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An Assessment of the Implementation of Fair Value Accounting in the Australian Agricultural Sector

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A thesis in fulfilment of the requirement for the Degree of Doctor of Philosophy

Department of Accounting and Corporate Governance

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DECLARATION

I certify that the work in this thesis entitled "An Assessment of the Implementation of Fair Value Accounting in the Australian Agricultural Sector" has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

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ABSTRACT

This purpose of this thesis is to provide an empirical assessment of the implementation of IAS 41, *Agriculture*, in the agricultural sector in Australia, in the context of long-standing concerns over the use of fair value accounting for biological assets. Three areas of concern are examined in three papers: first, whether fair value accounting adopted under IAS 41 provides decision-useful information; second, whether the discretion provided in IAS 41 leads to opportunistic behaviour by management; and third, whether executive compensation contracts and corporate governance attributes are effective to constrain opportunistic behaviour.

IAS 41 requires biological assets to be measured at fair value so that the transformation of biological assets through growth is presented in the financial statements in a timely manner, and thus provides information to investors for decision-making. The first paper of this thesis (in Chapter Two) evaluates the decision-usefulness of the information provided under fair value accounting in the Australian agricultural sector by examining the forecasting power of fair value of biological assets for future operating cash flows. The results find that fair value of biological assets contains limited useful information about future operating cash flows. Market-determined prices are not superior to managerial estimates in relation to providing useful information for decision-making.

The fair value measurements prescribed in the standard require considerable use of management discretion. Thus, one of the main concerns about the use of fair value accounting for biological assets is the reliability of the information. The second paper of this thesis (in Chapter Three) examines whether managers use the discretion provided

in IAS 41 opportunistically. The results indicate that managers in the Australian agricultural sector have used the discretion allowed in IAS 41 to manage their earnings in a manner consistent with meeting or beating target earnings. This problem mainly exists when managerial estimates are applied. The results also show that firms use a wide range of discount rates to achieve their various desired goals.

The inclusion of unrealised agriculture gains in the income statement as part of reported earnings raises the question about whether executive compensation contracts and corporate governance are effective in monitoring the reliability of fair value information. The third paper of this thesis (in Chapter Four) examines the pay-sensitivity of executive compensation to agriculture gains as well as the role of corporate governance in monitoring the opportunistic behaviour allowed by the discretion provided in IAS 41. The findings show that executive bonus is not related to unrealised agriculture gains, consistent with boards of directors reviewing the earnings and rewarding executives for realised earnings only. The results also show that unrealised gains are smaller and less associated with pre-agriculture earnings when female directors are present on the board, suggesting that a gender-diverse board is more able to monitor the reliability of fair value information.

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List of Abbreviations

AASB	Australia Accounting Standards Board
ASX	Australian Securities Exchange
CAMAC	Corporations and Markets Advisory Committee
CEO	Chief Executive Officer
CLERP	Corporate Law Economic Reform Program
DSOP	Draft Statement of Principles
ED	Exposure Draft
FADN	Farm Accountancy Database Network
FASB	Financial Accounting Standards Board
FRC	Financial Reporting Council
GFC	Global Financial Crisis
GICS	Global Industry Classification Standard
GMM	Generalised Method of Moments
GOV	Governance Composite Index
IASB	International Accounting Standards Board
IAS	International Accounting Standards
IASC	International Accounting Standards Committee
IFRS	International Financial Reporting Standards
MAPE	Mean Absolute Percentage Error
OLS	Ordinary Least Squares
PGCG	Principles of Good Corporate Governance and Best Practice Recommendations
PWC	PricewaterhourseCoopers
RBA	Reserve Bank of Australia
SGARA	Self-generating and Regenerating assets
UK	United Kingdom
US	United States of America

Chapter 1

Overview of the Thesis

1.1 INTRODUCTION

> *The IASB is aware that fair value measurement can involve a high degree of subjectivity when there is no active market … However, despite a high degree of measurement uncertainty, in some situations fair value may still be the only measurement basis that can provide faithful representation. (IASB, 2015, p.5)*

In the proposed new *Conceptual Framework for Financial Reporting*, the International Accounting Standards Board (IASB) categorises measurement bases as historical cost and current value. Current value measurement bases include fair value and value in use for assets and fulfilment value for liabilities. Historical cost uses information from the transaction while fair value reflects the perspective of market participants. These measurement bases are in stark contrast to each other.

Advocates of historical cost accounting believe it is objective and relatively reliable. They are concerned about the volatility of fair value resulting from changes in market prices, and whether fair value can be measured reliably, especially for those assets and liabilities for which active markets do not exist (Landsman, 2007; Allen & Ramanna, 2013; Ramanna, 2013). However, from its supporters' perspective, fair value accounting is the only way to provide the most meaningful picture of the financial position and performance of an entity (IASB, 2015).

Considering the hot debate on the choice between the two accounting measurements, the Chair of the IASB, Hans Hoogervorst, made the statement quoted at the head of this chapter in his speech at the IASB conference in June 2015 (IASB, 2015). This statement confirms the IASB's view on fair value accounting and is used to justify the increased use of fair value accounting in the International Financial Reporting Standards (IFRS).

As of 2016, fair value accounting is included in 18 of the IFRS and has been applied widely to both financial and non-financial assets.[1] One of these standards is International Accounting Standards (IAS) 41, *Agriculture*, which requires a biological asset to be measured at fair value. Any changes in fair value resulting from holding biological assets are reported in the income statement as gains or losses. When an active market exists for a biological asset, the quoted price in that market is the appropriate basis for determining the fair value of that asset. If an active market does not exist, an entity can use the most recent market transaction price or market prices for similar assets in determining fair value. When market-determined prices are not available, IAS 41 requires the entity to calculate the fair value using the present value of expected net cash flows. In cases where fair value cannot be determined reliably, historical cost is permitted.

Consistent with its general view on fair value accounting, the IASB believes that the value of biological assets is best reflected by fair value measurement, in which the reality of biological transformation can be faithfully represented in a timely manner

[1] Fair value accounting is used in International Accounting Standard (IAS) 16, IAS 17, IAS 18, IAS 19 IAS 20, IAS26, IAS 28, IAS 36, IAS 38, IAS 39, IAS 40, IAS 41, IFRS 1, IFRS 2, IFRS 3, IFRS 4, IFRS 7, and IFRS 13.

(IASC, 1998; IASB, 2012). With the implementation of fair value accounting in the agricultural sector, the IASB expected that more relevant information about the future prospects and performance of an entity engaged in agricultural activity can be provided. As a result, investors have the possibility of estimating the future economic benefits (Elad, 2004; Lefter & Roman, 2007; Elad & Herbohn, 2011; Fischer & Marsh 2013; Goncalves & Lopes, 2014; Stonciuviene et al., 2015). However, the implementation of IAS 41 is highly controversial, not only because it is the most radical change to Agriculture accounting, but also because of its practical difficulty, the discretion involved in determining fair value, and the recognition of unrealised gains or losses from holding a biological asset (Elad, 2004; Herbohn, 2006; Herbohn & Herbohn, 2006; Elad & Herbohn, 2011; Fischer & Marsh, 2013; Marsh & Fischer, 2013; Goncalves & Lopes, 2014; Stonciuviene et al., 2015).

The IASB's support for fair value accounting together with the controversy over IAS 41 motivates an in-depth and comprehensive empirical assessment of the implementation of IAS 41 in the agricultural sector. This thesis aims to provide an original evaluation of the decision-usefulness and reliability problems surrounding fair value accounting in the agricultural sector, and exposes original evidence of opportunistic behaviour. Considering that fair value accounting is applied in various corporate environments, this thesis also broadens the discussion of fair value accounting to executive compensation and corporate governance in the agricultural sector.

This thesis uses an Australian context because Australia led the way with the development of a standard for agricultural activities. Australia released its own

accounting standard, Australian Accounting Standards Board (AASB) 1037, *Self-Generating and Regenerating Assets* (SGARA), in 1998. This was the first accounting standard for biological assets in the world. More importantly, the requirements of AASB 1037 are highly similar to those of IAS 41. The reporting experience under AASB 1037 from within Australia provided important guidance and direction for the development of the subsequent international accounting standard for biological assets, IAS 41. Further, unlike European legislation which requires IFRS to be applied in the consolidated statements of listed companies only, all reporting entities (i.e. both private and public, both for profit and non-for-profit) in Australia under the Corporations Act 2001 are required to comply with IFRS from the date they commence to apply in Australia.[2] This means that Australia provides a unique setting for studying the application of fair value across a broad range of agricultural businesses for a long period (Elad & Herbohn, 2011).

The findings of this thesis will potentially benefit accounting standard-setters, researchers and practitioners by providing a comprehensive assessment of the use of fair value accounting in the Australian agricultural sector. In particular, the findings provide empirical evidence to answer three research questions: (1) whether fair value information, as expected by the IASB, is useful in helping investors to estimate future economic benefits in the agricultural sector?; (2) whether the discretion provided in IAS 41, about which its opponents are concerned, has potential to impact adversely the

[2] A reporting entity is identified in Australia by reference to the existence of users who are dependent on general purpose financial reports for information for making and evaluating resource allocation decisions (Statement of Accounting Concepts 1, Sec. 12).

reliability of fair value information?; (3) does the board of directors play an effective role in monitoring the reliability of accounting information reported under IAS 41?

The remainder of this chapter is organised as follows. Section 1.2 sets the background of this thesis. Section 1.3 outlines the research objectives and provides a brief summary of the three papers incorporated in this thesis. The contributions made by this thesis are outlined in Section 1.4. The organisation of the thesis is provided in Section 1.5.

1.2 BACKGROUND

1.2.1 The development of IAS 41

In its Draft Statement of Principles (DSOP) and an Exposure Draft (E65) on accounting in the agricultural sector published in the late 1990s, the International Accounting Standards Committee (IASC) broke fresh ground by proposing fair value accounting for agricultural activities (IASC, 1996; 1999; Elad, 2004, Elad, 2007; Elad & Herbohn, 2011). Despite the strong opposition from many agribusinesses, accounting practitioners, and the major professional accountancy bodies around the world, the IASC issued the final standard on agriculture (IAS 41) in 2001 with an effective date of 1 January 2003 (IASC, 1996; 1998; 2000; IASB, 2012; FRC, 2013; IASB, 2013).[3]

[3] The IASC was replaced by the IASB in 2001. The standards issued by the IASC are known as International Accounting Standards (IAS), whereas the standards formulated by the IASB are referred to as International Financial Reporting Standards (IFRS).

Under IAS 41, agricultural activity is defined as "the management by an entity of the biological transformation of biological assets for sale, into agricultural produce, or into additional biological assets" (IAS 41, sec. 5). IAS 41 prescribes that biological assets be measured at fair value less costs to sell, and changes in fair value less costs to sell of biological assets are to be recognised in the income statement for the period in which they occur, irrespective of whether or not the biological assets are harvested and sold (IAS 41, secs. 12, 26). If active markets exist, the quoted price from active markets is the appropriate basis for determining the fair value of biological assets (IAS 41, sec. 17). Otherwise, the most recent market transaction price or market prices for similar assets can be used (IAS 41, sec. 18). In cases where market-determined prices are not available, the present value of expected net cash flows from the asset discounted at a current market-determined rate is used to determine the fair value of biological assets (IAS 41, secs. 20, 21, 23). There is a rebuttable presumption that fair value can be measured reliably. The presumption can be rebutted on initial recognition for a biological asset for which market-determined price is not available, and an alternative estimate is clearly unreliable. In such a case, that biological asset shall be measured at its cost less any accumulated depreciation and any accumulated impairment losses (IAS 41, secs. 30, 31).

The introduction of IAS 41 has been controversial. One contentious aspect of IAS 41 relates to the practical difficulty with valuing biological assets for which active markets do not exist (Herbohn, 2006; Elad, 2004; Herbohn & Herbohn, 2006; Ferguson & Leech, 2007; Elad & Herbohn, 2011). In these cases, using fair value may be excessively costly particularly in developing countries (Elad, 2004). By reviewing the implementation of IAS 41 in the UK, France and Australia, Elad and Herbohn (2011) find that the

perceived costs of measuring biological assets at fair value outweigh the perceived benefits. They also find that all three countries use a variety of valuation methods under IAS 41 and thus there is a corresponding lack of comparability of disclosure practices. For example, a majority of agricultural businesses in France rebutted the presumption that fair value can be determined with reliability and continue to use historical cost to measure biological assets, while managerial estimates are commonly used by agricultural businesses in the UK and Australia.[4]

Another noteworthy criticism relates to contrasts between the idealised notion of fair value and the diluted version of the standard (Elad & Herbohn, 2011). IAS 41 requires biological assets to be measured at fair value. However, in cases where quoted market prices for identical items are not available, IAS 41 recommends the use of alternatives, for example, market price for similar assets, sector benchmarks, and the present value of expected net cash flows from the asset. The wide range of alternatives means that, in practice, fair value accounting in the agricultural sector may involve considerable management discretion, which may undermine the reliability of fair value information reported under IAS 41 (IASC, 1996; 1998; 2000; Elad, 2004; 2007; Herbohn & Herbohn, 2006; Elad & Herbohn, 2011; Fischer & Marsh, 2013; Marsh & Fischer, 2013).

A further criticism of the standard relates to the recognition of unrealised gains or losses from holding a biological asset. Proponents argue that the inclusion of unrealised gains

[4] Part of the reasons that agribusinesses in Australia do not rebut the presumption is that the presumption can only be rebutted upon initial recognition of a biological asset. Thus, agribusinesses in Australia that have already applied AASB 1037 to existing biological assets at their date of transition to IFRS have not been able to avail themselves of this provision of IAS 41.

or losses in the income statement is similar to the 'percentage-of-completion' revenue recognition for long-term construction contracts, and that this reflects the effects of management's stewardship of the biological assets over the period (Elad, 2004, Herbohn & Herbohn, 2006). However, critics maintain that there is too much uncertainty regarding the ultimate realisation of the revenue. The recognition of gains or losses that are not realised for several years increases the volatility of reported earnings, and provides misleading financial information which may lead to unrealistic expectations of distributable profits among shareholders (Elad, 2004; Herbohn, 2006; Herbohn & Herbohn, 2006; Elad & Herbohn, 2011). Hitz (2007) also criticises the lack of a concept of fair value income from the IASB despite the growing use of fair value accounting. Rayman (2007), therefore, urges standard-setters to provide justification for reporting change in fair value as 'gains' or 'losses' and stresses the need for an alternative conceptual framework. The survey conducted by Elad and Herbohn (2011) also reveals that there is strong agreement among accountants and auditors that the fair value accounting model prescribed by IAS 41 increases the volatility of reported earnings.

The concerns discussed above largely reflect the perceptions of accounting practitioners, researchers, and the major accountancy bodies around the world. However, empirical evidence is limited, partly due to the unavailability of empirical data in the early stage of implementation. Considering that agriculture is an important sector of the global economy, and IAS 41 has been implemented for more than a decade, it is an opportune time to assess its implementation empirically and thus provide deeper practical guidance to help with future development of the standard.

1.2.2 Accounting standards for biological assets in Australia

In Australia, various accounting practices were adopted to account for biological assets prior to 1998. By reviewing the accounting practices used by Australian agribusinesses for livestock and forestry operations up until 1990, Roberts et al. (1995) find that different valuation practices were used by agribusinesses in Australia. The diversity in accounting practices in the agricultural sector resulted in a lack of comparability of financial results between firms which held biological assets (Elad & Herbohn, 2011). To address the issue, AASB 1037 was released in 1998 and became operative for reporting periods beginning on or after 30 June 2001. It was the first accounting standard in the world to introduce fair value accounting to the agricultural sector.

AASB 1037 applied to non-human living assets that are held primarily for profit. The standard prescribes SGARAs to be measured at net market value from active markets (AASB 1037, sec. 5.2). Increments (decrements) in the net market values of SGARAs are recognised as revenues (expenses) in the profit and loss statement in the financial year in which the increments (decrements) occur (AASB 1037, sec. 5.4). Where there is no active and liquid market for a SGARA, the best indicator of net market value must be used to measure the SGARA (AASB 1037, sec. 5.3). These indicators include the most recent net market value of the same or similar assets, the net market value of related assets, and the net present value of cash flows which are expected to be generated by the SGARAs discounted at a current market-determined rate which reflects the risks associated with the assets, or cost where little biological change has taken place since the costs were incurred.

Reaction to the introduction of AASB 1037 was not positive with concerns being raised about the income statement effect of recognising unrealised gains or losses, and the valuation of SGARAs. For example, Dowling and Godfrey (2001) document the SGARA measurement methods that were disclosed in a cross-section of Australian firms' 1999 annual reports. They find that most firms did not measure SGARAs at market value. Rather, a range of measurement methods were used. Booth and Walker (2003) find that after the adoption of AASB 1037, reported earnings increased substantially in firms in the wine-making industry. Considerable subjectivity was involved in determining net market values for grape vines for which there is no active market. Herbohn (2006) reviews financial statements of 34 listed agribusinesses in Australia that were required to comply with AASB 1037. Over the four-year window since first compliance with the standard, the study finds that there has been significant volatility in the reported revenues from SGARAs, and that a range of valuation methods were used to determine net market value of SGARAs.

