources of Price Information: • log grades from which prices are derived; • markets for log grades from which prices are sourced; and • derivation of prices at point of sale. Disclosure of Price Movements: • method of forecast for assumed real price movement (including zero change); and • confidence limits around any analysis used to forecast trend. Reliability/Fitness for Purpose: • comparison with practice of others; and • valuer's statement. **Reference:** Chapter B8, Prices

CHAPTER D5 – CONTINGENCIES

Definition	A contingency is defined as a potential obligation or benefit that arises as a consequence of some earlier transaction or activity and: a) its occurrence is possible but not probable; and b) the associated cost or value cannot be measured with reliability. The common feature is the **significant degree of uncertainty** involved with a contingent liability.
Treatment in valuation	A contingent liability is not part of the forest valuation. It is part of the background information and may appear as a note in the valuation report.
What is reported?	Contingencies that could have a material impact on forest value shall be reported, including: • the existence and nature of the contingency; • uncertain factors that may affect possible outcomes; and • an assessment of the possible financial effect of the contingency.
Examples	Refer to Chapter B9, Guidance Notes On Contingencies for examples of possible contingencies.

CHAPTER D6 – VALUATION

Value statement	The statement of the forest value is the most important part of a valuation report. It must be carefully worded so that it is not read in isolation from amplifications or reservations placed on it by the valuer. The value statement should: • state the value of the forest according to the opinion of the valuer; • clearly refer to variable factors that have a material bearing on the stated value, by reference to the relevant part of the document; • where variables are involved (such as discount rate or log price assumptions) give a preferred level; and • state the date at which the valuation is applicable. **References:** Chapter C2, Presentation and Limitations
Calculations	The valuation calculation should be explained. Where applicable reference an appendix or separate document in which the value is computed.
Sensitivity analysis	The reader will benefit from analysis of how sensitive the valuation result is to critical assumptions. In most cases these will be: • discount rate; and • log price. However, in certain circumstances other key assumptions may influence value significantly, e.g. • land value; • yield (for immature plantations); and • stocked area (where not known precisely).
Non-market valuation	Where the forest value is presented based on some non-market assumptions (that is not the economically rational or 'highest and best' value), the market value should also be presented for comparison. **Reference:** Chapter B12, Guidance Notes For Forest Valuation Method
Change in value over time	Where the current valuation is an update of a previous valuation, to the extent that is practicable, and consistent with the purpose,

	terms of reference and availability of data for the previous valuation, the valuation report should include: • the date of the previous valuation and change in value since the previous valuation. • any significant change to the methodology adopted; and • any significant changes in component inputs. To the extent that is practicable, the valuer should calculate and report: • the impact of changes to methodology and to individual component inputs, on the total change in value; and • the change in value since the previous valuation broken down into its major components. **Reference:** Chapter B13, Change In Value Over Time

CHAPTER D7 – PRESENTATION ISSUES

General	Presentation standards are covered in Part C of these Forest Valuation Standards. Key points to check are: • the report can be printed and bound, or if electronically delivered, converted to a secured (edit protected) PDF format • use a logical page numbering system; • have an index or table of contents; • sign off the document or a covering letter that references the document; • put in place checking systems to ensure the valuation report is free of fundamental errors; and • ensure data or analytical methods are properly referenced. **Reference:** Chapter C1, Sources and References Chapter C2, Presentation and Limitations
Title Page and Preface	Include the following important information on the title page and/or preface that is inside the cover: • name of forest/s; • 'Forest Valuation'; • who it is prepared for: client name details and/or investment fund details where applicable; • who is responsible for preparation: name and address of valuer, and (if applicable) the firm; • date of valuation report (this may not coincide with the valuation date); and • any other reference necessary to uniquely identify the report from either earlier drafts of the same name or other reports that carry the same date.
Summary	The summary can be the only information read by some users. In addition to providing the forest value, it must draw attention to important information upon which the valuation is based. The summary should be between ½ and 3 pages and cover: what is being valued; • who commissioned the valuation; • the purpose of the valuation; • if the valuation is independent or one or more assumptions were stipulated by the client; • the date at which the valuation applies; • summary of methodology; • major assumptions made that impact significantly on the value, e.g., discount rate and log prices used;

	• the value (reference the value statement to draw attention to amplifications or reservations); • values reportable under applicable financial reporting standards; • comment on any assumption to which the value is particularly sensitive; and • identify any significant contingency.
Disclaimers	Properly worded disclaimers will: • alert the user to any reservations or limitations that the valuer wishes to place on the valuation inputs or results; • help protect the person who prepared the valuation from any claims for damages arising from the use of the valuation report: – by entities other than the entity that commissioned the valuation, – for purposes other than that for which the valuation was commissioned. **References:** Chapter C2, Presentation and Limitations
Copyright	Copyright to a valuation may be retained by the valuer except in respect of bona fide copying by the commissioner for uses consistent with the commission. **References:** Chapter C2, Presentation and Limitations
Appendices	Any background or supporting data that is not likely to be required by non-technical readers of the valuation should be given in appendices. Examples: – maps; – copies of legal titles; – legislation or regulations; – plot data summaries; – growth and yield tables; – stumpage calculation; – woodflows; – spread-backs; and – cashflows.