In July 2002, the Financial Reporting Council (FRC) in Australia announced its support for the adoption of IFRS in Australia on or after 1 January 2005. As a result, AASB 1037 was replaced by AASB 141, the Australian equivalent of IAS 41.[5] IAS 41 is consistent with its predecessor AASB 1037 in most respects. However, IAS 41 is stricter and narrower than AASB 1037 in relation to the scope of the standard shall be applied to, and the fair value measurement of biological assets. For example, AASB 1037 refers to 'SGARA' which is a non-human living asset regardless of the length of the production cycle, or how it was created. IAS 41 refers to "biological assets in

[5] For consistency, IAS 41 is used throughout the thesis.

agricultural activities" which are only living animals or plants involved in agricultural activities. As a result, some biological assets such as horses held for racing, non-human living assets other than animals and plants such as viruses, and blood cells were outside the scope of AASB 141 (Milne, 2004). Moreover, the previous standard specified measurement at net market value[6] while the new standard specifies measurement at fair value less estimated costs to sell (AASB 1037, sec.5.2; IAS 41, sec. 12). Unlike AASB 1037 which operated under the presumption that fair value is always reliably measurable, IAS 41 allows the presumption to be rebutted on the initial recognition of a biological asset. Specifically, if market-determined prices are not available and managerial estimates are clearly unreliable, the biological asset is allowed to be measured at cost (IAS 41, sec. 24).

The development of accounting standards for biological assets provides an accounting context for this thesis, and gives rise to the research questions examined in this thesis. Research objectives are elaborated upon in Section 1.3.

1.3 AIMS AND OBJECTIVES

In Chapters 2, 3, and 4, this thesis presents three self-contained research papers that empirically assess the implementation of IAS 41 in the Australian agricultural sector. Using data collected from all agricultural businesses that were listed on the Australian

[6] Net market value is the amount that could be expected from the disposal of the SGARA in the ordinary course of business. Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction.

Securities Exchange (ASX) in the period from 2001 to 2012, the following research objectives are addressed:

- To evaluate the decision-usefulness of fair value information reported under IAS 41 (Chapter 2);
- To investigate the reliability issue surrounding fair value accounting in the agricultural sector (Chapter 3);
- To examine executive pay-sensitivity to unrealised fair value gains or losses on biological assets, and the role of corporate governance in monitoring the reliability of accounting information reported under IAS 41 (Chapter 4).

Details for each paper are elaborated in the following subsections.

Paper 1 (Chapter 2): The decision-usefulness of fair value for future operating cash flows: Evidence from the Australian agricultural sector

The IASB expected that the use of fair value accounting in the agricultural sector would help investors with the estimation of future economic benefits. To see if the IASB's expectation embedded in IAS 41 is met, this paper focuses on the decision-usefulness perspective of fair value accounting by examining the forecasting power of fair value of biological assets for future operating cash flows. In particular, this paper addresses the following research questions:

1) What is the decision-usefulness of fair value for forecasting future operating cash flows in the Australian agricultural sector?

2) What is the effect of managerial estimates embedded in fair value information on the decision-usefulness of financial information when active markets are not available?

Financial data are obtained from DatAnalysis Premium or collected manually from annual reports of agricultural businesses that were listed on the ASX in the period from 2001 to 2012. The final sample includes 254 firm-year observations, representing 46 unique agribusinesses. Both in-sample and out-of-sample tests are adopted to examine the forecasting power of fair value of biological assets for future operating cash flows.

Paper 1 (Chapter 2) addresses the first objective of this thesis by providing empirical evidence of whether fair value of biological assets is able to provide investors with useful information about future operating cash flows. This is the first study known to the author which evaluates the decision-usefulness of fair value of biological assets from a cash flow prediction perspective. The findings of this study are important to accounting standard-setters, researchers and practitioners because they challenge the underlying belief that guides the development of IAS 41. Further, various views are provided in the literature concerning the forecasting power of market-determined prices versus estimated value. The findings of this paper show that fair value measurements do not make a difference in relation to the forecasting power of fair value information.

A manuscript based on this paper was co-authored with the PhD supervisors. The contribution made by the PhD candidate, in terms of percentage, was 80% for this chapter. The manuscript is currently under review with the *British Accounting Review*.

In revising this paper, comments from reviewers have been considered and included where appropriate.

Paper 2 (Chapter 3): Investigating the reliability of fair value information: Evidence from the Australian Agricultural Sector

Paper 2 (Chapter 3) focuses on the key issue surrounding the implementation of IAS 41 in the agricultural sector, that is, whether fair value of biological assets can be measured reliably, especially in cases where a high degree of management discretion is involved. Opponents of fair value accounting are concerned that managers might use the discretion provided in IAS 41 to strategically influence their reporting of fair value gains or losses resulting from holding biological assets. As a result, the reliability of fair value information is impaired. To examine whether the discretion provided in IAS 41 invites opportunistic behaviour, this paper examines two specific situations in which managers' incentives to use discretion to influence reported agriculture fair value gains or losses are relatively strong. Further, reported fair value gains or losses are more likely to be influenced by managers when active markets are not available and thus managerial estimates are relied on to measure fair value of biological assets. In this case, discount rates are the key for determining the fair value of biological asset. Therefore, this paper also investigates whether managers opportunistically select discount rates to achieve desired reported fair value gains or losses.

Financial data are obtained from DatAnalysis Premium or collected manually from annual reports of agricultural businesses that were listed on the ASX in the period from 2001 to 2011. The final sample includes 46 agribusinesses and 277 firm-year

observations. Both Ordinary Least Squares (OLS) regressions and quantile regressions are used to investigate the reliability of fair value information reported in IAS 41.

This paper addresses the second objective of this thesis by providing empirical evidence of whether management discretion adversely affects fair value reliability. The findings of this paper are important because they empirically highlight the concern of opportunistic behaviour engagement. Despite the fact that fair value measurement can involve a high degree of management discretion, the IASB believes that fair value may be the only measurement basis that can provide faithful representation (IASB, 2012; 2015). The findings of this paper challenge the IASB's belief by showing that opportunistic behaviour does exist in the Australian agricultural sector when management discretion is involved, and thus the reliability of fair value information is impaired.

A manuscript based on this paper was co-authored with the PhD supervisors. The contribution made by the PhD candidate, in terms of percentage, was 80% for this chapter. An earlier version of this paper was presented at:

- European Accounting Association Annual Congress in Paris, France, 2013
- Accounting and Finance Association of Australia and New Zealand Annual Congress in Auckland, New Zealand, 2014

In revising this paper, comments from participants at these conferences have been considered and included where appropriate.

Paper 3 (Chapter 4): Fair value accounting and gains from biological assets: Executive pay-sensitivity and the role of corporate governance

IAS 41 requires entities to include fair value gains or losses on biological assets in the income statement as part of reported earnings. This requirement raises a question about whether unrealised gains or losses on biological assets are treated as regular income along with other realised earnings components in executive compensation contracts. Moreover, given the discretion allowed in IAS 41, it is important to find effective mechanisms through which opportunistic behaviour can be effectively restrained. Paper 3 (Chapter 4) examines the pay-sensitivity of executive compensation to fair value gains or losses on biological assets, and the role of corporate governance in monitoring the abuse of the discretion allowed in IAS 41.

Financial data are obtained from DatAnalysis Premium or collected manually from annual reports of agricultural businesses that were listed on the ASX in the period from 2001 to 2011. The final sample includes 46 agribusinesses and 261 firm-year observations. The OLS regressions are estimated to test the hypotheses developed in this paper.

By addressing its last objective, this thesis extends the literature by applying executive pay-sensitivity and corporate governance to fair value accounting in the agricultural sector. The findings show that unrealised gains or losses on biological assets are not related to executive pay, providing some confidence to shareholders who largely rely on executives to manage the operation of a business. They also indicate to boards of directors that some corporate governance mechanisms add little to the monitoring of

opportunistic behaviour by management in response to the discretion provided in IAS 41.

The contribution made by the PhD candidate for this paper was 100%. An earlier version of this paper was presented at:

- Asian-Pacific Conference on International Accounting Issues in Taiwan, 2014

In revising this paper, comments from participants at these conferences have been considered and included where appropriate.

1.4 CONTRIBUTIONS OF THE THESIS

Motivated by the different views on the use of fair value accounting in the agricultural sector, this thesis empirically assesses the implementation of IAS 41 in the Australian agricultural sector in the period from 2001 to 2012. This thesis contributes to the accounting literature, particularly in the area of agricultural accounting. In spite of the important role agriculture plays in the global economy, accounting in agriculture has traditionally attracted little attention from researchers. As a result, research in agriculture accounting is minimal. This thesis enriches the literature by providing an analysis of the problems and challenges in applying fair value accounting in the Australian agricultural sector.

First, it evaluates the ideal view of the IASB on fair value accounting by examining whether fair value of biological assets can provide useful information to estimate future economic benefits (in this case, future operating cash flows). Further, the thesis

considers the concerns raised by opponents by examining the reliability of fair value information in the agricultural sector. In the first two phases of the assessment, the findings do not support the IASB's contention that fair value accounting will increase the decision-usefulness of accounting information. Further, it can be argued that the reliability of fair value accounting information is problematic. Therefore, in the last phase of the assessment, this thesis breaks new ground by linking reliability to other issues, such as the pay-sensitivity of executive remuneration and corporate governance, in order to find a way to monitor the reliability of fair value information. By understanding the issues and problems, standard-setters are better positioned to further develop the standard.

An additional contribution of this thesis is the specific focus on Australia. Prior research has focused on the implementation of IAS 41 in European countries. Considering the global trend towards convergence of IFRS, feedback and experience from jurisdictions other than Europe is required for a balanced approach to future standard development. This thesis extends the existing literature and shows standard-setters, researchers and practitioners empirical evidence on the implementation of fair value accounting across listed agricultural businesses for a long period by focusing on Australia where fair value accounting was first implemented in the agricultural sector,

Finally, this thesis also adds to the accounting literature on fair value accounting. While international accounting standards have incorporated extensive use of fair value accounting for both financial and non-financial assets, the effects of the application of fair value accounting on non-financial assets have not been studied extensively. Many

studies have demonstrated the usefulness of fair value accounting for financial instruments (Barth et al., 1995; Hodder et al., 2006; Bratten et al., 2012).[7] Yet, whether fair value accounting plays the same effective role in measuring non-financial assets reliably, in particular, biological assets, is largely unknown. This thesis fills the gap in the fair value accounting literature by providing a comprehensive evaluation of the usefulness of fair value for biological assets.

1.5 ORGANISATION OF THE THESIS

The thesis is organised into five chapters. Chapters 2 to 4 comprise the three self-contained papers. The relevant tables and figures for each paper are provided at the end of the respective chapters. Chapter 5 is the concluding chapter which summarises the findings of each paper and draws appropriate conclusions and implications. The limitations and suggestions for future research are also discussed in Chapter 5.

[7] However, some argue that fair value accounting is the primary cause of the global financial crisis (Pozen, 2009).

Chapter 2

(Paper One)

The Decision-usefulness of Fair Value for Future Operating Cash Flows: Evidence from the Australian Agricultural Sector

ABSTRACT

Although IAS 41 has used fair value accounting to measure biological assets for more than a decade, there has been no previous examination in the literature about whether it provides useful information for decision-making. Using data in the Australian agricultural sector, this paper investigates whether fair value of biological assets measured under IAS 41 is able to provide information about future operating cash flows. Using both in-sample and out-of-sample forecasting tests, I find that fair value of biological assets does not provide incremental forecasting power for future operating cash flows using either managerially estimated value or market-determined prices. The findings of this study challenge the view of the standard-setters that measuring biological assets at fair value provides useful information for decision-making.

Key words: fair value accounting, decision-usefulness, future operating cash flows, agricultural sector

2.1 INTRODUCTION

The International Accounting Standards Board (IASB) issued International Accounting Standard (IAS) 41, *Agriculture*, prescribing that biological assets be measured at fair value, with the change in fair value being recognised in the income statement. When fair value from an active market is not available, managerial estimation of fair value is allowed. The shift from traditional historical cost accounting to fair value accounting in the agricultural sector has been driven by the view that the value of biological assets is best reflected by fair value measurement, in which the reality of biological transformation can be faithfully represented (Elad, 2004; Lefter & Roman, 2007; Elad & Herbohn, 2011; Fischer & Marsh 2013). Using an Australian context, this study investigates the decision-usefulness of fair value accounting in the agricultural sector by examining the forecasting power of fair value of biological assets for future operating cash flows.[8]

The main motivation for this study comes from the controversy about the usefulness of fair value accounting in the agricultural sector. There has been strong opposition to the measurement of biological assets at fair value within Australia and globally. The main concerns are the recognition of unrealised gains or losses from changes in fair value, the availability of active markets, the costs of adopting fair value accounting, and the reliability of managerial estimation of fair value (IASC, 1998; 2000; IASB, 2012; Elad, 2004; Herbohn & Herbohn, 2006; Jack, 2006; Hitz, 2007; Rayman, 2007; Whittington,

[8] Other aspects of decision-usefulness include value relevance, cash flow timing and variability, and possible liquidation values of assets. This study examines only the aspect of forecasting power for future operating cash flows.

2008; Sedlacek, 2010; Cairns et al., 2011; Bohusova et al., 2012; Fischer & Marsh, 2013; Marsh & Fischer, 2013; Rozentale & Ore, 2013; Stonciuviene et al., 2015).

To further understand the issues and practical problems associated with the implementation of IAS 41, Elad and Herbohn (2011) conduct a survey and analyse annual reports in the UK, France and Australia after the implementation of the standard. They find that agribusinesses in all three countries are using a variety of valuation methods under IAS 41. Survey respondents generally stated that the costs of measuring and reporting biological assets at fair value outweigh the benefits. They conclude that the IASB needs to revisit IAS 41, not only because it has failed to change accounting practices in the agricultural sector, but also because it creates an illusion of comparability (Elad & Herbohn, 2011). Cairns et al. (2011) reach a similar conclusion, namely, that the mandatory use of fair value measurement under IAS 41 has had limited impact on the comparability of financial statements within and between countries.

The debate has also extended to the measurement of bearer plants.[9] In January 2014, the IASB published amendments to IAS 16, *Property, Plant and Equipment,* and IAS 41. The amendments change the financial reporting for bearer plants to bring them within the scope of IAS 16 instead of IAS 41, based on the view that the operation of bearer plants is similar to that of manufacturing. This is because once a bearer plant is mature, apart from bearing produce, its biological transformation is no longer significant in generating future economic benefits (IASB, 2014). Instead of supporting

[9] Bearer plants are used in the production or supply of agricultural produce, are expected to bear produce for more than one period, and are not intended to be sold as a living plant or harvested as agricultural produce (IASB, 2014). Examples of bearer plants include grape vines, rubber trees and oil palms.

the amendments, the Financial Reporting Council (FRC) in the UK has advocated a comprehensive revision of IAS 41 (FRC, 2013).

This study focuses on the decision-usefulness perspective of fair value accounting. According to the IASB's *Conceptual Framework for Financial Reporting*, financial information is decision-useful if it can help investors assess the amounts, timing, and uncertainty of an entity's future cash flows (Para. 1.3, ED May, IASB, 2015).[10] Some studies suggest that fair value captures information about future cash flows because it reflects up-to-date market conditions (Barth, 2006; Danbolt & Rees, 2008). Other studies show that fair value can be distorted by market inefficiency, and its forecasting power can be impaired by market volatility (Barth & Landsman, 1995; Hodder et al., 2006; Hitz, 2007). Moreover, different measurement attributes may generate different levels of useful information for decision-making. This study applies these broader findings on fair value to the specific setting of agricultural accounting by examining the impact of fair value measurement attributes on the decision-usefulness of fair value in the agricultural sector. The study addresses the following research questions:

(1) What is the decision-usefulness of fair value for forecasting future operating cash flows in the agricultural sector?

(2) What is the effect of managerial estimates embedded in fair value information on the decision-usefulness of financial information when active markets are not available?

[10] On May 2015, the IASB published for public comment an Exposure Draft proposing a revised *Conceptual Framework for Financial Reporting*. At the time of writing this paper, comments on the Exposure Draft were still under consideration by the IASB.

Australia is selected for examination because Australia was the first jurisdiction to use fair value accounting in an agricultural sector. From its own accounting standard, Australian Accounting Standard Board (AASB) 1037, *Self-generating and Regenerating Assets* (SGARA), which was implemented in 2001, to IAS 41, fair value accounting has been used in the Australian agricultural sector for more than fifteen years. Unlike the European legislation that requires International Financial Reporting Standards (IFRS) to be applied in the consolidated statements of listed companies only, all Australian reporting entities under the Corporations Act 2001 are required to comply with IFRS. Thus, Australia provides a sound setting for studying the application of fair value across a broad range of agricultural businesses over a long period.

Using all agricultural businesses listed on the Australian Securities Exchange (ASX) in the period from 2001 to 2012, I find that fair value of biological assets reported under IAS 41 does not provide incremental forecasting power for future operating cash flows. This result holds across all measurement attributes. The findings are consistent with the argument that fair value accounting only suits assets that are traded in highly liquid markets (Barth & Landsman, 1995; Hodder et al., 2006; Hitz, 2007). When the markets are inherently uncertain, it is too difficult for management to predict, or for the current market price to reflect, the realisation of future operating cash flows (Barth & Landsman, 1995; Lev et al., 2010). Overall, the findings of the study challenge the view of the standard-setters that measuring biological assets at fair value provides useful information for decision-making.

This study contributes to the fair value accounting literature by providing evidence on the implementation of fair value accounting in the agricultural sector from a cash flow prediction perspective. The findings of the study demonstrate the limited ability of fair value to forecast future operating cash flows in that sector. More importantly, the study provides empirical support for calls by FRC in 2013 and Elad and Herbohn in 2011 for the IASB to revisit the implementation of fair value accounting in the agricultural sector.