5 PART E – GLOSSARY

CHAPTER E1 – GLOSSARY OF FORESTRY TERMS

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • edit for Australian content; and • minor updates.
Current Status	Released as draft.

CHAPTER E1 – GLOSSARY OF FORESTRY TERMS

Term	Definition
Abbreviations	See 'Symbols'
Area	'Superficial extent' (The Concise Oxford Dictionary). Area is usually expressed by reference to a flat un-tilted plane (i.e. defined in two dimensions).
Arisings	Logs which are by-products to the major value components of the tree stem. Arisings are generally used for the production of woodchips for pulp or reconstituted board products.
Basal area	The sum of areas of the stem cross sections (usually over bark) taken at Breast Height (usually over bark) (1.3 (**Australia**) or 1.4m (**New Zealand**) above 'ground level') of all the trees growing on one hectare. A parameter used in inventory and growth and yield estimates and expressed in square metres per hectare. A simple formula is [BA (m^2/ha) = 0.00007854* DBH (cm) * DBH (cm) * SPH]. Basal area per hectare is the sum of the basal areas of individual trees or diameter classes and not simply the basal area of the mean diameter multiplied by stocking. It can also be calculated as the quadratic mean diameter squared * 0.00007854 * SPH ... see Mean Top DBH.
Breast height	Refers to the usual point of measurement of standing tree diameter, i.e. 1.3m (**Australia**) or 1.4m (**New Zealand**) above the ground level on the uphill side of the tree.
Butt log	The log directly above the stump. The biggest diameter log and usually having the greatest unit value of all the logs in the tree. If the tree has been pruned this log will contain most of the clearwood in the tree.
Clearfelling	The practice of felling all the trees in a given area.
Clearwood	Wood showing no (or negligible) defects caused by knots, resin pockets or mechanical damage and usually displaying straight and even grain patterns. Clearwood in small amounts is found in all trees. Pruning is designed to grow additional amounts, especially in long lengths.
Clonal forestry	The practice of plantation forestry using tested clones as the growing stock.
Clone	A group of individual organisms each having identical genetic characteristics, and hence in the case of trees nearly identical growth and production characteristics. Produced by cuttings, tissue culture or another tissue or cell multiplication method.
Compartment	A contiguous area within a forest defined and recorded on a map (or by recording noticeable boundary markers) used as the basic unit of forest record and description. Usually contains stands which are referenced with respect to the compartment.
Confidence limit(s) (Statistics)	The confidence limits of a sample indicate the range of values within which the true mean of the population is likely to be found. They are normally expressed as the estimated mean plus or minus some interval. For forest management purposes it has become customary to adopt the 95% probability level for

	sampling. This implies that there is a 5%, or 1 in 20, chance of the true mean lying outside these limits.
Crop tree	Any tree harvested for the production of wood fibre.
Croptype	An aggregation of 'stands' for the purposes of recording, analysis and forest management. The aggregation parameters will vary dependent on the purpose of the grouping, but single crop types will generally be comprised of trees of identical species that have similar growth and yield patterns and will have experienced similar silvicultural treatment. Sometimes, when harvesting characteristics are at question, a given crop type will also exhibit similar harvesting characteristics.
Cross Laminated Timber (CLT)	CLT is a solid engineered wood product, similar in construction to an extremely large plywood, used for pre-fabricated structural applications. This can be further processed into beams is a large-scale, prefabricated, solid engineered wood panel. A CLT panel consists of several layers of kiln-dried lumber boards stacked in alternating directions, bonded with structural adhesives, and pressed to form a solid, straight, rectangular panel.
Crown forestry license (NZ)	A licence granted by the Crown under the Crown Forest Assets Act 1989 in relation to Crown forest land.
Cubic meter (m^3)	A measure of volume equal to 35.32 cu. ft. See 'Volume'. Also true m^3, JAS m^3 etc.
Cull tree	A tree which will be selectively removed (usually to waste) at some point during the rotation and commonly at thinning.
DBH	An acronym of 'Diameter Breast Height' and now usually used in acronym form. A term used to describe a tree diameter measurement taken at the standard height of 1.3 meters (**Australia**) or 1.4 metres (**New Zealand**) above 'ground level'. Usually measured and expressed overbark on the standing tree.
Defect core	The central core of a pruned tree outside of which clearwood is laid down and which contains the pith, branch stubs and any occlusion defects.
Diameter Breast Height	See 'DBH'.
Diameter Over Stubs (DOS)	The diameter over the largest diameter whorl of branch stubs left on a tree stem immediately after pruning (the largest diameter circle of stubs is also called 'the largest pruned whorl'). Usually occurs at the first pruning operation and therefore in the butt log.
DOS height	The distance (to nearest one tenth metre) from 'ground level' to the largest pruned whorl in a pruned log.
Dump	See 'Skid Site'.
Epicormics	Shoots coming from the stem of a tree too small to be classed as branches and not within a 'Whorl'. Also used for needles growing directly from the stem (`epicormic needles').
Exotic	A species not endemic to the site or (more usually) country. Used in Australia and New Zealand in the term `Exotic Forest'. Opposite to 'Indigenous'.

Final crop tree	A tree expected to remain in the stand until clearfelling time.
Follower tree	A tree which, although not being removed in the current thinning operation may not remain in the stand until clearfelling or may not receive the full silvicultural treatment.
Forest	An area of land fully or partially stocked with growing trees. See also plantation forest.
Forestry right	The right granted by the owner or lessee of land to another person enabling that other person to establish, manage, protect and harvest, or simply to manage, protect and harvest, trees on the land. In **Australia** by s.87A Conveyancing Act 1919, a forestry right or profit à prendre is an interest in land in which the person having the benefit is entitled to enter the land, establish, maintain and harvest a crop of trees on the land and construct and use buildings, works and facilities as may be necessary for the above. In **New Zealand**, by the Forestry Rights Registration Act 1983, Forestry Rights may be registered under the Land Transfer Act 1952 against the Grantor's title to the land.
Framing lumber	Grades of lumber suitable for structural purposes in buildings and for other load bearing applications. Appearance is not a prime consideration and accordingly, subject to adequate or specified strength and stiffness 'framing lumber' may show knots and other grain imperfections.
Freehold	An estate in fee simple in land.
GF rating	Australian and New Zealand forest growers have a seed and plant classification system that provides comparative rank of genetic gain across seedlots. These are four breeds, each with its own improvement rating: GF (Growth and Form) LI (Long Internode) DR (Dothistroma Resistant) HD (High wood Density) An example of a seedlot description is DR21 (23)*. This indicates that we are dealing with the Dothistroma Resistant breed, with a Dothistroma resistance of 21. The figure for parentheses is the rating on the GF scale, and the asterisk is a warning that the seedlot comprises only a few parents. It is important to stress that improvement ratings are not a linear scale; they do not translate directly into gains of volume, value or anything else. They are merely a ranking.
Ground level (special sense in forestry)	The surface of the firm or mineral soil, but when the surface is sloping
Hardwood	Tree species which are angiosperms (flowering trees) and whose wood structure contains vessels. Often broadleaved species. Also used for the wood from these species. (See 'Softwood' in comparison.)

Harvesting	The processes of felling, commonly in-forest processing and transport of either whole trees or logs to the skid site (also called logging). May also extend to loading onto trucks and cartage of logs from the forest.
Hectare	10,000 square metres (or approximately 2.471 acres). See 'Area'.
Hog fuel	Residues from sawmills and other production units, usually containing a high percentage of bark commonly used as boiler fuel. Sometimes subject to a mechanical breakdown process (called 'hogging') before use.
Increment	The arithmetic difference between a tree, forest or stand statistic at different points in time. In the Australia and New Zealand, this is represented as 'I'. The time difference is usually annual, 'A' and unless otherwise specified the statistic is volume related. See 'Mean Annual Increment'.
Indigenous	Naturally occurring or native to a particular site or region. (In a botanical sense generally relating to the natural situation prior to any human influence).
Indigenous forest	See 'Natural Forest'.
Landing	See 'Skid Site'.
Leasehold	An estate in land granted by the owner of the freehold to another person which usually gives the right of exclusive possession and use of the land to that other person for a specified number of years.
LED	An acronym for 'Large End Diameter'. Used in log measurement. Usually refers to an underbark measurement, with the addition of UB for Under Bark.
Log	Merchantable lengths of the tree stem to be selected at harvesting. The raw material from which lumber, plywood and other wood products are manufactured. Always refers to produce after felling.
Logging	See 'Harvesting'.
Lumber	Any wood reduced by sawing or other mechanical means to a square or rectangular section and (frequently) dried, planed or given treatment against insect, borer and fungal attack. Originally a North American term it is infrequently used in Australia and may be used New Zealand because it is more specific than 'Timber' which may also include wood in other states. See also Timber.
Mean annual increment (MAI)	Total 'Volume' of a 'Stand' divided by present age, e.g. 460 m^3/ha at 28 years = 16.42m^3/ha/yr. **Australian** average MAI varies greatly between natural forests and planted forests. The **New Zealand** average MAI for *P. radiata* on feasible sites is about 22m^3/ha/yr.
Mean crop height	The average height of the crop trees – commonly a **New Zealand** term.
Mean Top DBH (MTDBH)	The quadratic mean of the 100 largest (by DBH) trees per hectare, or if less than 100 trees per hectare, the quadratic