Further, the results reported in this study provide evidence on the implementation of IAS 41 in a jurisdiction outside Europe. The extant literature is dominated by European studies. For example, Argiles and Slof (2001) conclude that the European Farm Accountancy Database Network (FADN) offers an excellent tool for operationalising IAS 41 in European farms. Argiles et al. (2012) conclude that agricultural enterprises encounter more problems applying the cost method than the fair value method. In contrast, Elad (2004) argues that some key provisions of IAS 41 are incompatible with the European Union Fourth Directive. Cairns et al. (2011) find that fair value measurement is hardly applied in the UK. Given the fact that more than 120 countries have adopted IFRS globally, feedback and experience from countries outside Europe contribute to a balanced approach in future standard development (PWC, 2015).

This study also contributes to the literature on choice of measurement attributes by providing evidence on whether measurement attributes affect forecasting power of fair value of biological assets. A survey conducted by Gassen and Schwedler (2008) finds that investors are concerned about the decision-usefulness of management's estimates of fair value. Hitz (2007) support these concerns and concludes that the validity of the

fair value paradigm appears particularly problematic for managerial-based estimation. This study, to some extent, shows support for these concerns by providing evidence that management's estimates of fair value of biological assets does not provide useful information for decision-making.

The remainder of this paper is organised as follows. Section 2.2 reviews the related literature and section 2.3 explains research design. Section 2.4 describes the sample selection and the data, and is followed by a discussion of the results in section 2.5. Section 2.6 presents the robustness tests and section 2.7 concludes the study.

2.2 RELATED LITERATURE

2.2.1 Debate on IAS 41

The shift to fair value accounting has been driven by the presumed decision-relevance of market-based measures. Both the IASB and Financial Accounting Standards Board (FASB) stress the capacity of market value to incorporate the market's consensus expectation about future cash flows in an efficient and virtually unbiased manner (IASB, 2006; 2007). Advocates suggest that fair value accounting faithfully represents the reality of biological transformation and thus can enhance the stewardship function of providing relevant information to stakeholders (Barlev & Haddad, 2003). In the European context, Argiles et al. (2012) indicate that agricultural enterprises encounter fewer problems applying fair value accounting than historical cost accounting. Argiles and Slof (2001) also argue that IAS 41 simplifies asset valuation processes and thus could be the key element in improving the use of accounting in European farms.

Opponents to fair value accounting such as Hitz (2007) and Bohusova et al. (2012) argue that theoretical reasoning does not unequivocally support the conceptual foundations of the fair value paradigm articulated by the IASB. Elad (2004) questions the claimed success of the widespread adoption of IAS 41 by arguing that the standard represents the most radical departure from historical cost accounting to date, and this departure provokes a broad range of theoretical and practical problems. Herbohn and Herbohn (2006) and Whittington (2008) express concerns about the subjectivity of managerial estimates.

The inclusion of the change in fair value of biological assets in the income statement has also attracted criticism (IASC, 1998; 2000; Herbohn & Herbohn, 2006; Sedlacek, 2010; Elad & Herbohn, 2011, Bohusova et al., 2012; Marsh & Fischer, 2013; Stonciuviene et al., 2015). Change in fair value is supposed to reflect the progressive results of management's ongoing stewardship of biological assets over the period. However, the realisation of this change is uncertain, especially for biological assets with a long growing and production cycle, such as forests and grape vines (Herbohn & Herbohn, 2006; Marsh & Fischer, 2013). There is broad agreement among all groups surveyed by Elad and Herbohn (2011) that agriculture is not an appropriate type of business for the early recognition of profit.

A further concern expressed by Hitz (2007) is that "no concept of fair value income is developed, despite the growing use of fair value measurements" (Hitz, 2007, p.325). Rayman (2007), therefore, urges standard-setters to provide a justification for reporting change in fair value as 'gains' or 'losses' and stresses the need for an alternative

conceptual framework.[11]

Although comparability is one of the four qualitative characteristics in the IASB's *Conceptual Framework for Financial Reporting*, accountants and auditors in agribusinesses agree that IAS 41 has failed to enhance the international comparability of accounting practices in the agricultural sector. This lack of comparability is due to the variety of measures for fair value that are used both within and across countries (Cairns et al., 2011; Elad & Herbohn, 2011, Marsh & Fischer, 2013; Stonciuviene et al., 2015). These views are consistent with the argument provided in Georgiou and Jack (2011) that the embedding and legitimising of fair value accounting principles have resulted in pragmatic acceptance of mixed measurement in financial accounting. Mixed measurement in financial statements in fact destroys rather than improves comparability.

2.2.2 The forecasting power of fair value of biological assets

Financial reporting has always aimed to provide investors with the ability to predict the future, for example by including current economic conditions and up-to-date expectations of future cash flows in current financial statements (Barth, 2006). The literature provides two opposing views concerning the forecasting power of the market-determined price versus managerial estimated value.

[11] IASB issued IFRS 13, *Fair Value Measurement*, in May 2011. The standard provides a single IFRS framework for measuring fair value and requires disclosures about fair value measurement. However, the concept of fair value income has not been discussed by the IASB in the standard.

There are several reasons for not expecting market-determined prices to be useful for this purpose. Citing behavioural finance theory, advocates of managerially estimated value emphasise that irrational market behaviour will reduce the informational quality of market value (Shleifer, 2000). The fair value paradigm only holds for specific assets that are traded on organised, highly liquid markets, which does not describe most non-financial assets (Hitz, 2007). From an information perspective, market-determined prices, by definition, include information publicly available in the marketplace. The disclosure of (already) publicly available information creates no incremental information content (Hitz, 2007). Managerially estimated value, in contrast, is capable of capturing management's knowledge of the current operating environment, and their current decisions and plans, signalling to investors their expectations of future cash flows (Barth, 2006). It is argued that management is in the best position to judge the amount, timing, and risk of future cash flows (Ronen, 2008). While managerially estimated value is more discretionary than market-determined prices, management is also more accountable for the disclosure of measurements that reflect their expectations. Ryan (2008) concludes that the goal of fair value accounting is to enable firms to estimate, as accurately as possible, the value of assets they currently hold in order to assist investors in forecasting future cash flows.

In response, proponents of market-determined prices argue that managerially estimated value cannot represent the aggregation of expectations for future cash flows found in the marketplace because it rests on the information set of one person or one organisation (Hitz, 2007). Consistent with this argument, Lev et al. (2010) find that managerial estimates embedded in accruals do not contribute to the forecasting of future operating cash flows.

Additionally, the existence of two types of measurement error in estimated value also impairs management's ability to explain and forecast future operating cash flows. The first type is non-systematic error arising from general uncertainty about the economic environment due to fast-changing market conditions (i.e. deregulation, privatisation, emerging economies) and rapid technological changes (Barth & Landsman, 1995; Lev et al., 2010). It is difficult, even if management acts honestly, for firms to make reliable and accurate projections of future business events in an uncertain economic environment. Unintended bias in the preferred direction may be present in management estimates (Wilks, 2002), perhaps as a result of overconfidence based on the amount of evidence they use in developing their estimates (Davies et al., 1994; Martin et al., 2006).

The second type of measurement error is systematic error arising from the deliberate exercise of discretion by management in determining the estimates. An extensive literature on discretionary accruals suggests that managers do manipulate earnings (Schipper, 1989; Jones, 1991; Dechow & Sweeney, 1995; Healy & Wahlen, 1999; Dechow & Dichev, 2002; Kothari et al., 2005; Stubben, 2010; Dechow et al., 2012, Dichev et al., 2016).[12] Agency theory also predicts that opportunistic management will manipulate financial reports using available discretionary choices (Fama & Jensen, 1983; Beasley, 1996; Jiraporn et al., 2008; Beaudoin et al., 2015; Chi et al., 2015; Leoni & Florio, 2015).[13]

[12] However, Ball (2013) criticises the belief that the discretionary accruals are managed and argues that it is the most incorrect belief in accounting.

[13] Jensen and Meckling (1976) argue that the principals are aware of managerial incentives. The costs of agency relationships end up with the agents. However, there is extensive literature on earnings management documenting that agents have strong incentives to report positive earnings, sustain recent performance, and meet analysts' expectations in order to build credibility in the capital market and maintain the external reputation of the management team (Burgstahler & Dichev, 1997; Degeorge et al., 1999, Jacob & Jorgensen, 2007).

2.3 RESEARCH DESIGN

This study uses both in-sample and out-of-sample forecasting methods to test the predictive ability of fair value of biological assets for future operating cash flows. The in-sample regressions conducted in the first part of the test assume parameter estimates are stable through time. However, time variation of parameter estimates is a critical issue in forecasting (Poon & Granger, 2003). Kim and Kross (2005) also note that results found in in-sample regressions do not necessarily imply good forecasting power because a model can 'overfit' the data. To address these issues, out-of-sample regressions are also generated in this study.

2.3.1. In-sample forecasting test

This study examines the forecasting power of change in fair value of biological assets for future operating cash flows up to three-years-ahead (Dechow et al., 1998; Barth et al., 2001). The examination of forecasting power is limited to three-years-ahead because it is expected that fair value can only explain future operating cash flows over a short time frame. Although change in fair value reflects biological transformation, the ultimate cash flow realisation of change in fair value of biological assets is not guaranteed due to fast-changing market conditions. Therefore, today's fair value is less likely to reflect cash flow realisations in the distant future. The longer the forecasting horizon, the lower the probability that significant forecasting power can be found.

Following Dechow et al. (1998) and Barth et al. (2001), I begin with the relation between current earnings and future cash flows, where current earnings are disaggregated into total accruals and cash flows. It is expressed in Eq. (1) as follows:

$$CF_{it+\tau} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \varepsilon_{it} \quad (1)$$

where subscripts i and t denote firm and year respectively; subscript i ranges from 1-3. CF_{it} is the cash flows from operating activities of firm i in year t. $TACC_{it}$ is total accruals, obtained from deducting operating cash flows from the after-tax operating income before extraordinary items of firm i in year t, and ε_{it} is the mean zero disturbance term.

Total accruals itself consists of a number of components. The items that have been examined most frequently in the literature are changes in receivables, changes in payables, changes in inventory, depreciation expenses, amortisation expenses and other accruals (Dechow, 1994; Dechow et al., 1998; Barth et al., 2001; Kim & Kross, 2005; Subramanyam & Venkatachalam, 2007; Lev et al., 2010; Barth et al., 2015; Kothari et al., 2015). An additional accrual component emerges for firms that use fair value for biological assets, that is, changes in fair value of biological assets. To test the incremental power of change in fair value of biological assets to forecast future operating cash flows, I modify Eq. (1) by including change in fair value of biological assets, one of the components of total accruals, into the equation. The new equation is shown in Eq. (2).

$$CF_{it+\tau} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \varepsilon_{it} \quad (2)$$

where ΔFV_{it} is unrealised change in fair value of biological assets of firm i between year$_t$ and year$_{t-1}$.

Equation (2) is the main equation used in this study for testing the incremental forecasting power of change in fair value of biological assets for future operating cash flows. *ΔFV* is not removed from *TACC* in Eq. (2). This is because the paper intends to test the INCREMENTAL power of *ΔFV* to forecast future operating cash flows. To serve this purpose, instead of decomposing *TACC* in Eq. (1) into *TDACC* and *ΔFV*, Eq. (1) is modified by including *ΔFV* into the equation. So the incremental power of *ΔFV* can be observed and tested separately from the total power of TACC for forecasting future operating cash flows.

Ordinary Least Squares (OLS) regressions are used in the in-sample forecasting test. Coefficient α_3 will be positively and significantly different from zero if change in fair value contains additional information useful for predicting future operating cash flows. Consistent with the extant literature, I also expect both current operating cash flows (CF_{it}) and total accruals ($TACC_{it}$) to have forecasting power for future operating cash flows (Dechow et al., 1998; Barth et al., 2001).

To assess the difference in incremental forecasting power between market-determined prices and managerially estimated value, I modify Eq. (2) to include an indicator variable for fair value measurement attributes, and its interaction variable with change in fair value, as shown in Eq. (3).

$$CF_{it+\tau} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 MEASUREMENT_{it} + \alpha_5 (MEASUREMENT_{it} \times \Delta FV_{it}) + \varepsilon_{it} \quad (3)$$

where $MEASUREMENT_{it}$ is an indicator of fair value measurement attributes of firm *i* in year *t*. Market-determined prices (i.e. unadjusted/adjusted market price) is '0' while managerially estimated value (i.e. net present value of future cash flows) is '1'. ($MEASUREMENT_{it}$ x ΔFV_{it}) is the interaction variable between measurement attributes and change in fair value of biological assets. Coefficient α_3 indicates the incremental forecasting power of fair value of biological assets when fair value is determined by markets. The sum of α_3 and α_5 indicates the incremental forecasting power of fair value when it is managerially estimated.

2.3.2. Out-of-sample forecasting test

Out-of-sample regressions are also generated in this study to compare the forecasting accuracy between Eq. (1) and Eq. (2). Equation (1) is the benchmark equation with a restriction of coefficient equivalency imposed on the accruals components, while Eq. (2) isolates the effect of change in fair value from total accruals. If change in fair value of biological assets contains incremental forecasting power over aggregated accruals for future operating cash flows, Eq. (2) should exhibit higher forecasting accuracy than Eq. (1).

Consistent with Kim and Kross (2005), the out-of-sample forecast test is produced in two steps. First, I use five prior years' data to estimate one-year-ahead operating cash flows. For example, using the alternative equations, I use data in the period from 2001 to 2005 to calculate parameter estimates in the equations. Second, I use these parameter estimates for the respective independent variables in 2006 to predict operating cash

flows in 2007. Mean Absolute Percentage Error (MAPE) is used to compare the forecasting accuracy of the two equations (Krishan & Largay III, 2000; Arthur et al., 2010). MAPE is calculated for each equation by taking the mean of the absolute differences between cash flow estimated by the equation and the actual realised cash flow for the corresponding period. Lower MAPE represents better forecasting accuracy.

2.4 SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

The examination period of this study covers financial years 2001 to 2012.[14] AASB 1037 was applied in Australia until it was replaced by AASB 141, an Australian equivalent of IAS 41, on 1 January 2005.[15] The initial sample comprises all ASX listed firms that held biological assets in the period from 2001 to 2012. It includes 46 listed agribusinesses and 362 firm-year observations.

Due to the change from AASB 1037 to AASB 141 after 1 January 2005, I only include observations that fall in the definition of biological assets in both standards, which reduces the sample of firms to 352 firm-year observations.[16] Further reductions in the size of the sample result from requirements for complete information regarding fair value measurement of biological assets, non-zero change in fair value of biological

[14] The data collection of this study was completed in early 2014 when financial results for year 2014 had not been released. Thus, the data were collected up to year 2012 to predict one-year-ahead operating cash flows (i.e. year 2013).
[15] AASB 1037 was developed and became operative in Australia for reporting periods beginning on or after 30 June 2001. It was the first standard in the world to apply fair value accounting to the agricultural sector. AASB 141 is highly consistent with its predecessor AASB 1037 in most respects. Detailed discussion is provided in Chapter 1 of the thesis.
[16] For instance, blood cells or viruses for medical experiments or living animals for racing are treated as biological assets under AASB 1037 but not under AASB 141. These observations are eliminated from the sample.

assets[17], and use of historical cost.[18] The final sample includes 254 firm-year observations drawn from three industries and five sub-industries. Financial data were either obtained from the DatAnalysis Premium or hand-collected. Consistent with the literature, all financial data retain their original sign and are deflated by average assets (Barth et al., 2001; Kim & Kross, 2005).

Approximately two-thirds of the firm-year observations use one of the forms of managerially estimated fair value, such as net present value, value recommended by independent appraisers, and value determined by directors. This statistic is in line with the findings reported in Elad and Herbohn (2011). The variety of valuation methods adopted by firms demonstrates the range of proxies for fair value available under the standard and underlines concerns about comparability arising from such differences. Details for sample selection are presented in Table 2.1.

[Insert Table 2.1 here]

Table 2.2 presents descriptive statistics for the variables used in the regressions. Because there are some extreme values, the winsorisation technique (covering the top 1% of values to the 99th-percentile and the bottom 1% to the 1st-percentile) is employed to ensure that these do not bias the results of this study.[19] As shown, both *CF* and *TACC* have a positive mean. The mean of earnings (*EARN*) is the algebraic sum of the means

[17] There are eight observations reporting zero change in fair value of biological assets. These observations are removed from the sample to remove additional noise from the statistical analysis.
[18] IAS 41 allows an entity to rebut the presumption that fair value can be determined for all agricultural assets on initial recognition. Historical cost is permitted in cases where fair value cannot be determined reliably.
[19] The results are largely consistent when I (i) delete these observations or (ii) do not employ winsorisation.

of *CF* and *TACC* (Sloan, 1996; Barth et al., 2001; Kim & Kross, 2005). The positive mean for *EARN* indicates that, on average, the sample firms report profits in the period examined. In addition, the relatively smaller mean of 0.016 compared with the standard deviation (0.134) shows that there is substantial variation in *EARN* across firms and over time.

The mean of *ΔFV* is positive (Laswad & Baskerville, 2007), which reveals that, on average, sample firms in the period of the study report increases in the fair value of biological assets. The standard deviations show that *ΔFV* is relatively less volatile than other earnings components. *CF* is less volatile than *EARN* (Sloan, 1996; Barth et al., 2001). The Pearson and Spearman correlations between variables presented in Panel B, Table 2.2, also show that *EARN* is positively correlated with *CF*, *TACC*, and *ΔFV* while *CF* is negatively correlated with *TACC* and *ΔFV*.