	mean of those remaining. The quadratic mean is the square root of the mean of the diameters squared e.g. 10, 20, 30; Mean = 20 Quadratic Mean = $\sqrt{\frac{(10^2+20^2+30^2)}{3}}$ = 21.6
Mean Top Height (MTH)	In **Australia**, this term is used in pre-harvest inventory, but the number of trees may not necessarily be set at 100 as is the case in New Zealand. It is a term more commonly used in **New Zealand**. The height is generally predicted by reading from the Pettersen curve (a model of tree height plotted against tree diameter) for a DBHOB corresponding to the Mean Top DBH (MTDBH).
Medium Density Fibreboard (MDF)	MDF is a reconstituted wood panel product. It is a dry-processed fibreboard manufactured from wood fibres, as opposed to veneers or particles, and is denser than plywood and particleboard. MDF is primarily used for internal use applications, in part due to its poor moisture resistance unless water resistant chemicals are added in processing.
Mensuration	The theory and technique of measuring standing trees and logs to determine yields and other parameters.
Merchantable volume	See 'Merchantable yield'.
Merchantable yield	The total quantity of 'Merchantable' wood (usually expressed as a volume and broken down to the various wood qualities present in the total) recovered (or expected to be recovered) from an area of trees at a given age. Also 'Merchantable volume'.
MGP	Machine graded pine, e.g. MGP10 where the number 10 refers to the minimum threshold for stiffness of 10 thousand megapascals. MGP12 a minimum stiffness of 12 thousand megapascals.
Natural areas	Areas of land with a predominant cover of indigenous vegetation, including natural forests as defined above, and also naturally occurring water bodies.
Natural forest	Areas of land which are predominantly covered in indigenous tree species that are naturally established, including managed forest areas where regeneration is supplemented by planting of indigenous species.
Net stocked area	The area of land currently occupied by the tree crop.
Outturn	The ratio or quantum of subject forest produce derived from a process.
Occlusion	The process in a tree stem whereby new healthy tissue grows over and covers stem wounds, branch stubs, etc. This process may also enclose small bark or resin pockets associated with the wound and known as the occlusion defect.
Peeler	A veneer log suitable for the production of veneers by rotary peeling in a lathe (see also 'Veneer Log').
Piece size	The size parameter(s) (volume or weight or dimensions) of a single log. Average Piece Size is a useful parameter to indicate

	the size and power of equipment used in harvesting, the costs of the harvesting, and the value of the assortment of logs.
Plantation forest	Areas of land predominantly covered in trees growing for cropping and managed for commercial purposes and excluding natural forests as defined here.
Plantlets	A plant produced by micropropogation.
Plywood	A flat panel made up of a number of thin sheets (‘Veneers’) of wood in which the direction of each layer ('Ply') is at right angles to the one under it. The sheets are joined under pressure by a bonding agent.
Predominant/Dominant Height (PH)	An **Australian** term for the mean height of largest diameter trees per hectare, commonly defined as the mean height of the largest 40, 50, 75 or 100 trees/ha. The definition of selection criteria may differ between forest enterprises but the various definitions generally provide close to compatible estimates of upper stand height. See predominant height (PDH).
Predominant Mean Height (PMH)	The mean height of tallest trees per hectare. Commonly defined as the mean height of the tallest 40, 50, 75 or 100 trees per hectare. In **Australia** the definition of selection criteria may differ between forest enterprises but the various definitions generally provide close to compatible estimates of upper stand height. In **New Zealand** the predominant tree is the tallest tree on an area of 0.01 ha and the mean is the mean height of at least 4 predominant trees. See Mean Dominant Height (MDH). Called predominant mean height (PMH) in New Zealand.
Prescription	The specification for the treatment of growing forest (e.g. silvicultural p., harvesting p.,) with particular reference to tree sizes (or ages where reflecting the attainment of a certain size), and treatments to be applied.
Probable Limits of Error (PLE) (Statistics)	A term which refers to the ‘Confidence Limits’ expressed as a percentage of the estimated mean. For example, a PLE of 10% at the 95% probability level implies that the true mean is likely to lie within 10% of the estimated mean 95 times out of 100.
Pruned height	The height above ground level of the lowest branch whorl remaining after the last pruning operation.
Pruned log	A large high quality log, containing a substantial proportion of clearwood, used primarily in the veneer and plywood industries and in the production of clearwood lumber for furniture and interior and exterior finishing uses.
Pruned log quality	In New Zealand, various measures of pruned log quality have been derived. The three most common are given here. Classification of variables and application should be sought from the New Zealand Forest Research Institute. 1. Grade Index (GI) = (DBH/Defect core) x conversion 2. Clearwood Index (CWI) = SED - Defect core

	3. Pruned Log Index (PLI) - an index based on measurable log parameters that reflects the potential for producing clear grades of timber from pruned sawlogs.
Pruning	The silvicultural practice of removing the lower branches of a tree by mechanical means (e.g. shears, saws) while the tree is still growing to eliminate or prevent the formation of knots and deformation of the grain in the wood subsequently grown. A strategy to grow clearwood.
Pruning intensity	$\frac{\text{Pruned Height x 100}}{\text{Mean Crop Height}}$
Pulp log	A low grade log used as fibre input for the production of woodchips for pulp and paper and reconstituted wood products.
Recoverable yield	The amount of wood, usually expressed as a volume of round logs of whatever length produced from a stand during the harvesting operation.
Regime	A complete programme of silvicultural operations covering the stand rotation, directed towards the creation of a specific mix of forest products.
Relative spacing index	An expression of the average distance between trees in a stand relative to crop tree height. Relative spacing is expressed as a percentage $RS(\%) = \frac{10{,}000}{MTH(m)\ X\ \sqrt{stocking\ (SPH)}}$
Roundwood	Wood in log form, more specifically used as a general term for posts and poles.
Rotation	The span of years in which a tree or stand grows from first planting at the forest site through to felling. Usually has an economic connotation in that a rotation is optimised to some set of economic criteria. A first rotation is referred to as R1, a second as R2 and so on.
Sawlog	A log used in the sawmilling industry to produce a range of sawn products or the export log industry, where this can cover a range of log qualities, each with their own refined form of coding.
SED	An acronym for `Small End Diameter'. Used in log measurement. Written SED. (See also LED).
Seedlings	Small trees grown from seed in a nursery (usually) for planting out at the forest site.
Selection ration	The ratio of the number of trees available for selection for an operation to the number of trees to be selected.
Silviculture	The practice of tending forest crops based on the knowledge of forestry; more particularly managing all aspects of the establishment, composition and growth of forests. (excludes harvesting and subsequent operations).