[Insert Table 2.2 here]

2.5 RESULTS AND DISCUSSION

2.5.1. In-sample forecasting test

Table 2.3 reports the results of pooled OLS regressions estimating Eq. (2). The coefficient for *ΔFV* is negative but insignificant across all the three regressions which indicates that, as one of the components of total accruals, fair value of biological assets does not provide incremental forecasting power for future operating cash flows. In contrast and consistent with the literature, current operating cash flows show strong positive associations with operating cash flows more than one-year-ahead. Total

accruals also contain information about future operating cash flows, but the forecasting power reduces over time. Standard errors are clustered by firm only.[20]

[Insert Table 2.3 here]

I next investigate whether incremental forecasting power is affected by the use of different fair value measurement attributes. In accordance with IAS 41, measurement attributes are categorised into market-determined prices and managerially estimated value. Market-determined prices include both unadjusted and adjusted market price while managerially estimated value includes fair value determined by management with underlying assumptions. The results presented in Table 2.4 show that the coefficient is -0.032 when fair value of biological assets is determined by markets while the coefficient is -0.014 (i.e. -0.032 + 0.018) when fair value is managerially estimated. However, none of these coefficients is statistically significant. These results indicate that there is no incremental forecasting power contained in fair value of biological assets for future operating cash flows regardless of the use of different measurement attributes.[21]

[Insert Table 2.4 here]

In conclusion, the in-sample forecasting test shows that fair value of biological assets does not provide useful information about future operating cash flows. Fair value measurement attributes play a limited role in determining the forecasting power of fair

[20] When there are only a few clusters in time, clustering by the more frequent cluster (i.e. firm) yields results that are almost identical to clustering by both firm and time (Pertersen, 2009).
[21] I also ran the interaction regression for two-years-ahead and three-years-ahead cash flows. Consistent with the initial findings, none of the interaction terms is statistically significant.

value of biological assets. The insignificant results for market-determined fair value support the view that the fair value paradigm only holds for certain assets that are traded on organised, highly liquid markets (Hitz, 2007; Bohusova et al., 2012; Marsh & Fischer, 2013; Stonciuviene et al., 2015). Biological assets, like most non-financial assets, do not fall into this category.

Further, many expect that management signals private information through fair value estimates in order to reduce information asymmetry between outsiders and insiders (Dye, 2001; Healy & Palepu, 2001; Verrecchia, 2001; Stonciuviene et al., 2015). However, I find that managerially estimated value does not have forecasting power for future operating cash flows, which is the same as fair value determined by active markets. There are three possible explanations for this insignificant result. First, fair value estimates, at least for the period examined in this study, are not a tool used by management to deliver private information to investors. Second, consistent with the notion of non-systematic error, management has limited ability to project future operating cash flows due to general uncertainty about the economic environment (Barth & Landsman, 1995; Lev et al., 2010). Third, fair value estimated by individuals does not represent the aggregation of expectation about future operating cash flows found in the marketplace because individual estimates rest on information available to one person or one organisation (Hitz, 2007; Lev et al., 2010).

2.5.2. Out-of-sample forecasting test

Out-of-sample forecasts are estimated using Eq. (1) and Eq. (2) across all firms in both the full sample and a reduced 'survivor' sample. The full sample consists of all 254 firm-year observations over the period from 2001 to 2012 while the survivor sample only includes 203 firm-year observations that have complete data for at least five of the sample years. I estimate out-of-sample forecasts using previous five years' data to forecast one-year-ahead cash flows. Detail procedures of the out-of-sample forecasting test are provided in the research design section in Section 2.3.2. [22]

Table 2.5 shows the MAPEs for both the full and survivor pooled samples. It is found that Eq. (2) yields similar MAPEs as Eq. (1) in most of the prediction years. A t-test is also undertaken to see if MAPEs generated in Eq. (1) are statistically different from MAPEs in Eq. (2). The results presented in Table 2.5 show that for the year 2007, the MAPE in Eq. (1) is statistically lower than the MAPE in Eq. (2) for both the full and survivor pooled samples. For the other six years, both Eq. (1) and Eq. (2) generate similar level of MAPEs.[23] These results are consistent with the in-sample forecasting test revealing that fair value of biological assets does not provide incremental forecasting power for future operating cash flows.

[Insert Table 2.5 here]

[22] For the main analysis, it is not necessary for a firm to have six years of continuous data to be included in the full sample. A smaller survivor sample of firms that do have at least six continuous years of data is also constructed and used. For each equation, one cross-sectional regression is estimated for each year. Thus, the same co-efficients apply to all firms in a given year.

[23] One previous year's data is also used to conduct out-of-sample forecasts. These coefficients for the out-of-sample forecasts are not stable and consistent over the period due to the small sample size in each year.

I also divide the sample into a 'mark-to-market group' (market-determined prices) and a 'mark-to-model group' (managerially estimated value) to compare the forecasting accuracy of Eq. (1) and Eq. (2) for the full sample and survivor sample. The *t*-tests presented in Table 2.6 show that the MAPEs generated in Eq. (2) are not significantly lower than the MAPEs generated in Eq. (1) for all seven years. Thus, Eq. (2) is not superior to Eq. (1) in forecasting power in either a 'mark-to-market group' or a 'mark-to-model group'. The results imply that fair value of biological assets does not contain incremental forecasting power, regardless of the measurement attributes applied. They fail to refute the criticisms of managerial estimates made in the literature that they do not represent the aggregate of expectations dispersed in the marketplace (Hitz, 2007; Lev et al., 2010). The results also support the view that disclosure of publicly available information creates no incremental information content.

[Insert Table 2.6 here]

2.6 ROBUSTNESS TESTS

Barth et al. (2001) find that, compared with thirteen other sectors, the agricultural sector has the longest operating cash cycle because of the long growing time of biological assets. This raises a concern that the main equation of this study, Eq. (2), may only be valid for agribusinesses with a short operating cycle because the model is developed and applied to firms across all industries with shorter operating cycles on average. When biological assets (i.e. forest products) have a harvest date beyond three years and so will not be converted into cash within that period, the forecasting power of fair value of biological assets will not be captured in Eq. (2).

To demonstrate the validity of the results, I expand the measurement of the independent variable, a one-year change in fair value at year *t* (ΔFV_t), to be an aggregated change in lagged fair value over three years (i.e. sum of $\Delta FV_{t-2} + \Delta FV_{t-1} + \Delta FV_t$). Because the dependent variable is cash flow measured over the following one, two and three years, this robustness test can be used to examine the forecasting power of fair value for cash flows up to six-years-ahead.

The results are presented in Table 2.7. Consistent with the main findings, current operating cash flows show strong positive associations with future operating cash flows while the forecasting power of total accruals reduces progressively. In contrast and consistent with the main results, aggregated three-year change in lagged fair value does not provide incremental forecasting power for future operating cash flows. The results suggest that the main findings do not appear to be dominated by firms with a short operating cycle.

[Insert Table 2.7 here]

I also examine the incremental forecasting power of fair value for a change in operating cash flows one-year-ahead (i.e. ΔCF_{t+1}). The results are presented in Table 2.8. I find that the higher the operating cash flows in the current year, the lower the changes in operating cash flows one-year-ahead. Total accruals also present strong association with the change in operating cash flows one-year-ahead. In contrast, fair value of biological assets provides no forecasting power for change in future operating cash flows

regardless of the use of different measurement attributes. Overall, the robustness tests confirm the results found in the main tests.[24]

[Insert Table 2.8 here]

2.7 CONCLUSION AND LIMITATIONS

This study investigates the decision-usefulness of fair value accounting in the agricultural sector by examining the forecasting power of fair value for future operating cash flows. Using all agribusinesses listed in Australia in the period from 2001 to 2012, both the in-sample and out-of-sample forecasting tests indicate that fair value of biological assets does not contain incremental forecasting power for future operating cash flows. More importantly, the forecasting power is not affected by fair value measurement attributes.

The small sample size of this study may affect the statistical inferences drawn from the results. Future research can extend the sample size by replicating the analysis across multiple jurisdictions. Some might also argue that the tests used in this study for decision-usefulness (i.e. testing forecasting power) are not applicable for some agricultural assets. This argument may reduce the applicability of the results.

[24] The author also notices that, in the main results, the mean of ΔFV is 3.5 times of the median of ΔFV, indicating the possible existence of outliners after winsorisation. The author has looked at the dataset thoroughly and reran the regressions after further deleting observations with extreme ΔFV values. However, the results are qualitatively similar.

However, the findings in this paper have important implications for researchers, standard-setters and investors, thus shedding light on future research. First, the findings reveal the limited ability of fair value accounting in forecasting future operating cash flows, providing contrary evidence to the view of the standard-setters that measuring biological assets at fair value provides relevant and useful information for decision-making. Future research can explore the value relevance aspect of fair value to add to the understanding of the decision-usefulness of fair value in the agricultural sector.

Second, the two main fair value measurement attributes allowed in IAS 41, market-determined prices versus managerially estimated value, have given rise to different views about the superiority of one over the other in reflecting the value of biological assets. Yet the findings of this study imply that neither of them is better than the other in terms of providing useful information for decision-making. Further, although many expect that management signals private information to investors through fair value estimates, this kind of evidence is not found in the current study. Future studies may investigate the reasons why management does not consider fair value estimates as a useful tool for signalling information.

Finally, it is worthwhile noting that agribusinesses provide incomplete disclosures relating to the measurement of biological assets. For example, some entities only disclose the fair value recommended by independent appraisers without detailing the procedures adopted and the assumptions applied in determining that value, which suggests that investors may not receive relevant information that could guide their investment decisions. This underscores concerns raised in the literature that increased

comparability from global convergence of financial reporting is not being achieved (Ball, 2006; Nobes, 2006; Tsalavoutas et al., 2012). Future studies may compare the difference in comparability of financial information when firms use fair value accounting versus historical cost accounting using the quantitative methods suggested in Taplin (2011) and Barth et al. (2012).

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Table 2.1
Sample overview

Panel A: Sample collection

Procedure	Obs.
Observations having biological assets from 2001 to 2012	362
After excluding observations that hold blood cells or viruses	357
After excluding observations with missing one-year-ahead operating cash flows	309
After excluding observations with missing value of variables and zero fair value change	261
After excluding observations using historical cost	254

Panel B: Observation distribution over years

Year	Obs.	Year	Obs.
2001	30	2008	17
2002	30	2009	14
2003	29	2010	14
2004	28	2011	11
2005	26	2012	9
2006	24		
2007	22	Total	254

Panel C: Industry distribution by firm-year observation

Industry	GICS code	Sub-industry	GICS code	Obs.	Obs. (%)
Paper & forest products	151050	Forest products	15105010	44	17%
Beverages	302010	Brewers	30201010	7	3%
		Distillers & Vintners	30201020	58	23%
Food Products	302020	Agricultural Products	30202010	54	21%
		Meat, Poultry & Fish	30202020	43	17%
Observations in multi sub-industries				48	19%
				254	100%

Panel D: Valuation of biological assets by firm-year observation

Measurement attribute	Firm-year obs. (%)
Market-determined prices (i.e. market price for identical or similar assets, recent market transaction price)	79 (31%)
Managerially estimated fair value	158 (62%)
Use both measurement attributes	17 (7%)
	254 (100%)

Table 2.2
Descriptive statistics and correlations

Panel A: Distributional statistics

Variable	Obs.	Mean	St. dev.	Min.	Median	Max.	Skewness
EARN	254	0.016	0.134	-0.956	0.040	0.339	-3.195
CF	254	0.008	0.095	-0.387	0.018	0.274	-0.851
TACC	254	0.008	0.136	-0.984	0.008	0.393	-2.412
ΔFV	254	0.032	0.080	-0.225	0.009	0.485	2.970

Panel B: Pearson (Spearman) correlations below (above) the diagonal

	$EARN_t$	CF_t	CF_{t+1}	$TACC_t$	ΔFV_t
$EARN_t$		**0.4719**	**0.4743**	**0.3682**	0.0277
CF_t	**0.3315**		**0.5614**	**-0.5299**	**-0.2012**
CF_{t+1}	**0.3653**	**0.5922**		*-0.1357*	**-0.1929**
$TACC_t$	**0.7532**	**-0.3709**	-0.0532		**0.2924**
ΔFV_t	*0.1506*	*-0.1540*	*-0.1247*	**0.2556**	

This table presents descriptive statistics and Pearson (Spearman) correlations for the variables. Definitions of variables: *EARN*, earnings before extraordinary items and discontinued operations; *CF*, net cash flows from operating activities; *ΔFV*, gains or losses from change in fair value of biological assets; *TACC*, total accruals, calculated as *EARN – CF*; All financial variables are deflated by average assets. Figures in bold font are significant at the 1% level. Figures in italic font are significant at the 5% level.

Table 2.3
In-sample forecasting test - pooled sample

Panel data – OLS regression

Eq. (2): $CF_{it+\tau} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \varepsilon_{it}$

	One-year-ahead CF		**Two-years-ahead CF**		**Three-years-ahead CF**	
Variable	**Coefficient**	***p*-value**	**Coefficient**	***p*-value**	**Coefficient**	***p*-value**
Intercept	0.007	0.171	0.006	0.305	0.008	0.340
CF_{it}	0.637	0.000***	0.577	0.000***	0.496	0.000***
$TACC_{it}$	0.143	0.001***	0.103	0.008**	0.095	0.015*
ΔFV_{it}	-0.051	0.520	-0.047	0.556	-0.031	0.710
R^2 (%)	38.8		31.6		25.3	
Overall *p*-value	0.000***		0.000***		0.001***	
Obs.	254		213		172	

This table presents the results of standard OLS regressions in regard to the forecasting power of fair value for future operating cash flows up to three-years-ahead. Definitions of variables: *CF*, net cash flows from operating activities; *ΔFV*, gains or losses from change in fair value of biological assets; *TACC*, total accruals, calculated as *EARN – CF*; All financial variables are deflated by average assets. Figures in bold font are significant at the 1% level. Figures in italic font are significant at the 5% level. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm. Outliers have been defined and adjusted using the winsorisation technique.

Table 2.4
In-sample forecasting test - market-determined prices vs managerially estimated fair value

Panel data – OLS regression

Eq. (3) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 MEASUREMENT_{it}$

$+ \alpha_5 (MEASUREMENT_{it} \text{ x } \Delta FV_{it}) + \varepsilon_{it}$

	One-year-ahead CF	
Variable	**Coefficient**	***p*-value**
Intercept	0.018	0.036**
ΔFV_{it}	-0.032	0.186
CF_{it}	0.611	0.000***
$TACC_{it}$	0.176	0.000***
$MEASUREMENT_{it}$	-0.016	0.259
$MEASUREMENT_{it}$ x ΔFV_{it}	0.018	0.132
R^2 (%)	42.1	
Overall *p*-value	0.000***	
Obs.	237	

This table presents results of a standard OLS regression in regard to the difference in the forecasting power for future operating cash flows between market-determined prices and managerially estimated fair value. Definitions of variables: *CF*, net cash flows from operating activities; *ΔFV*, gains or losses from change in fair value of biological assets; *TACC*, total accruals, calculated as *EARN* – *CF*; *MEASUREMENT*, a dummy variable with a value of 1 if managerially estimated fair value is applied, otherwise zero; *MEASUREMENT* x *ΔFV* is the interaction variable between fair value measurement attributes and the change in fair value of biological assets. Firms that use more than one measurement attribute are excluded from the analysis. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm. Outliers have been defined and adjusted using the winsorisation technique.