Site Index (SI)	A measure of the productivity of a forest site expressed in terms of the height growth attained by trees growing on it. In Australia and New Zealand, the parameter usually used is the 'Mean Top Height' of *Pinus radiata* at age 20. See also Site Quality (SQ).
Site Quality (SQ)	An **Australian** measure of the productivity of a forest site and the trees growing on that site commonly expressed in terms of volume per hectare at a particular age.
Skid site	An area of land in the forest, often specially prepared and surfaced, where logs or tree lengths extracted from the forest are accumulated and further processed by trimming, cutting to length ('bucking'), sorting marking and stacking and thereafter loaded on to trucks for removal. 'Skid' refers to the (now discontinued) practice of pushing or rolling logs up an inclined plane for loading onto trucks etc. Alternative terms are 'Landing' and 'Dump'.
Softwood	Usually refers to the wood from the botanical groupings including coniferous trees, gymnosperms, usually with needles or scalelike leaves such as pines, firs, spruces and other similar genera.
Solid wood	Wood (usually sawn, sliced or peeled) which is used in its natural form and not reconstituted by a pulping or chipping process.
Species	'Group of animals or plants subordinate in classification to Genus and having members that can interbreed and that differ only in minor details' (Concise Oxford Dictionary). E.g. *Pinus radiata* is the short specific name for a species fully named in accordance with the International Rules of Botanical Nomenclature *Pinus radiata* D. Don. (The underlining is optional).
Stand	In a **plantation forest** context, a block of trees (usually contiguous but not necessarily so) of the same age, species and silvicultural regime. A unit of forest area record, usually a subdivision of a 'compartment'. In a **natural forest context**, a block of trees (usually contiguous but not necessarily so) of the same silvicultural regime. A unit of forest area record, synonymous with a 'compartment'.
Stem	The major vertical structural member of a tree (i.e. trunk).
Stems per hectare (SPH)	The number of live trees existing on one hectare. Compounded uses of the term include 'Crop SPH', 'Pruned SPH', etc, all of which have obvious meanings. Commonly referred to as `Stocking'.
Stocking	See 'Stems Per Hectare'.
Stumpage	The value of the standing tree. Usually expressed as the value per cubic metre (or tonne) of the logs by quality in the tree. Generally derived from the sale value of the logs at a sale point (e.g. 'at mill', 'at wharf gate' or 'on skid') by deduction of all the costs incurred in getting the tree off the stump to that point of sale.

Sustainable Forest Management (SFM)	In **Australia**, SFM mostly applies to natural forests and entails the management of forests to maintain their full range of environmental, social and economic values[21]. Australia's Sustainable Forest Management Framework of Criteria and Indicators 2008 established the criteria and indicators against which SFM can be assessed, in this case for Australia's international reporting obligations. Various Forest Certification schemes also assesses sustainability criteria of natural and planted forests for reporting purposes. In the context of **New Zealand's** Resource Management Act (1991) sustainable management includes: Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social economic, and cultural wellbeing and for their health and safety while: a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.
Sustainable yield	The yield of merchantable forest produce that may be taken from a forest area whilst sustaining the long term productive capacity of the forest area. In practice 'Sustainable Yield' is also defined by reference to maintaining a minimum age of felling and/or meeting other minimum requirements over a period of time.
Sweep	A measure of the bend in a log calculated as the maximum distance of the centre of the log from a straight line joining the centre of the log at each end of the log. Sweep can be expressed as a proportion of the small end diameter of the log.
Symbol	A notation for a concept or measurement, usually by means of an initial letter acronym or condensation of the word and containing mathematical notation as appropriate. An inventory of standard forest terminology symbols has been prepared by the International Union of Forest Research Organisations (IUOFRO) 'The Standardisation of Symbols in Forest Mensuration' 1959. However, the standard does not appear to be much used in New Zealand. Abbreviations commonly used in **New Zealand** are given in parentheses after the defined word in this present Glossary. Standard mathematical, mensurational, system internationale and statistical notation is used in conjunction with these abbreviations. Major IUFRO Symbols are: c circumference or girth d diameter

[21] https://www.agriculture.gov.au/forestry/australias-forests/forest-mgnt

	f form factor g basal area at 1.3 m h height i increment k form quotient n number (of stems, years etc.) p increment per cent (volume, value, etc.) t age v volume. Capital letters should generally be reserved for one of two purposes: either to denote totals per unit area (e.g. V = volume per ha) or population totals in sampling schemes Example: The IUFRO term is N/ha whereas the usual symbol in **New Zealand** is SPH (Stems Per Hectare). Where these symbols are used they are identified by 'IUFRO' in the text of this Glossary. Symbols used in this glossary and otherwise unidentified are the 'NZ Set' and are summarised in Chapter E3. The Metric Systems Internationale symbol set is also commonly used in conjunction with the IUFRO and the **New Zealand** set.
Tending	A collective term for silvicultural operations that are directly applied to the growing tree e.g. aerial fertilisation and fire protection are not usually referred to as 'tending', whereas pruning and thinning are referred to as 'tending'.
Terrain	Similar to 'Topography' but also has connotations of the effect of the soil, water, rock and vegetation cover conditions on the ability to traverse the country.
Timber	Any wood reduced by sawing or other mechanical means to a square or rectangular section and (frequently) dried, planed or given treatment against insect, borer and fungal attack.
Thinning	The silvicultural practice of removing selected trees to promote the more rapid growth of the crop trees. May be 'to waste' where the thinned trees are left on the forest site or 'production' where the thinned trees are removed for use.
Thinnings	Logs produced by thinning. Usually of small size and with immature wood characteristics. Generally used as fibre input in the manufacture of pulp and paper and reconstituted wood products.
Topography	The vertical form of the land surface. Usually expressed by contours in mapping systems.
Tree stocks	The plant material used for planting, includes seedlings and plantlets.

Variable lift pruning	A ‘pruning’ technique where each tree is considered individually. The height to which each tree in the stand is pruned is determined by a chosen factor. Factors commonly in use include, a percentage of the tree height, a proportion of the crown to be left or the diameter at the base of the remaining crown. Variable lifts can also refer to pruning undertaken at different times on the same tree with each lift increasing the height of pruning.
Veneer	A thin sheet of wood produced from a short log (‘Billet’) by rotary peeling in a lathe or by slicing across the grain. Used in the production of Plywood and other laminated products.
Veneer log	A log, usually of large diameter and high quality, used for making veneer. Also called a ‘Peeler’ when used for rotary peeling.
Vocabulary	Words used in forestry are defined in many source works from general purpose dictionaries through to specialist vocabularies. An example of the latter, possibly the most comprehensive work in English, is ‘Terminology of Forest Science, Technology Practice and Products,’ Society of American Foresters 1971. Forestry is notable for many local word usages, jargon words and units of measurement, for example in ‘skid’, ‘landing’ and ‘dump’ are in common use and denote essentially the same thing.
Volume	‘Solid content, bulk, space occupied by gas or liquid, ...’ (Concise Oxford Dictionary). In forestry usually refers to the potentially useable wood content of the steam of a tree. Many ways of calculating and expressing the volume of a log or tree from its linear dimensions have been developed. Trees and logs have non regular shapes which differ between species, log position in the stem and age class. The measurement of log volume and its application to costs, values, weights and so on is a complex and specialised study. Also used in compound measures, (e.g. ‘Volume per Hectare’), aggregated measures (e.g. ‘Stand Volume’, ‘Forest Growing Stock Volume’), and qualified measures (e.g. ‘Merchantable Volume’). See ‘Cubic Metres’.
Whorl	A group of branches growing radially around the tree. A typical branching habit of ‘softwoods’, but not of ‘hardwoods’.
Wood chips	Wood in the form of small fragments, generated either in a whole log chip mill or as a by-product of the manufacture of lumber and plywood and used in the manufacture of pulp and paper and various composite panel products such as medium density fibreboard, particle board and hardboard.
Yield	The quantity of forest produce that is, or is expected to be, recovered from a unit area of land. Net yield generally means the same as ‘Merchantable Yield’.

CHAPTER E2 – GLOSSARY OF FORESTRY ECONOMIC TERMS

REVISION HISTORY

Original Standard	NZIF, released in May 1999.
Review by IFA Valuation Working Group, Sept 2020	Main revisions are: • edit for Australian content; and • minor updates.
Current Status	Released as draft.

CHAPTER E2 – GLOSSARY OF FORESTRY ECONOMIC TERMS

Term	Definition
APLPI	Australian Pine Log Price Index
Articulation	The way concepts, treatments and definitions relate to one another in a (supposedly) logical system. The objective of articulation in a system of valuation is to make parts of the subject of the valuation (e.g. the Forest) susceptible to the general propositions of mathematics and simple logic. (e.g. that the parts add up to the whole, the 'Real Return' when adjusted by the 'Rate of Inflation' equals the Gross Rate of Return). Lack of 'Articulation' is prima facie evidence that the valuation (etc.) is flawed. Because of the long time spans involved in forestry and the complexity of the data, lack of 'Articulation' that would be immaterial in (say) the valuation of a car would be material in the valuation of a large forest.
Beta (β)	A measure of the riskiness of an equity investment and used as a multiplier of the premium rate of return to capital (ie above the risk free rate) required in the overall industry or investment class for a particular equity investment. A generalised equation relating rates of return and beta is: $ER_i = R_f + \beta(R_m - R_f)$ where: ER_i = expected rate of return on asset i. R_f = the 'risk free' rate of return. ER_m = the rate of return expected in the industry or investment class (i.e. the market rate of return). $(Er_m - R_f)$ = market risk premium The Beta number is developed from the fluctuations over time in the value of the capital. A beta measure can apply to assets (i.e an investment in trees) or to equity (i.e. an investment in 50% leveraged company 'A', compared with investment in debt free company 'B' owning identical assets).
Capital (economic sense)	The wealth used in the forms of land, plant, equipment and labour with a view to producing a surplus.
Capital (accounting sense)	A quantum of wealth, measured in monetary terms and owned by an 'Investor', committed to an enterprise and which is at risk dependent on the success of the enterprise. The many categories of 'Capital' have different rights, obligations and risks attached to them.
Cashflow	The movement of cash resulting from transactions with parties external to the forest enterprise. 'Costs' may be regarded as negative cash flows and 'revenues' as positive cashflows. Note: Cashflows are generally 'transaction' based. Value increments (for example) in a forest are not cashflows. For the purpose of analysis cashflows are projected 'transactions' and may include flows which are not strictly 'transaction' based but are implied 'transactions' to fit all value effects into an 'enterprise' 'life' (e.g. land notionally 'bought' and 'sold' at the beginning and end of a 'rotation').
Consideration	In simple terms, the price paid for goods. Although 'consideration' may be other than money it is usually expressed as a quantum of money. 'Consideration' is always related to a transaction.