Table 2.5
Out-of-sample forecasting test - pooled sample

Eq. (1) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \varepsilon_{it}$

Eq. (2) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \varepsilon_{it}$

	MAPE						
Equation	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Panel A: Full sample							
Eq. (1)	0.6942	0.6127	0.7132	0.6111	0.6709	0.8883	0.7921
Eq. (2)	0.7229	0.6631	0.7358	0.6113	0.7031	0.9206	0.7887
t-test: mean (diff) ≠ 0							
p-value	0.008***	0.310	0.424	0.982	0.580	0.541	0.498
Obs.	145	137	129	117	106	93	78
Panel B: Survivor sample							
Eq. (1)	0.7102	0.6291	0.7143	0.5839	0.7270	0.8818	0.7679
Eq. (2)	0.7307	0.6690	0.7031	0.7060	0.7302	0.9509	0.8340
t-test: mean (diff) ≠ 0							
p-value	0.004***	0.290	0.726	0.313	0.961	0.132	0.589
Obs.	100	105	106	101	92	83	72

This table presents results of out-of-sample forecasts. Full sample includes 254 firm-observations over the years 2001 - 2012 while survivor sample only includes 203 firm-observations that have complete data for at least five of the sample years. Outliers have been defined and adjusted using the winsorisation technique. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

Table 2.6
Out-of-sample forecasting test - mark-to-market vs mark-to-model

Eq. (1) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \varepsilon_{it}$

Eq. (2) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \varepsilon_{it}$

	MAPE						
Equation	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Panel A: Full sample (mark-to-market)							
Eq. (1)	0.4905	0.3579	0.6775	0.4538	0.3972	0.802	0.8244
Eq. (2)	0.5134	0.3720	0.6500	0.5127	0.5136	1.000	0.8107
t-test: mean (diff) ≠ 0							
p-value	0.087*	0.735	0.394	0.228	0.179	0.252	0.370
Obs.	45	46	42	35	29	25	21
Panel B: Full sample (mark-to-model)							
Eq. (1)	0.6577	0.8130	0.7646	0.6795	0.5348	0.9968	0.7799
Eq. (2)	0.7566	0.7903	0.7824	0.8401	0.8156	0.9373	0.9035
t-test: mean (diff) ≠ 0							
p-value	0.013	0.483	0.756	0.268	0.051*	0.184	0.313
Obs.	88	82	77	72	65	58	51

Table 2.6
Continued

Eq. (1) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \varepsilon_{it}$

Eq. (2) $CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \varepsilon_{it}$

	MAPE						
Equation	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Panel C: Survivor sample (mark-to-market)							
Eq. (1)	0.3787	0.3773	0.6628	0.1106	0.4264	0.9081	0.7608
Eq. (2)	0.4198	0.3261	0.6535	0.4231	0.5293	1.000	0.8628
t-test: mean (diff) ≠ 0							
p-value	0.340	0.562	0.456	0.229	0.168	0.423	0.249
Obs.	37	36	34	30	26	23	20
Panel D: Survivor sample (mark-to-model)							
Eq. (1)	0.6295	0.7815	0.7781	0.7392	0.6256	0.9166	0.7786
Eq. (2)	0.6934	0.8752	0.7168	0.8656	0.7431	0.9322	0.8709
t-test: mean (diff) ≠ 0							
p-value	0.189	0.100*	0.353	0.396	0.326	0.821	0.1816
Obs.	56	60	62	61	57	52	46

This table presents results of out-of-sample forecasts. Full sample includes 254 firm-observations over the years 2001 - 2012 while survivor sample only includes 203 firm-observations that have complete data for at least five of the sample years. Outliers have been defined and adjusted using the winsorisation technique. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

Table 2.7

In-sample forecasting test - aggregated change in lagged fair value

Panel data – OLS regression

Modified Eq. (2): $CF_{it+\tau} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \sum \Delta FV_{t\text{-}i} + \varepsilon_{it}$

	One-year-ahead CF			Two-years-ahead CF			Three-years-ahead CF		
Variables	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**
Intercept	0.007	0.003	0.005	0.006	0.005	0.014	0.008	0.014	0.018
ΔFV_t	-0.051			-0.047			-0.031		
ΔFV_{t-1+t}		-0.034			-0.007			0.023	
$\Delta FV_{t-2+t-1+t}$			-0.009			0.013			0.012
CF_t	0.637***	0.697***	0.657***	0.577***	0.566***	0.444***	0.496***	0.355***	0.292***
$TACC_t$	0.143***	0.196***	0.173***	0.103**	0.068	0.012	0.095*	-0.044	-0.08
Clustered standard errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	38.8	38.8	37.8	31.6	28.9	23.7	25.3	17.2	15.38
Overall *P*-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.001***	0.000***	0.000***
Observations	254	210	137	213	172	136	172	136	104

This table presents results of the forecasting power of aggregated lagged fair value for future operating cash flows up to three-years-ahead. Definitions of variables: *CF*, net cash flows from operating activities; $\sum \Delta FV$, is aggregated lagged change in fair value of biological assets over one, two and three years, respectively; *TACC*, total accruals, calculated as *EARN* – *CF*; *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm. All variables are scaled by average assets.

Table 2.8
In-sample forecasting test- change in future operating cash flows (ΔCFt+1)

Panel data – OLS regression

Modified Eq. (2): $\Delta CF_{it+\tau} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \varepsilon_{it}$

Modified Eq. (3) $\Delta CF_{it+1} = \alpha_0 + \alpha_1 CF_{it} + \alpha_2 TACC_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 MEASUREMENT_{it}$

$+ \alpha_5 (MEASUREMENT_{it} \text{ x } \Delta FV_{it}) + \varepsilon_{it}$

Variables	One-year-ahead ΔCF Coefficient	One-year-ahead ΔCF Coefficient
Intercept	0.007	0.018
ΔFV_t	-0.051	-0.032
CF_t	-0.363***	-0.389***
$TDACC_t$	0.143***	0.176***
MEASUREMENT		-0.016
MEASUREMENT x ΔFV		0.018
Clustered standard errors	Yes	Yes
R^2 (%)	27.5	30.29
Overall *P*-value	0.000***	0.000***
Observations	254	237

This table presents results of the forecasting power of fair value for one-year-ahead change in future operating cash flows. Definitions of variables: *CF*, net cash flows from operating activities; ΔCF, the change in operating cash flows between $year_t$ and $year_{t-1}$; ΔFV, gains or losses from change in fair value of biological assets; *TACC*, total accruals, calculated as *EARN – CF*; *MEASUREMENT*, a dummy variable with a value of 1 if managerially estimated fair value is applied, otherwise zero; *MEASUREMENT* x ΔFV is the interaction variable between fair value measurement attributes and the change in fair value of biological assets. Firms that use more than one measurement attribute are excluded. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm.

Chapter 3

(Paper Two)

Investigating the Reliability of Fair Value Information: Evidence from the Australian Agricultural Sector

ABSTRACT

This study investigates the reliability of fair value information reported under IAS 41, *Agriculture*. I examine whether managers use the discretion obtained from fair value accounting rules to strategically influence the size of reported agriculture gains. Using all agribusinesses listed on the ASX in the period from 2001 to 2011, agriculture gains are shown to be relatively larger when pre-agriculture earnings are lower, or below the prior level. When agriculture losses are reported, managers tend to report larger agriculture losses when pre-agriculture earnings are lower. I also find that managers who estimate fair value themselves use a wide range of discount rates, and those who select higher discount rates tend to report extremely large agriculture gains or losses. Overall, the findings support the concern that IAS 41 allows opportunistic management discretion and thus may reduce the reliability of fair value information.

Key words: fair value accounting, reliability, discretion, managerial estimates

3.1 INTRODUCTION

Concerns over the use of fair value accounting for biological assets have been raised in both the practitioner and academic literatures for as long as fair value has been prescribed in International Accounting Standard (IAS) 41, *Agriculture* (IASC, 1998; 2000; IASB, 2012; Elad, 2004; Herbohn & Herbohn, 2006; Hitz, 2007; Rayman, 2007; Whittington, 2008; Elad & Herbohn, 2011; Fischer & Marsh, 2013; Marsh & Fischer, 2013; Rozentale & Ore, 2013; Goncalves & Lopes, 2014; Stonciuviene et al., 2015). One of the main concerns is the reliability of fair value information due to the discretion provided in the standard. For example, when an entity has access to different active markets, IAS 41 allows the entity to choose the most relevant active market (IAS 41, sec. 17). If information from active markets suggests different conclusions as to the fair value of a biological asset, the entity uses its own discretion in reporting the most reliable fair value of a biological asset (IAS 41, sec. 19). In situations where market-determined prices are not available, the standard allows an entity to calculate the fair value using the present value of expected net cash flows, in which a significant discretion is involved in determining an appropriate discount rate and expected net cash flows (IAS 41, sec. 20).

Further, the standard also requires that any changes in the fair value of a biological asset are included in the income statement as gains or losses (agriculture gains[25] hereafter). By including these unrealised agriculture gains that are largely the result of managerial discretion in the income statement, the opponents of fair value accounting are concerned that managers will use this discretion to "massage their accounts in any financial year,

[25] This income effect is referred to as 'agriculture gains' since gains are more frequent in this industry, as shown in the descriptive statistics.

depending on the level of earnings they wished to report" (Herbohn, 2006, p.5). Thus, the reliability of fair value information is reduced.

This study empirically examines whether the discretion allowed in IAS 41 adversely affects the reliability of fair value information. In particular, I look at whether managers use the discretion provided in IAS 41 to strategically influence reported agriculture gains, for instance, to report larger agriculture gains when pre-agriculture earnings are lower. Pre-agriculture earnings are defined as earnings before recognising agriculture gains. Using discretion is not costless because over-stating values in the current period will increase the possibility of future write-downs (Graham et al., 2005). Therefore, I expect that managers will only exercise discretion when the projected benefits exceed costs.

I examine two situations in which managers' incentives to use discretion to strategically influence reported agriculture gains are expected to be relatively strong. The first is when pre-agriculture earnings are below market expectations. In this circumstance, managers would face pressure from shareholders to achieve higher earnings, they would be less likely to receive bonuses related to financial performance, and they would have difficulties in attracting new capital to the firm. Hence, the benefits of reporting higher agriculture gains, and therefore meeting the earnings target, are likely to exceed the potential costs of a future write-down. Conversely, when pre-agriculture earnings meet the target, managers have less incentive to influence reported agriculture gains.

The second situation is when pre-agriculture earnings are lower than the prior year's level. Research suggests that firms are rewarded for reporting positive earnings changes (Barth et al., 1999) and that managers provide earnings comparisons that emphasise improvements (Schrand & Walther, 2000). However, due to inherent uncertainty in the business environment, it is challenging for managers to achieve earnings increases continually. As a result, they might need to use accounting discretion to maintain the perception of earnings growth in some years. Thus, I expect that managers will report larger agriculture gains when current performance would otherwise be worse than that of the prior year.

If the results show that managers indeed use the discretion provided in IAS 41 to report desired earnings, the next step of this study is to investigate how managers use the discretion provided to achieve their goals. I expect that reported agriculture gains are more likely to be influenced by managers when market-determined price is not available and discounted cash flow modelling is relied on as a basis for determining the present value of expected net cash flows. This is because discount rate selection requires significant judgement. The discretion surrounding discount rate selection could be used opportunistically to influence the outcomes of managerially estimated agriculture gains (Husmann & Schmidt, 2008; Carlin & Finch, 2009; Gallery, 2009; Dechow et al., 2010). Lower discount rates increase reported agriculture gains, resulting in larger reported earnings. Given the key role of discount rate selection in calculating managerially estimated fair value, I specifically look at whether managers opportunistically select discount rates to achieve desired reported agriculture gains.[26]

[26] Desired agriculture gains vary across firms. This term is defined as the amounts of agriculture gains that managers wish to report in order to achieve the earnings target.

This paper examines all agricultural firms listed on the Australian Securities Exchange (ASX) in the period from 2001 to 2011. Australia is chosen because it was the first country to apply fair value accounting to agricultural sector. From Australian Accounting Standards Board (AASB) 1037, *Self-Generating and Regenerating Assets* (SGARA),[27] to AASB 141, *Agriculture*,[28] fair value accounting has been used in the Australian agricultural sector for more than fifteen years. The longevity of use of fair value accounting for biological assets in Australia implies that managers of Australian agricultural firms are familiar with fair value rules and aware of the opportunity provided in the standard for management discretion. Thus, the Australian setting offers an advantageous research site for examining whether managers have used the discretion provided in IAS 41 to influence reported agriculture gains.

I find that changes in fair value of biological assets reported in income statements are relatively larger when pre-agriculture earnings do not meet market expectations, or when they are below the prior level for all listed agricultural firms in Australia. When agriculture gains are separated from agriculture losses, I find that this negative association only holds for agriculture gains. In contrast, when agriculture losses are reported, a positive association is found, consistent with managers recognising losses in a bad year. Overall, the findings suggest that managers use the discretion provided in IAS 41 in an opportunistic manner, and thus the reliability of fair value information reported under IAS 41 is impaired.

[27] AASB 1037 was developed and became operative in Australia for reporting periods beginning on or after 30 June 2001. It was the first standard in the world to apply fair value accounting to the agriculture sector. IAS 41/AASB 141 is highly consistent with its predecessor AASB 1037 in most respects. Detailed discussion is provided in Chapter 1 of the thesis.
[28] AASB 141 is the Australian equivalent of IAS 41.

To report desired agriculture gains, firms choose discount rates in a wide range from 8% to 30%. Firms that report large agriculture gains and large agriculture losses tend to use high discount rates, which is consistent with managers strategically timing agriculture gains to maximise their incremental benefits over time. Again, the reliability of fair value information reported under IAS 41 is adversely affected.

This study contributes in three ways. First, I add empirical evidence to the extant literature on fair value accounting in the agricultural sector. Although existing studies express their concerns on the reliability of fair value information reported under IAS 41, empirical evidence is limited. This study completes the picture by providing empirical evidence that managers have used the discretion provided in IAS 41 to strategically influence reported agriculture gains. In particular, the study reveals situations under which managers' incentives to use discretion to influence reported agriculture gains are relatively strong.

Second, the study explores the use of discount rates in relation to fair value measurements in the agricultural sector. Agency theory suggests that, in the absence of effective monitoring mechanisms, managers have incentives to select discount rates opportunistically (Gallery, 2009). Carlin and Finch (2009) document opportunistic behaviour in discount rate selection for goodwill impairment. Dechow et al. (2010) find that managers use their discretion over discount rates to obtain desired gains or losses from asset securitisation. Consistent with the literature on discount rate selection, this study confirms that opportunistic behaviour also exists in discount rate selection for determining the fair value of biological assets.

Finally, the evidence provided in this study shows support for the introduction of International Financial Reporting Standards (IFRS) 13, *Fair Value Measurement*, in the hope that opportunistic behaviour in determining fair value of biological assets can be reasonably constrained when more information about fair value measurements are mandatorily disclosed by entities. The results obtained in this study also provide a more in-depth understanding of the issues and limitations of IAS 41 which might guide standard-setters to further develop the standard.

The remainder of the paper is organised as follows. Section 3.2 reviews related literature and develops the hypotheses. Section 3.3 details the research design while section 3.4 describes the sample selection and descriptive statistics. The findings are summarised in section 3.5. Finally, section 3.6 offers the conclusion and implications of the results.

3.2 RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

A study by Graham et al. (2005) reports on a survey of and interviews with more than 400 executives, documenting that managers believe meeting earnings targets helps them to build credibility with the capital market and maintain the external reputation of the management team. However, the managers also stress that using discretion provided in accounting standards to hit earnings target is costly, so they only exercise discretion when the projected benefits exceed the potential costs. Building on the extant literature, I investigate two circumstances in which managers are expected to be more likely to influence reported agriculture gains using the discretion provided in IAS 41. The first

circumstance is when pre-agriculture earnings do not meet market expectations while the second is when pre-agriculture earnings are lower than the prior year's level.

Earnings represent the general health of the entity, indicating the extent to which it has engaged in value-added activities. Given the importance of earnings, managers frequently emphasise the desire to maintain profitability in the opening lines of the annual report. For example, in the agricultural sector, Australian Vintage Ltd, an Australian winemaker that owns more than eight international brands, after substantial losses in 2009, stated in its 2010 annual report that:

> *Australian Vintage reported a strong turnaround in the financial results for 2010 and for the first time in many years we anticipate that the worst may be behind us and that the outlook for our Company is one of cautious optimism* (Australian Vintage Ltd, 2010, p.1).

Similarly, Australian Agricultural Company Ltd, the largest cattle company in Australia, attributed its performance in 2011 to a demonstration of

> *The company's resilience and capability …… to face a wide range of external pressures and challenges while delivering a profitable outcome for shareholders* (Australian Agricultural Ltd, 2011, p.3).

Further, the literature documents the importance of positive earnings. Degeorge et al. (1999) show that the positive profits threshold is predominant compared with the thresholds of sustaining recent performance, and meeting analysts' expectations. Burgstahler and Dichev (1997) report unusually low frequencies of small losses and

unusually high frequencies of small positive earnings, and conclude that firms take action to ensure profitability. Although this interpretation is questioned by Durtschi and Easton (2005; 2009) with an alternative interpretation of discontinuities at zero earnings, Burgstahler and Dichev's findings are later confirmed by Jacob and Jorgensen (2007), who examine the relation between earnings management and accounting income aggregation. Burgstahler and Chuk (2015) also conclude that earnings management remains the only plausible explanation for the discontinuities in earnings distributions. Graham et al. (2005, p.5) document that managers are willing to make small or moderate sacrifices in economic value in the long-term to "deliver earnings" in the short term.[29]

In this paper, I postulate that managers have incentives to report higher agriculture gains when pre-agriculture earnings are low or negative. In contrast, when pre-agriculture earnings are high, reporting even higher earnings tends to elicit a relatively small positive market reaction. Managers may therefore prefer to save their ability to increase the current earnings for a future period, by either reporting lower agriculture gains or even losses (DeFond & Park, 1997). Thus, I postulate that agriculture gains are negatively associated with pre-agriculture earnings.

H1: Agriculture gains are larger (smaller) in firms with lower (higher) pre-agriculture earnings.

[29] Although there has been a large amount of attention given to the opportunistic perspective of earnings management in the history of accounting research, the information perspective of earnings management is also well supported. Ball (2013) also criticises the belief that earnings management is rampant, arguing that it is the most incorrect belief in accounting.

Prior studies suggest that managers have incentives to maintain consistent increases in earnings. Degeorge et al. (1999) and Graham et al. (2005) identify sustaining recent performance as one of the thresholds that managers intend to meet. Barth et al. (1999) demonstrate that firms with patterns of increasing earnings have higher price-to-earnings multiples while DeAngelo et al. (1996) document that firms that break earnings-increasing patterns experience an average of 14% negative abnormal stock return in the year in which the pattern is broken.

Managers' intentions to sustain current performance is also evidenced in annual reports. In the agricultural sector, Select Harvests Ltd, an Australian firm that manages the second largest area of almond orchards globally, stated on the first page of its 2010 annual report that:

> *We are committed to driving long-term sustained earnings growth for our shareholders* (Select Harvests Ltd 2010, p.1)

Tandou Ltd, the Australian company involved in water, cropping and pastoral operations, reviewed its performance in 2011 and stated prominently on the first page of its annual report that:

> *Tandou Directors remain committed to … develop new income streams…, and Tandou's result in 2011 is further confirmation that our strategy will deliver growth and earnings in the future* (Tandou Ltd 2011, p.1)

Further, managers' remuneration, reputation and job security are linked to reported earnings. If accepting lower earnings today might result in a termination or greater

pressure from shareholders, greater earnings tomorrow may not represent a rational trade-off. Acknowledging the importance of reporting sustaintable performance, I postulate that managers have stronger incentives to boost agriculture gains when pre-agriculture earnings are below those of the prior period, whereas they will record lower agriculture gains or even losses when pre-agriculture earnings exceed the prior level.[30]

H2: Agriculture gains are larger (smaller) in firms with more negative (positive) changes in pre-agriculture earnings.