Cost	The price of a good as viewed from the purchaser's viewpoint.
Cost benefit analysis	An economic analysis technique which aims to evaluate a project in terms of all the relevant costs and benefits associated with it, including imputed social costs and benefits not otherwise recognised in the cash flows.
CPI	Consumer Price Index
CEV	Crop expectation value, being the expectation value of the tree crop. Also see TCEV.
Currency	The units and legal framework given to the money issued within a country.
Deflation	The periods between the assumed timing of the cash flow and the timing of the NPV. E.g. if calculating value at the beginning of a year with mid-period timing, the discount periods would be 0.5 for the first year and 1.5 for the second year.
Discount period	The point in time at which interest is deemed to be added in a compounding calculation or deducted in a discounting calculation.
Discount point	The annualised rate at which projected costs and revenues are deflated to reduce them to a 'Net Present Value'. This term is always used with reference to future projected events.
Discounted cash flow	Projected costs and revenues multiplied by the 'Discount Factor' at the given 'Discount Rate' appropriate to the future years.
Enterprise	The scope of the economic venture considered by the analysis. In the forestry sense the 'enterprise' may be the age class, or the stand, or the crop type or the forest or any other definable unit. In analysis the 'enterprise' is generally given a 'life'.
Equity	The residual interest in the assets of an entity after deduction of its liabilities.
Exchange rate	The ratio at which the currencies of two countries are exchanged at a particular time.
Exit price	The price that would be received to sell an asset or paid to transfer a liability.
Fair Value	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. Also see 'Market Value' and 'Value'.
Fixed costs	Costs which in the short run, do not vary in total with output or the level of activity. Therefore, in unit terms they vary inversely with output.
Highest and best use	The use of a non-financial asset by market participants that would maximise the value of the asset or the group of assets and liabilities (e.g. a business) within which the asset would be used.
Income	Net profit, i.e. what remains after expenses and taxes have been subtracted from revenue.
Inflation	A measure of the increase of price levels over time as measured by money — and hence, inversely, a measure of the decreasing purchasing power of unit money measures over time. Usually

	expressed as a percentage rate. Deflation is the same effect but with decreasing price levels and increased purchasing power.
Interest rate	The proportion of a capital sum (usually expressed as a percentage) charged by the lender (actually or notionally) to the borrower for the use of that capital sum over a unit time (usually a year). There are many (mathematically related) ways of expressing this rate, viz 'In Arrears', 'Real', 'In Advance', etc.
Internal rate of return (IRR)	The 'Discount Rate' at which the 'Investment' and the 'Future Returns' equate in a 'Net Present Value' calculation. There are as many varieties of 'IRR' as there are of the type of cash flow input into the model. See in this context 'Real', 'Tax', and 'Interest Rate'.
Investment	The initial capital sum and (generally) any future sums laid out as 'Capital'.
Land Expectation Value (LEV)	The 'price' that can be imputed to land so that all the positive and negative 'cash flows' (including the 'price' imputed to the land) associated with the forestry 'enterprise' when discounted at the required rate % indicate a zero 'enterprise' capital value. In common language, the maximum that can be paid for land to achieve a given rate of project return.
Life	The span of time in which an economic 'enterprise' starts and concludes. In forestry the life is often defined by reference to tree age.
Market	A series of 'transactions' in goods or services of a similar nature carried out by individuals assumed to have a reasonable knowledge of the nature of the goods and services traded, the past history of 'prices' and a reasonable appreciation of the factors influencing 'prices'.
Market value	Market value is the amount for which the defined good or service should exchange • on the date of the valuation; • between a willing buyer and a willing seller; • in an arm's length transaction; • after proper marketing; and • wherein the parties had each acted knowledgeably, prudently and without compulsion. (after NZIV Practice Standard 3) 'Market price' and 'Market cost' are the same measure. 'Market Values' may be applied (with appropriate adjustments) to a good not yet the subject of a transaction to give a market-based valuation. Also see 'Value' and 'Fair Value'.
Money	A measure of wealth having universal acceptance in (typically) one country.
Net Present Value (NPV)	The sum of all the 'Discounted Cash Flows' appropriate to the item measured. The NPV of a project is a measure of the project's contribution to wealth. In this context the word 'present' means the beginning of first time period of the calculation, not necessarily the date at which the calculation is performed.