The first two hypotheses focus on whether managers use the discretion provided in IAS 41 to strategically influence the size of agriculture gains. If the two hypotheses are supported, the next step of the study is to investigate how managers use the discretion provided in the standard to achieve the desired level of agriculture gains. This investigation is undertaken by examining the association between discount rate selection and the size of reported agriculture gains. In cases where market-determined prices are not available, IAS 41 allows managers to use the present value of expected net cash flows from the biological asset in determining its fair value. This includes the exercise of judgement in the selection of appropriate market value benchmarks, and the exercise of judgement in the selection of risk-adjusted discount rates. Every judgement in this selection process has the capacity to affect materially the outcome of managerial estimates. In the absence of effective monitoring mechanisms, managers may have incentives to select discount rates opportunistically (Gallery, 2009). Carlin and Finch

[30] An alternative way to examine whether managers use the discretion to influence agriculture gains would be to analyse analysts forecast error. Research suggests managers face incentives to meet or beat analysts' forecasts (Degeorge et al., 1999; Bartov et al., 2002; Burgstahler & Eames, 2006), but this study does not use this benchmark because only a few agricultural firms in Australia are followed by analysts.

(2009) suggest this opportunism may manifest itself in the selection of extremely low or high discount rates depending on differing needs, for example, to inflate or dampen earnings or to take what has been termed a 'big bath'.[31]

Empirical evidence on the use of discount rates to manage opportunistically reported agriculture gains is limited. However, some insights can be obtained based on evidence found in other accounting standards in which discount rates are used to determine an asset's present value. For example, Carlin and Finch (2009) focus on the selection of discount rates for the purposes of goodwill impairment testing and see if IAS 36, *Impairment of Assets*, offers managers an environment to exercise discretion opportunistically. They find evidence consistent with opportunistic behaviour by documenting variation between discount rates used by firms for the purposes of impairment testing and independently generated estimates of firm-specific risk-adjusted discount rates. Focusing on the fair value accounting for asset securitisations, Dechow et al. (2010) find that managers use their discretion over discount rates to obtain desired gains or losses from asset securitisation.

Perhaps to improve perceived objectivity and reliability, agricultural managers frequently mention in their annual reports that they consider the most appropriate market valuation for their biological assets to be managerial estimates, and they believe that their accumulated knowledge and experience enable them to provide reliable estimates and reasonable assumptions upon which to calculate fair value. If this is true,

[31] A 'big bath' is when managers take actions to make poor results look even worse, ensuring an increase in reported earnings in the following year that may result in a larger reward for managers (Walsh et al., 1991; Beattie et al., 1994; Christensen et al., 2008; Ridel & Srinivasan, 2010).

the discount rate chosen by managers will be determined by relevant factors, including the cost of capital, the riskiness of the project and other relevant economic factors, and should not be affected by the size of agriculture gains to be reported in the income statement. However, if managers face pressure to meet an earnings target, it is likely that their selection of a discount rate will be influenced by the size of agriculture gains they would like to report. In that case, the discount rate enables managers to achieve the level of desired agriculture gains.

Considering the evidence of opportunistic behaviour found in the selection of discount rates in relation to other accounting standards, I postulate that managers have incentives to select discount rates in an opportunistic manner in order to achieve desired agriculture gains.

H3: Managers use their discretion over discount rates to achieve their earnings target through agricultural gains.

3.3 RESEARCH DESIGN

This study focuses on the association between two earnings components, pre-agriculture earnings and agriculture gains. I begin the testing by dividing reported earnings into pre-agriculture earnings and agriculture gains as expressed in Eq. (1):

$$EARN_{it} = PREFV_{it} + \Delta FV_{it} \quad (1)$$

where subscripts i and t denote firm and year, respectively; $EARN_{it}$ denotes after-tax operating earnings (before extraordinary items and discontinued operations) of firm i in year t; ΔFV_{it} denotes agriculture gains measured by the changes in fair value of

biological assets of firm i in year t reported in the income statement; and $PREFV_{it}$ denotes pre-agriculture earnings derived by deducting ΔFV_{it} from $EARN_{it}$.

The first hypothesis is tested using an Ordinary Least Squares (OLS) regression to estimate the relation between the size of agriculture gains and pre-agriculture earnings. The relation between agriculture gains and pre-agriculture earnings is modelled in Eq. (2) below:

$$\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 INDUST\_\Delta FV_{it} + \alpha_4 LEV_{it} + \alpha_5 IND_{it} + \varepsilon_{it} \qquad (2)$$

ΔFV_{it} and $PREFV_{it}$ are scaled by the average assets.[32] ε_{it} is the mean zero disturbance term. If managers arbitrarily adjust agriculture gains in response to a given level of pre-agriculture earnings, agriculture gains will be larger when pre-agriculture earnings are lower and the coefficient of $PREFV_{it}$ will be negative. Control variables are the median level of agriculture gains in the industry ($INDUST\_\Delta FV_{it}$), whether independent appraisal estimates are adopted by the firm (IND_{it}), and the firm's leverage (LEV_{it}).

$INDUST\_\Delta FV_{it}$ reflects the agriculture gains reported by firms in the industry and is measured as the median level of agriculture gains deflated by average assets in the industry by year, where industries are defined using the eight-digit Global Industry Classification Standard (GICS) code level.[33] A positive association is expected between $INDUST\_\Delta FV_{it}$ and ΔFV_{it} due to common economic factors affecting all firms in the

[32] Scaling these variables by the average total assets rather than the book value of equity is to avoid the mechanical negative relation between pre-agriculture earnings and agriculture gains.

[33] Since agricultural products are very diverse in nature, I define observations at the eight-digit GICS code level (the maximum level) to group agricultural products of a similar nature together. Thus, $INDUST\_\Delta FV_{it}$ in each group truly reflects the median level agriculture gains for products of a similar nature. When a company has more than one type of biological assets, the main type that is identified by the ASX in accordance with the GICS code is counted.

industry. IND_{it} is included as a control because Elad and Herbohn (2011) find that fair value of biological assets is managerially estimated in many agribusinesses in Australia, and independent external valuers are usually involved in the valuation process. It is expected that external independent appraisal estimates are significantly less biased and more accurate than director-based appraisals (Dietrich et al., 2001). To control for risk, LEV_{it} is also included in the OLS regression.[34]

Other than the factors that have been controlled for, the unpredictability of rainfall and consequent droughts is another important source of uncertainty that affects the agricultural production process in Australia (Quiggin & Chambers, 2004). Kent et al. (2008) find that Australian agricultural firms are more likely to take a 'big bath' in drought years than in non-drought years. However, the current study does not control for this factor because different agricultural products and production processes, and different regions could be differently affected by droughts. For example, production of cereal grain, cotton and sugar may drop in drought years whereas if low rainfall occurs shortly before the grapes are due to be harvested, it is good news for the vintage. Also, given the large size of the Australian continent, droughts rarely affect the whole country.[35]

To test whether managers report larger agriculture gains when pre-agriculture earnings are lower than the prior year (*H2*), I regress agricultural gains on the change in pre-agriculture earnings. The OLS regression model is presented in Eq. (3) below:

[34] Discount rates are not controlled for as they only affect agriculture gains estimated by managers.
[35] I reran the regressions after including a dummy variable for drought. The results show that drought is neither negatively nor positively associated with agricultural gains.

$$\Delta FV_{it} = \alpha_1 + \alpha_2 \Delta PREFV_{it} + \alpha_3 INDUST\_\Delta FV_{it} + \alpha_4 LEV_{it} + \alpha_5 IND_{it} + \varepsilon_{it} \quad (3)$$

$\Delta PREFV_{it}$ is defined as the change in pre-agriculture earnings of firm *i* between year *t* and year *t-1*. Both ΔFV_{it} and $\Delta PREFV_{it}$ are scaled by the average assets. If agriculture gains are larger when current pre-agriculture earnings are lower than the previous period, the coefficient of $\Delta PREFV_{it}$ is expected to be negative.

To investigate the association between discount rate choice and managerially estimated agriculture gains (*H3*), discount rates are regressed on agriculture gains, on agriculture losses indicator and on their interaction. I separate agriculture losses from gains to examine whether discount rate selection is different between firms reporting agriculture gains and firms reporting agriculture losses. The OLS regression model is shown in Eq. (4) below:

$$DISCOUNT_{it} = \alpha_1 + \alpha_2 \Delta FV_{it} + \alpha_3 LOSS_{it} + \alpha_4 \Delta FV_{it} \text{ x } LOSS_{it} + \alpha_5 BOND_{it}$$

$$+ \alpha_6 LEV_{it} + \alpha_7 IND_{it} + \varepsilon_{it} \quad (4)$$

where $DISCOUNT_{it}$ is the discount rate applied in managerial estimates of firm *i* in year *t*; and $LOSS_{it}$ is an indicator of agriculture losses. Since discount rates are affected by management discretion as well as economic factors, I control for some of these economic factors in the regression analysis by including the yield on five-year government bonds ($BOND_{it}$). In addition, Elad and Herbohn (2011) find that fair value of biological assets is managerially estimated in many agribusinesses in Australia. Some of them involve independent external valuation. IND_{it} is therefore included with an expectation that discount rates selected by independent valuers are less biased than those selected by managers. To control for risk, LEV_{it} is also a control variables in the analysis.

3.4 SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

This study covers all ASX listed firms that held biological assets in the period from 2001 to 2011. Data were collected up to financial year 2011 before IFRS 13 was issued by the IASB.[36] This is because IFRS 13 sets out a framework for measuring fair value, and requires the disclosure of fair value measurements. Prior to the introduction of IFRS 13, agricultural firms had not routinely discussed their fair value assumptions or other information relevant to valuing their biological assets,[37] and there was no requirement in IAS 41 to do so. Thus, it is reasonable to believe that the regulatory environment before the implementation of IFRS 13 provided more flexibility to managers to opportunistically use of the discretion obtained from IAS 41.

This initial sample includes 46 listed agribusinesses and 338 firm-year observations. Due to the change in the standard from AASB 1037 to AASB 141 as at 1 July 2005, this paper only includes observations that fall within the definition of biological assets under both standards, which reduces the sample to 333 firm-year observations.[38] Further reductions in the size of the sample result from missing values of variables and the use of historical cost.[39] The final sample includes 277 firm-year observations drawn from three industries and five sub-industries. Financial data were either obtained from DatAnalysis Premium or hand-collected from annual reports. Data on the Australian government bond rate were obtained from the Reserve Bank of Australia (RBA).

[36] IFRS 13 was issued by the IASB on 12 May 2011 with an effective date on 1 January 2013.
[37] Information about management risks and other restrictions of biological assets has also been neglected.
[38] For instance, blood cells or viruses for medical experiments or living animals for racing are treated as biological assets under AASB 1037 but not under AASB 141. These observations are removed from the sample.
[39] IAS 41 allows an entity to rebut the presumption that fair value can be determined for all agricultural assets on initial recognition. Historical cost is permitted in cases where fair value cannot be determined reliably.

Approximately two-thirds of the firm-year observations use one of the forms of managerially estimated fair value, such as net present value and net realisable value. This statistic is in line with the findings reported in Elad and Herbohn (2011), who demonstrate the use of the range of measurements for fair value available under the standard. Further, a few agribusinesses switch between market-determined prices and managerial estimates throughout the examination period, but no explanation is provided. Details for sample selection are presented in Table 3.1.

[Insert Table 3.1 here]

Panel A of Table 3.2 presents descriptive statistics for the variables used in the regression analysis. Noting some extreme values, the winsorisation technique (covering the top 1% of values to the 99th-percentile and the bottom 1% to the 1st-percentile) is employed to ensure that extreme values do not bias the results.[40] The mean of *EARN* is the algebraic sum of the means of *ΔFV* and *PREFV*. The relatively smaller mean of 0.004 for *EARN* compared with the standard deviation (0.133) shows that there is substantial variation in *EARN* across firms and over the years. The mean of *ΔFV* is positive whereas both *PREFV* and Δ*PREFV* have negative means. The mean of *INDUST_ΔFV* is positive revealing that on average, all industries in the sample report positive fair value changes. However, the average agriculture gain reported at the industry level (0.006) is much lower than at the firm-level (0.028). In relation to correlations, as shown in Panel B of Table 3.2, *EARN* is positively correlated with *PREFV* and Δ*PREFV* whereas *ΔFV* is negatively correlated with *PREFV*.

[40] The results are qualitatively consistent when I (i) delete these observations or (ii) do not employ winsorisation.

[Insert Table 3.2 here]

3.5 RESULTS AND DISCUSSION

3.5.1 Relation between agriculture gains and earnings performance

Figure 3.1 graphs the impact of reported agriculture gains on reported earnings. As shown, 29% of the firm-year observations of reported earnings remained negative after reporting positive agriculture gains, whereas 13% of observations switched to positive reported earnings. Only 1% of firm-year observations do not report any agriculture gains and losses. For those reporting positive agriculture gains (45% of firm-year observations), the gains are more likely within 1% to 5% of the reported earnings, but in some extreme cases, the agriculture gains are more than 50% of the reported earnings. On average, the mean (median) impact of agriculture gains on earnings is a 23% (2%) increase, suggesting that for many firms, agriculture gains substantially affect reported earnings.

[Insert Figure 3.1 here]

Equation (2) tests the relation between agriculture gains and pre-agriculture earnings, from which inferences can be drawn about managers' reactions to incentives to maintain profitability. Panel A of Table 3.3 reports the results, which support *H1*. The coefficient of *PREFV* is negatively significant at the 5% level (-0.2078, *p*-value = 0.019). This result indicates that managers report larger agriculture gains when pre-agriculture earnings are lower. The negative association between *ΔFV* and *PREFV* may also be generated when agriculture firms are mainly engaging in the management of biological

assets and thus the main revenues of agriculture firms are from agriculture gains (*ΔFV*) rather than pre-agriculture earnings (*PREFV*). In this case, the negative coefficient is a reflection that the main revenues of agriculture firms (i.e. *ΔFV*) are mechanically negatively related to the expenses that are reported as the main part of *PREFV*. In relation to control variables, industry gains are positively associated with agriculture gains (significant at the 10% level) whereas leverage is negatively associated with agriculture gains (significant at the 5% level). Owing to the small sample size, standard errors are clustered by firm only.[41]

Equation (3) tests the relation between agriculture gains and the change in pre-agriculture earnings. Panel A of Table 3.3 shows that the coefficient of Δ*PREFV* is negatively significant at the 5% level (-0.0683, *p*-value = 0.019). This is consistent with the expectation that managers report larger agriculture gains when the current pre-agriculture earnings are lower than the prior level. Thus, *H2* is supported. In relation to the control variables, only leverage is negatively associated with agriculture gains at the 1% significant level. Standard errors are clustered by firm. [42]

To understand whether the relation between agriculture gains and earnings performance varies when fair value measurement attributes are different, I divide the sample into a mark-to-market group and a mark-to-model group and then rerun the regressions. Based on the information provided in the annual reports of the sample firms, I was able to

[41] When there are only a few clusters in time, clustering by the more frequent cluster (i.e. firm) yields results that are almost identical to clustering by both firm and time (Pertersen, 2009).
[42] Quantile regressions are also undertaken separately for agriculture gains and agriculture losses in Section 3.5.2 to see if both of them have a negative association with pre-agriculture earnings.

identify that 83 firm-year observations use unadjusted or adjusted market-determined prices (a mark-to-market group) and 175 firm-year observations use managerially estimated fair value (a mark-to-model group). Observations that use more than one fair value measurement attribute due to operating in multi-segments are excluded from this analysis.

As presented in Panel B of Table 3.3, none of the variables of interest is associated with agriculture gains when fair value is obtained from active markets. The results suggest that agriculture gains are used less systematically for management discretion when market-determined price is used to determine the fair value of a biological asset. The plausible reasons are firstly, there may be very little room for managers to influence the size of agriculture gains when active markets are available and, secondly, that even though managers are able to exercise a certain level of discretion over market-determined price, it is costly (i.e. risky) for managers to do so because the fair value can be easily verified (Graham et al., 2005).

Contrasting results are found for the mark-to-model group, in which both pre-agriculture earnings (*PREFV*) and their change (Δ*PREFV*) have a significant negative relation with agriculture gains, suggesting that managers are more likely to influence the size of agriculture gains when managerial estimation is applied. In regard to the control variables, the use of external independent valuers is shown to be negatively associated with agriculture gains. This finding is consistent with external independent valuers being able to provide more objective valuations than managers, and thus constrain opportunistic behaviour.

Significant judgement is required in developing underlying assumptions upon which estimated fair value is derived. However, the integrity and objectivity of this judgement are hard to verify or to have assured by auditors. It is likely that managers adopt favourable assumptions in order to produce desired fair value estimates. My findings confirm this, supporting concerns over reliability that have been raised by opponents of fair value.

[Insert Table 3.3 here]

3.5.2 Analysis extension

The OLS regression method used in the main analysis only estimates the conditional mean effects of a response variable and assumes the identified association holds across various conditional quantiles of a response variable. Nevertheless, the negative association found in the OLS regressions between agriculture gains and pre-agriculture earnings may not hold across all circumstances, for example, in a situation where managers have no incentive to meet or beat an earnings target. This situation could happen when, no matter how hard managers try, the earnings target cannot be met. Under this circumstance, theory suggests that managers may prefer to take a 'big bath'.

To examine whether the negative association between agriculture gains and pre-agriculture earnings holds across all levels of the agriculture gains distribution, I extend the previous analysis by using quantile regression, which allows observation of the association at various points in the conditional distribution of the dependent variable. To better understand this association, the tests for agriculture gains and losses are conducted separately.

Quantile regression, as introduced by Koenker and Bassett (1978), can estimate the relation between the response variable and explanatory variables at all conditional quantiles of a response variable's distribution. Thus, I obtain multiple sets of coefficient estimates with each set describing the relation between the response variable and explanatory variables at a certain quantile of the response variable (i.e. 10%, 25%, 90% quantiles) (Koenker & Hallock, 2001). This is different from the OLS regression, which estimates only the conditional mean effect of the response variable.[43] By using quantile regression, a complete picture can be derived of how pre-agriculture earnings relate to agriculture gains and losses at different conditional quantiles.

Table 3.4 presents quantile regression results for the 0.1, 0.25, 0.50, 0.75 and 0.90 quantiles of agriculture gains.[44] As seen in Panel A of Table 3.4, the coefficients of *PREFV* are significantly negative at all levels. Consistent with the main analysis, these results suggest that lower agriculture gains are associated with higher pre-agriculture earnings at all levels of the agriculture gains distribution. Also, the coefficients of *PREFV* increase progressively from -0.0191 at 10% quantile to -0.5768 at 90% quantile. This means, for the 10% agriculture gains quantile, every one unit increase in return of pre-agriculture earnings on assets is, on average, associated with a reduction of approximately 0.02 units in return of agriculture gains on assets. Nevertheless, for the 90% agriculture gains quantile, every one unit increase in return of pre-agriculture earnings on assets is, on average, associated with the return of agriculture gains on assets reduces by 0.57 units.

[43] Koenker and Hallocak (2001) provide comprehensive introduction to quantile regression.
[44] These quantiles are used because they are the five conventional quantiles used in the quantile regression (Koenker & Hallock, 2001).

I test the *F*-statistics on whether the increase in the coefficients is significant. As shown in Panel B of Table 3.4, the coefficients of *PREFV* when the agriculture gains are high (q = 75% or 90%) are significantly larger than when the agriculture gains are low (q = 10% or 25%). This suggests that although pre-agriculture earnings are negatively associated with agriculture gains, the negative effect is more pronounced for firms at higher quantiles of the agriculture gains than firms at the lower quantiles.

[Insert Table 3.4 here]

Table 3.5 presents quantile regression results for the five quantiles of agriculture losses. As seen in Panel A of Table 3.5, the coefficients of *PREFV* are positively significant at all levels except for the 10% quantile. For example, for the 25% agriculture loss quantile, agriculture losses scaled by assets, on average, would be reduced by 0.17 units by every one unit increase in pre-agriculture earnings scaled by assets. These findings are not consistent with the main analysis in which a negative association is found, suggesting that grouping agriculture gains and losses together may mask the heterogeneity revealed in the current results. The positive association found in the quantile regression reveals that if agriculture losses are reported, firms tend to report larger agriculture losses when pre-agriculture earnings are lower, which is consistent with the 'big bath' theory. Panel B of Table 3.6 shows that the decrease in the coefficients of *PREFV* from the 25% to the 90% quantiles of agriculture losses is statistically significant, suggesting that the positive association between pre-agriculture earnings and agriculture losses is more pronounced for firms at the 25% to the 50% quantiles than firms at the 90% quantile.

[Insert Table 3.5 here]

The effects of agriculture gains and losses at different quantiles can be seen in Figure 3.2 and Figure 3.3, respectively. I plot the coefficients of pre-agriculture earnings along the vertical axis and the quantiles of agriculture gains (losses) along the horizontal axis. The bold dotted line in each panel gives the OLS estimate of the conditional mean effect whereas the fine dotted lines depict the 90% confidence interval for the OLS estimate. The curved line in the middle of the shaded area reflects the coefficient estimates of the quantile regression at different quantiles. The shaded area depicts a 90% pointwise confidence interval for the quantile regression estimates.

Figure 3.2 shows that coefficients of the quantile regression for quantiles below 70% are smaller than the estimate from the OLS regression. Pre-agriculture earnings have the largest effect around the 90% quantile, suggesting that the negative effect of pre-agriculture earnings on agriculture gains is larger for higher agriculture gain firms. Figure 3.3 shows that coefficients of the quantile regression for quantiles below around 38% are larger than the estimate from the OLS regression. Pre-agriculture earnings have the largest effect around the 25% quantile, suggesting that the positive effect of pre-agriculture earnings on agriculture losses is larger for lower agriculture loss firms.

[Insert Figures 3.2 & 3.3 here]

Overall, the application of quantile regression confirms the negative association between agriculture gains and pre-agriculture earnings. It also reveals agriculture losses and pre-agriculture earnings have opposite associations; a finding that is masked in the main analysis of the study in which agriculture gains and losses are grouped together.

The positive association between agriculture losses and pre-agriculture earnings is consistent with the 'big bath' theory that managers recognise losses in a bad year.

3.5.3 Discount rate selection

The first part of this study shows circumstances in which managers use the discretion provided in IAS 41 strategically to influence reported agriculture gains. In particular, managers are more likely to report larger agriculture gains when managerially estimated fair value is used. The third hypothesis examines whether managers' choice of discount rates influences the size of reported agriculture gains. Out of 277 firm-year observations, 105 observations include information about discount rates. The majority of these observations report positive agriculture gains.

Panel A of Table 3.6 reports the overall average discount rate (14.57%). The average discount rate for agriculture gain observations (87 firm-years) is 14.13% whereas for agriculture loss observations (18 firm-years) it is 16.70%. However, this difference in discount rate selection between agriculture gain and loss observations is not significant (*t*-test = 1.561, *p*-value = 0.133). Correlations of discount rates with agriculture gain and loss observations are reported separately. I find a strong positive (*p*-value = 0.461) correlation between discount rates and agriculture gain observations, suggesting that firms that report large agriculture gains use higher discount rates. However, no similarly significant correlation is found for agriculture loss firms.

Results for the regression analysis are presented in Panel B of Table 3.6, where associations between discount rates and agriculture gain/loss firms are tested, controlling for other factors that may affect discount rate selection. The coefficient of ΔFV is 55.289, significant at the 1% level, indicating that a one unit increases in the return of agriculture gains on assets is associated with 55 basis points increase. This result suggests that firms that report large agriculture gains use higher discount rates. On the other hand, a negative association is observed between agriculture loss firms and discount rates. A one unit increases in the return of agriculture gains on assets is associated with 19 basis points decrease, revealing that firms that report agriculture losses also use higher discount rates. External independent appraisers adopt lower discount rates.

[Insert Table 3.6 here]

Figure 3.4 shows the movement of average discount rates and the yield on five-year and ten-year government bonds respectively, over time. If economic factors are considered when determining discount rates, the average discount rates should move somewhat consistently with the yields over time. However, the pattern of movement shown in Figure 3.4 does not support this expectation. For example, the yields on government bonds remained steady in the period from 2001 to 2002 whereas the average discount rates dropped significantly from 16% to 14%. From 2008 to 2009, the yields reduced by at least two percentage points due to the global financial crisis whereas average discount rates, in fact, remained unchanged. The inconsistent co-movements between the average discount rates and yields on government bonds suggest that economic factors are not a primary consideration for managers for determining discount rates.

[Insert Figure 3.4 here]

Figure 3.5 provides further analysis of discount rate selection between agriculture gain and loss firms. As shown, only 10% of agriculture gain firms use discount rates of below 10% while more than 33% of the gain observations use discount rates of between 10% to 12%. Some firms (7% of the gain observations) use extremely high discount rates (i.e. rates of 28% or greater) to report agriculture gains. Contrary to the gain observations, only 6% of the agriculture loss observations use discount rates of between 10% to 12%. They are more likely to use higher discount rates. For example, 17% of observations use discount rates of between 12% to 14% while 22% use discount rates of between 14% to 16%. Notably, 12% of the agriculture loss firms use extremely high rates of 28% or greater. This percentage is more than double the percentage for the agriculture gain firms.

[Insert Figure 3.5 here]

Overall, the second part of the study reveals that firms using higher discount rates (28% or greater) tend to report larger agriculture gains or larger agriculture losses. At a given level of future cash flows, these higher discount rates will magnify agriculture losses and minimise agriculture gains. This is suggestive of incentives created by the lower and upper performance targets in a performance target plan. Thus, the results suggest managers use their discretion over discount rates to achieve desired agriculture gains and thus *H3* is supported.

3.6 CONCLUSION

This paper evaluates the reliability of fair value information reported under IAS 41 by investigating whether managers use the discretion provided in the standard strategically to influence the size of agricultural gains. The paper focuses on two settings in which the incentives to report larger agriculture gains are relatively strong. I find that managers are more likely to report larger agriculture gains when pre-agriculture earnings are (1) lower than market expectations; and (2) lower than the previous level. When separating agriculture gains from losses, the study finds that the negative association between the two earnings components only holds when agriculture gains are reported. This is consistent with managers endeavouring to maximise positive reported earnings. In contrast, a positive association between agriculture losses and pre-agriculture gains is found. The result reveals that if agriculture losses need to be reported, managers are more likely to report larger agriculture losses when pre-agriculture earnings are lower, suggesting a 'big bath' approach is adopted. Both results support fair value opponents' concerns that the discretion allowed within IAS 41 creates ample opportunities for management discretion and thus reduces the reliability of reported information (Herbohn, 2006).

The study also finds that management discretion is more prevalent when managerial estimates are applied. To influence the managerially estimated fair value successfully, the discount rate is an important tool used by managers. Although agriculture gain and loss firms appear to use a similar range of discount rates, firms that report larger agriculture gains and larger agriculture losses tend to use higher discount rates compared to firms that report lower agriculture gains and lower agriculture losses. However, due to limited disclosures before the introduction of IFRS 13, the author

cannot rule out the possibility that the choice of discount rates reflects underlying economic factors. Further, although discount rate selection is the pre-eminent area of discretion in estimating fair value of biological assets, the numerator issue of discount rates may be magnified in settings in the agricultural sector where there are long production cycles.

The results of this study have implications for standard-setters and investors. First, the results of this study indicate that the discretion provided in IAS 41 has unintended effects on fair value reliability, thus undermining the IASB's aim of providing more useful information for decision-making. However, the author is cautious in drawing a conclusion that using fair value accounting in the agricultural sector is not desirable. This is because the evidence of management discretion is mainly found when managerial estimates are applied. Fair value quoted from active markets does not appear to be a problem. Further, evidence of management discretion or its absence is "not a sufficient condition for the desirability of an accounting standard" (Holthausen & Watts, 2001, p.29). To assess the appropriateness of the fair value rules required by IAS 41, it is important not only to consider the costs and benefits of the standard, but also those of the alternatives (Barth et al., 2001).[45] Thus, the evidence presented in this study is one part of the answer, and should be considered in conjunction with other relevant perspectives for assessing the desirability of using fair value accounting in the agricultural sector.

[45] The benefits and costs of fair value accounting are discussed in Laux and Leuz (2009).

Second, it is apparent from the empirical evidence that bias in the selection of discount rates exists. This is a matter of serious concern to standard-setters, auditors and financial statement users about the quality of reported agriculture gains. One change to fair value accounting for biological assets has occurred with the introduction of IFRS 13. Agricultural firms are now required to disclose information in their financial statements that guides users in firms' application of valuation techniques, and in understanding the effects of measurements on profit or loss (IFRS 13, sec. 91). This paper supports the changes introduced under IFRS 13 to require enhanced disclosures. These changes may improve the transparency of the valuation process. Any future research that seeks to evaluate the effect of these changes in the accounting standard can use these results as a benchmark for assessing improvement.

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Table 3.1
Sample overview

Panel A: Sample collection

Procedures	**Obs.**
Observations having biological assets from 2001 to 2011	338
After excluding observations that hold blood cells or viruses	333
After excluding observations with missing value of variables	282
After excluding observations using historical cost	277

Panel B: Observation distribution over years

Year	**Obs.**	**Year**	**Obs.**
2001	31	2008	22
2002	33	2009	17
2003	33	2010	14
2004	30	2011	13
2005	29		
2006	28		
2007	27	Total	277

Panel C: Industry distribution by firm-year observation

Industry	**GICS code**	**Sub-industry**	**GICS code**	**Obs.**	**Obs. (%)**
Paper & forest products	151050	Forest products	15105010	48	17%
Beverages	302010	Brewers	30201010	7	3%
		Distillers & Vintners	30201020	72	26%
Food Products	302020	Agricultural Products	30202010	61	22%
		Meat, Poultry & Fish	30202020	42	15%
Observations in multi sub-industries				47	17%
				277	100%

Panel D: Valuation of biological assets by firm-year observation

Measurement attribute	**Firm-year obs. (%)**
Market-determined prices (i.e. market price for identical or similar assets, recent market transaction price)	83 (30%)
Managerially estimated fair value	176 (63.5%)
Use both measurement attributes	18 (6.5%)
	277 (100%)

Table 3.2
Descriptive statistics and correlations

Panel A: Distributional statistics

Variable	Obs.	Mean	St. dev.	Min.	Median	Max.	Skewness
EARN	277	0.004	0.133	-0.786	0.036	0.339	-2.039
ΔFV	277	0.028	0.079	-0.295	0.008	0.485	2.754
PREFV	277	-0.024	0.146	-0.736	0.018	0.350	-1.546
ΔPREFV	277	-0.012	0.161	-0.725	0.002	0.947	0.462
INDUST_ΔFV	277	0.006	0.041	-0.001	0.001	0.567	11.500
LEV	277	0.469	0.183	0.046	0.477	1.484	0.960

Panel B: Pearson (Spearman) correlations below (above) the diagonal

	EARN	*ΔFV*	*PREFV*	*ΔPREFV*	*INDUST_ΔFV*	*LEV*	*IND*
EARN		*0.139*	**0.838**	**0.552**	0.041	**-0.176**	-0.093
ΔFV	0.039		**-0.371**	*-0.128*	0.023	*-0.152*	0.007
PREFV	**0.863**	**-0.291**		**0.621**	0.023	-0.078	-0.061
ΔPREFV	**0.438**	-0.117	**0.538**		0.015	-0.072	0.005
INDUST_ΔFV	*0.152*	**0.220**	0.084	*0.135*		-0.011	-0.062
LEV	-0.108	*-0.147*	0.005	-0.043	-0.062		0.087
IND	*-0.157*	-0.076	-0.087	-0.006	**-0.173**	0.067	

This table presents descriptive statistics and Pearson (Spearman) correlations for the variables. Definitions of variables: *EARN*, after-tax operating earnings (before extraordinary items and discontinued operations) of firm *i* in year *t*, deflated by average assets; *ΔFV*, gains or losses from changes in fair value of biological assets of firm *i* in year *t,* deflated by average assets; *PREFV*, pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from *EARN*; *ΔPREFV*, the change in pre-agriculture earnings of firm *i* between year *t* and year *t-1*; *INDUST_ΔFV*, the median level of agriculture gains in the industry in year *t*, deflated by average assets; *LEV*, total liabilities divided by total assets of firm *i* for year *t*; *IND*, an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. Figures in bold font are significant at the 1% level. Figures in italic font are significant at the 5% level.

Table 3.3
The OLS egressions - the relation between agriculture gains and earnings performance

Panel data – OLS regression
Eq. (2) $\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 INDUST\_\Delta FV_{it} + \alpha_4 LEV_{it} + \alpha_5 IND_{it} + \varepsilon_{it}$
Eq. (3) $\Delta FV_{it} = \alpha_1 + \alpha_2 \Delta PREFV_{it} + \alpha_3 INDUST\_\Delta FV_{it} + \alpha_4 LEV_{it} + \alpha_5 IND_{it} + \varepsilon_{it}$

Panel A: Rlation between agriculture gains and earnings performance (pooled sample)

Variable	Predicted sign	Eq. (2)	Eq. (3)
Intercept		0.0610***	0.0605***
PREFV	-	-0.2078**	
Δ*PREFV*	-		-0.0683**
INDUST_ΔFV	+	0.0585*	0.0484
IND	-	0.0002	0.0045
LEV	-	-0.0781**	-0.0704***
R^2		17.11%	2.94%
Overall *p*-value		0.0023***	0.0164**
Obs.		277	277

Panel B: Relation between agriculture gains and earnings performance (mark-to-market vs mark-to-model)

		Mark-to-market		Mark-to-model	
Variable	**Predicted sign**	**Eq. (2)**	**Eq. (3)**	**Eq. (2)**	**Eq. (3)**
Intercept		0.0186	0.0148	0.0502**	0.0527***
PREFV	-	-0.0525		-0.1279**	
Δ*PREFV*	-		-0.0076		-0.0513**
INDUST_FV	+	0.0705***	0.0653**	0.0424**	0.0322
IND	-	-0.0068	-0.0077	-0.0224**	-0.0219**
LEV	-	-0.0078	0.0043	-0.0666	-0.0679***
R^2		2.3%	2.1%	22.59%	11.16%
Overall *p*-value		0.000***	0.000***	0.0365**	0.0001***
Obs.		83	83	176	176

This table presents the results of standard OLS regressions concerning the relation between agriculture gains and earnings performance. Definitions of variables: *EARN*, after-tax operating earnings (before extraordinary items and discontinued operations) of firm *i* in year *t*, deflated by average assets; *ΔFV*, gains or losses from changes in fair value of biological assets of firm *i* in year *t,* deflated by average assets; *PREFV*, pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from *EARN*; *ΔPREFV*, the change in pre-agriculture earnings of firm *i* between year *t* and year *t-1*; *INDUST_ΔFV*, the median level of agriculture gains in the industry in year *t*, deflated by average assets; *LEV*, total liabilities divided by total assets of firm *i* for year *t*; *IND*, an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm. Outliers have been defined and adjusted using the winsorisation technique.