Opportunity Cost	The Opportunity Cost of a decision is the value of the next best alternative which has to be given up because of that decision.
Price	The quantum of money (or money's worth expressed in current money terms) used as the consideration in an economic transaction. 'Price' always has a connotation of occurrence at a defined point in time.
Price point	A geographic point where a commercial transaction is assumed to take place. Differs from 'Point of Sale' in that in fact no transactions as described may actually take place at the Price Point. The Price Point is a convenient point to which costs and prices may be adjusted to bring all transactions in an area on to a common basis.
Profit	The return due to the owner(s) of invested capital through the operation of an enterprise. 'Profit' may be viewed as a return to the owners of the 'Capital' for their entrepreneurial ability which appears as a cost to the purchaser of the enterprise's products.
Rational	A rational outcome, action or conclusion is based on the rules and processes of reason. Rationality, being based on culturally, personally or organisationally held postulates, precepts and perceptions of facts, will produce different outcomes for different entities from the same situation. In the economic arena Market participants may therefore consider the actions of other participants irrational. A Market outcome of price, market, volume etc. is, by extension, reckoned to result from the 'average' postulates, precepts and perceptions held by the participants in the market rationally assembled. It is generally held that a Market will tend to impose a common rationality on participants in the medium to long term. Economic rationality is generally considered able to be represented by mathematical constructs, but this does not imply that market participants will always proceed from a pre-existing rational model.
Real	With reference to 'cash flows' and calculated 'Net Present Values' refers to a calculation and a result in which future (or past) inflation or deflation has been excluded from the included money quanta and interest rates. Hence 'Real Interest Rate', 'Real Value', 'Value in 2020 dollars'. The underlying postulate is that value concepts can only be comprehended by reference to the present prices of goods and services and value impacts of present interest rates.
Revenue	The total amount of income generated by the sale of goods or services.
Risk	The likelihood of occurrence of an event adverse to the 'enterprise'. Usually expressed as a percentage of the 'capital' of the 'enterprise' exposed to future adverse events. May be categorised by the type of risk , viz 'Inflation Risk', 'Capital Loss Risk', 'Industry Risk' etc. Risk is connected to both 'Interest Rate' and 'Profit'.
Social cost	Costs which may not feature in financial accounts in the short term, e.g. costs of air and water pollution, but which are real costs to society as a whole.
Tax	Any contribution levied on a person (including a corporate person) by law for the support of national, state or local government. In the context of forestry analysis local government taxes ('Rates') and 'ad valorem' national government taxes ('GST', 'Land Tax', 'Stamp Duty',

	'Filing Fees', 'Excise Duties') are generally internalised into cost and the expression 'Pre-Tax' is taken to mean (with respect to a cash flow) 'before the impost of Income Tax and the benefit of any associated tax deductions or write offs on the forest owning entity'.
TCEV	Terminating crop expectation value, being the terminal expectation value of the tree crop, typically computed at the end of a modelling period. Also see CEV.
Transaction	A transfer of goods and/or services from a seller to a buyer in return for 'consideration' transferred to the seller from the buyer. A 'transaction' is the best evidence of value in that two separate individuals are agreeing at a definable point of time with respect to definable goods/services and a specific and universal measure of value. At the point of the 'transaction', 'price' and 'buyer's cost' and 'value' are an equal quantum of wealth.
Valuation event	Expected occurrence relevant to a valuation process and its associated cashflows. Includes: land purchase, establishment operations, tending operations, other operations, harvesting operations and the associated costs of those operations. Recognition of overheads. Payment of interest, dividends and taxation. Receipt and return of capital and borrowings.
Value	The quantum of moneys worth placed on a defined good or service by an individual or market at a particular time. Two individuals may legitimately hold that the same good or service has a different value at the same time. A 'transaction' in the subject good or service can only take place in a free 'market' if each prospective party separately holds that their personally held value for the good or service is either, below the transaction value (in the case of the seller) or, above it (in the case of the buyer). Value is always subjective and largely immeasurable until a completed transaction places a 'price' or 'exchange value' on the good or service in that instance. It follows that each party to a transaction will receive a surplus of personal value from the transaction. The subcategories of personally held value (e.g. need, sentimental, ecological, aesthetic, compensation, spiritual, cultural, time preference, loss minimisation) are extensive. Articulate analysis of the personal value components plus the personal surplus back to price is rarely possible. (See 'Market Value' and 'Fair Value').

CHAPTER E3 – GLOSSARY OF SYMBOLS COMMONMY USED IN FORESTRY

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Current Status	Released as draft.

CHAPTER E3 – GLOSSARY OF SYMBOLS COMMONLY USED IN FORESTRY

Symbol	Definition
1R	Current rotation
2R	Second or next rotation
2R+	All future rotations
CAI	Current Annual Increment
DBH	Diameter at Breast Height Over Bark (1.3 m above ground in Australia, 1.4 m in New Zealand)
DOB	Diameter Over Bark
DOS	Diameter Over Stubs (diameter of stem at point of pruning)
GIS	Geographic Information System
HBU	Highest and Best Use
LED	Large End Diameter
MAI	Mean Annual Increment
MCH	Mean Crop Height
MDH	Mean Dominant Height
MTDBH	Mean Top DBH
MTH	Mean Top Height
NPA	Net Productive Area
NSA	Net Stocked Area
PLE	Probable Limits of Error
PMB	Predominant Mean Height
SED	Small End Diameter
- SEDUB	SED under bark (also SEDIB – SED inside bark)
- SEDOB	SED over bark
SI	Site Index
SQ	Site Quality
SPH	Stems Per Hectare
TRV	Total Recoverable Volume
TSV	Total Standing Volume