Table 3.4
Quantile regressions - the relation between agriculture gains and earnings performance

Panel data – quantile regression
Eq. (2) $\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 INDUST\_\Delta FV_{it} + \alpha_4 LEV_{it} + \alpha_5 IND_{it} + \varepsilon_{it}$

Panel A: Rlation between agriculture gains and pre-agriculture earnings

Variable	**q=10%**	**q=25%**	**q=50%**	**q=75%**	**q=90%**
Intercept	0.0031**	0.0139***	0.0471***	0.0978***	0.1485***
PREFV	-0.0191***	-0.0512***	-0.1573***	-0.4288***	-0.5768***
INDUST_ΔFV	0.0874***	0.0780**	0.0486	-0.0116	-0.0696
IND	-0.0018	-0.0046	-0.0094	-0.0135	-0.0079
LEV	-0.0020	-0.0143*	-0.0518***	-0.0928***	-0.1339**
Pseudo R^2	2.32%	5.07%	14.38%	26.32	40.18%
Obs.	222	222	222	222	222

Panel B: Difference in the coefficients on PREFV across ΔFV quantiles (F-statistics)

	q=25%	q=50%	q=75%	q=90%
q=10%	0.0321 (1.87)	0.1382 (4.38)**	0.4097 (15.41)***	0.5577 (17.36)***
q=25%		0.1061 (4.11)**	0.3766 (14.90)***	0.5256 (14.50)***
q=50%			0.2715 (13.58)***	0.4195 (9.67)***
q=75%				0.1480 (1.71)

Panel A presents quantile regressions results concerning the relation between agriculture gains and pre-agriculture earnings for the 10%, 25%, 50%, 75% and 90% quantiles. The "qreg" command in STATA's statistical software is used. Panel B presents the difference in the coefficients on *PREFV* across *ΔFV* quantiles. Definitions of variables: *EARN*, after-tax operating earnings (before extraordinary items and discontinued operations) of firm *i* in year *t*, deflated by average assets; *ΔFV*, gains or losses from changes in fair value of biological assets of firm *i* in year *t,* deflated by average assets; *PREFV*, pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from *EARN*; *ΔPREFV*, the change in pre-agriculture earnings of firm *i* between year *t* and year *t-1*; *INDUST_ΔFV*, the median level of agriculture gains in the industry in year *t*, deflated by average assets; *LEV*, total liabilities divided by total assets of firm *i* for year *t*; *IND*, an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

Table 3.5
Quantile regressions - the relation between agriculture losses and earnings performance

Panel data – quantile regression
Eq. (2) $\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 INDUST\_\Delta FV_{it} + \alpha_4 LEV_{it} + \alpha_5 IND_{it} + \varepsilon_{it}$

Panel A: Rlation between agriculture losses and pre-agriculture earnings

Variable	**q=10%**	**q=25%**	**q=50%**	**q=75%**	**q=90%**
Intercept	-0.0676	-0.0259	-0.0090	-0.0018	-0.0001
PREFV	0.1576	0.1723**	0.0588**	0.0160*	0.0042**
INDUST_ΔFV	-0.0434	-0.0198	-0.0810	-0.0484	-0.4966***
IND	-0.0774	-0.0276	-0.0017	-0.0018	0.0001
LEV	-0.0859	0.0137	0.0036	0.0005	-0.0008
Pseudo R^2	14.79%	18.17%	10.53%	2.90%	1.53%
Obs.	51	51	51	51	51

Panel B: Difference in the coefficients on PREFV across ΔFV quantiles (F-statistics)

	q=25%	q=50%	q=75%	q=90%
q=10%	-0.0147 (0.02)	0.0988 (1.25)	0.1416 (3.92)*	0.1534 (4.36)**
q=25%		0.1135 (3.21)*	0.1563 (6.31)**	0.1681 (6.80)**
q=50%			0.0428 (1.82)	0.0546 (1.82)
q=75%				0.0118 (0.38)

Panel A presents quantile regressions results concerning the relation between agriculture losses and pre-agriculture earnings for the 10%, 25%, 50%, 75% and 90% quantiles. The "qreg" command in STATA's statistical software is used. Panel B presents the difference in the coefficients on *PREFV* across *ΔFV* quantiles. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Definitions of variables: *EARN*, after-tax operating earnings (before extraordinary items and discontinued operations) of firm *i* in year *t*, deflated by average assets; *ΔFV*, gains or losses from changes in fair value of biological assets of firm *i* in year *t,* deflated by average assets; *PREFV*, pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from *EARN*; *ΔPREFV*, the change in pre-agriculture earnings of firm *i* between year *t* and year *t-1*; *INDUST_ΔFV*, the median level of agriculture gains in the industry in year *t*, deflated by average assets; *LEV*, total liabilities divided by total assets of firm *i* for year *t*; *IND*, an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

Table 3.6
Discount rate selection

Panel A: Descriptive statistics and correltations on discount rates

	All firms	Agriculture gain firms	Agriculture loss firms
Average discount rate (%)	14.57	14.13	16.70
Pearson correlation between discount rates and agriculture gains and losses	0.315***	0.488***	0.028
Obs.	105	87	18
Difference in discount rate selection between agriculture gain and loss firms (*t*-test)		t = 1.561 *p*-value = 0.133 (two-tailed)	

Panel B: Relation between discount rates and the size of agriculture gains

Panel data – OLS regression

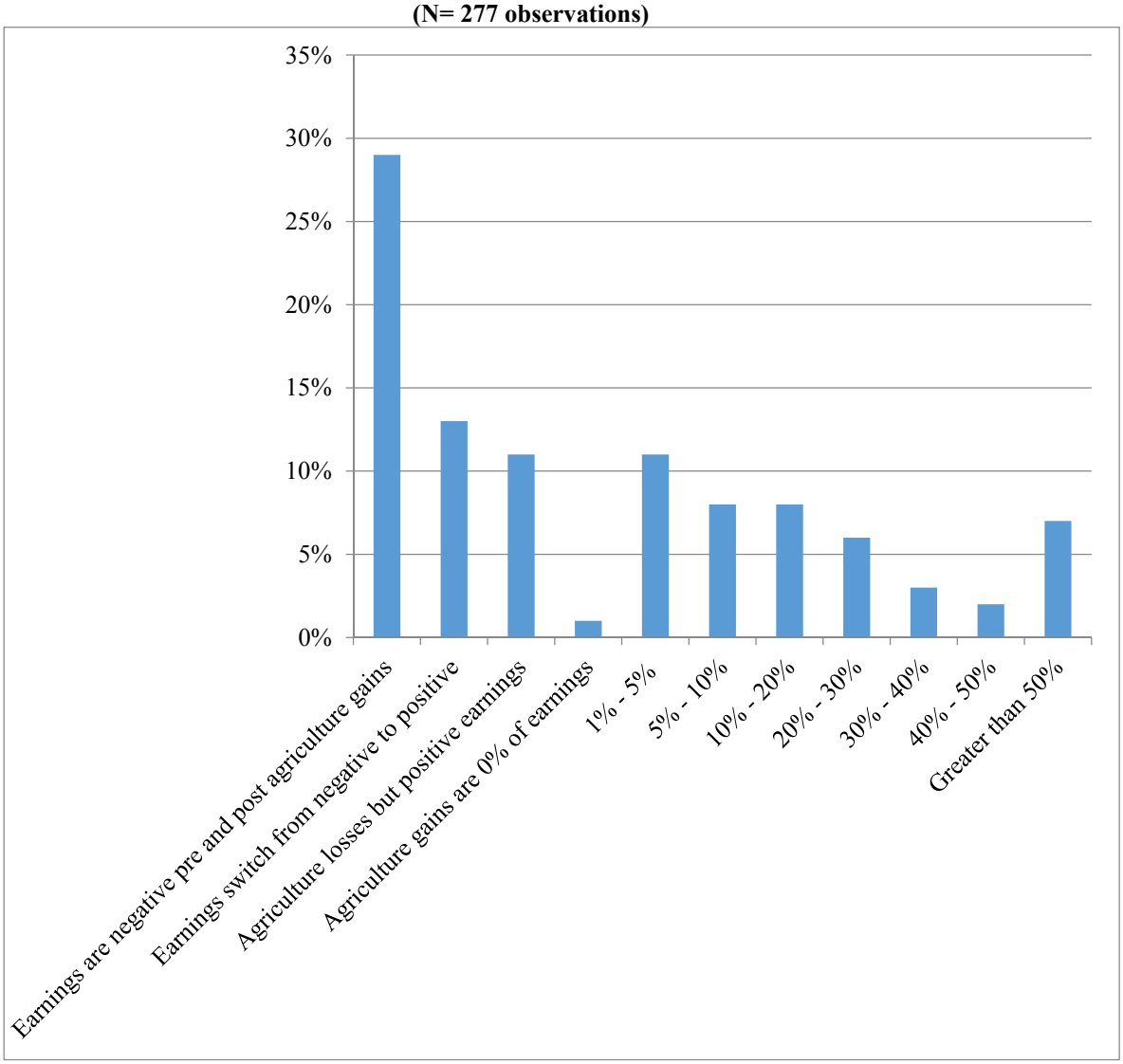
Eq. (4) $DISCOUNT_{it} = \alpha_1 + \alpha_2 \Delta FV_{it} + \alpha_3 LOSS_{it} + \alpha_4 \Delta FV_{it}$ x $LOSS_{it} + \alpha_5 BOND_{it} + \alpha_6 LEV_{it} + \alpha_7 IND_{it} + \varepsilon_{it}$

Variable	Predicted sign	Eq. (4)
Intercept		
ΔFV	?	55.289***
LOSS	?	5.311**
ΔFV x LOSS	?	-74.615**
BOND	+	0.726
IND	-	-4.343**
LEV	-	6.550
R^2		27.85%
Overall *p*-value		0.000***
Obs.		102

This table presents difference in discount rate selection between agriculture gain and loss firms, and the results of standard OLS regressions concerning the relation between discount rates and the size of agriculture gains. Definitions of variables: *DISCOUNT*, the discount rate applied in managerial estimates of firm *i* in year *t*; *ΔFV*, gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *LOSS*, an indicator of agriculture losses; *BOND*, the yield on five-year government bonds; *LEV*, total liabilities divided by total assets of firm *i* for year *t*; *IND*, an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Three observations that use both market-based and managerially estimated fair value are excluded from the regression analysis. Standard errors are clustered by firm.

Figure 3.1

The distribution of the impact of agriculture gains on reported earnings (N= 277 observations)



The horizontal axis reports the impact of reported agriculture gains on earnings whereas the vertical axis reports the percentage of observations.

Figure 3.2
The OLS and quantile regression estimates – pre-agriculture earnings and agriculture gains

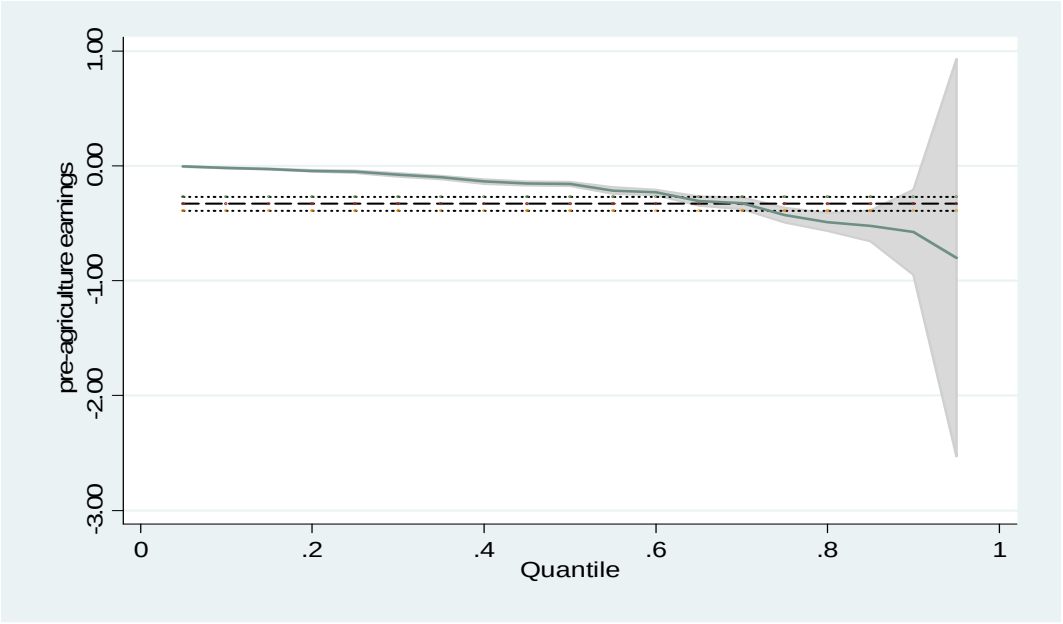
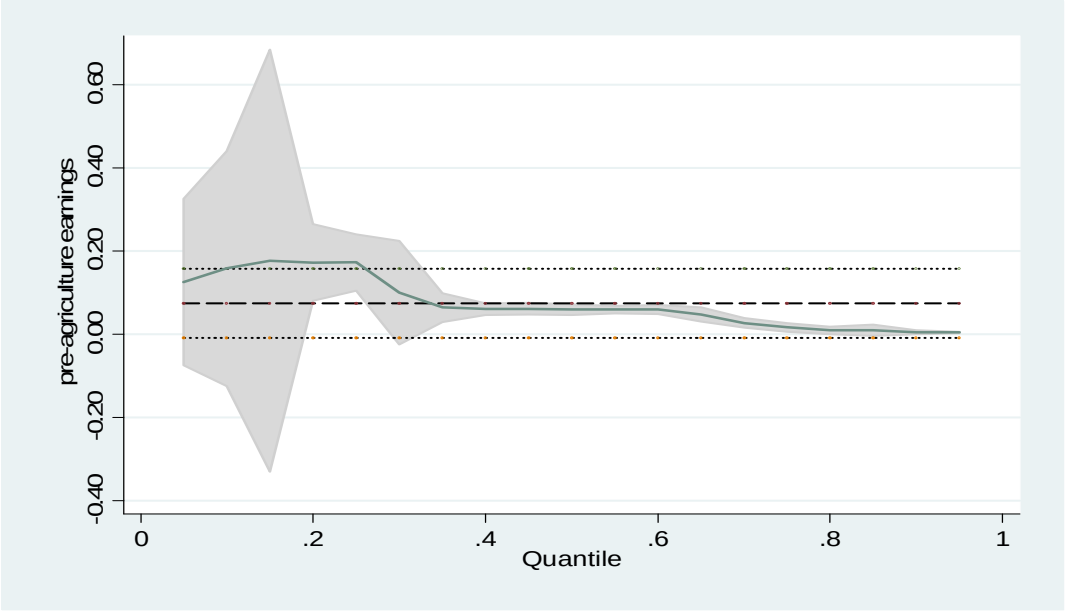
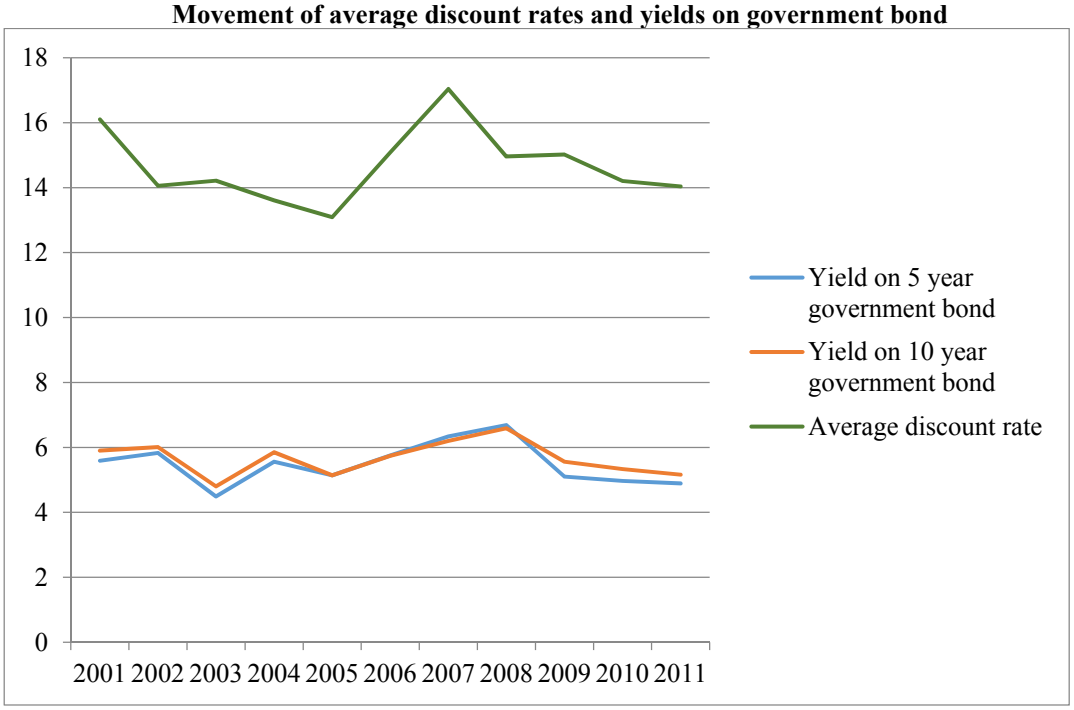


Figure 3.3
The OLS and quantile regression estimates – pre-agriculture earnings and agriculture losses



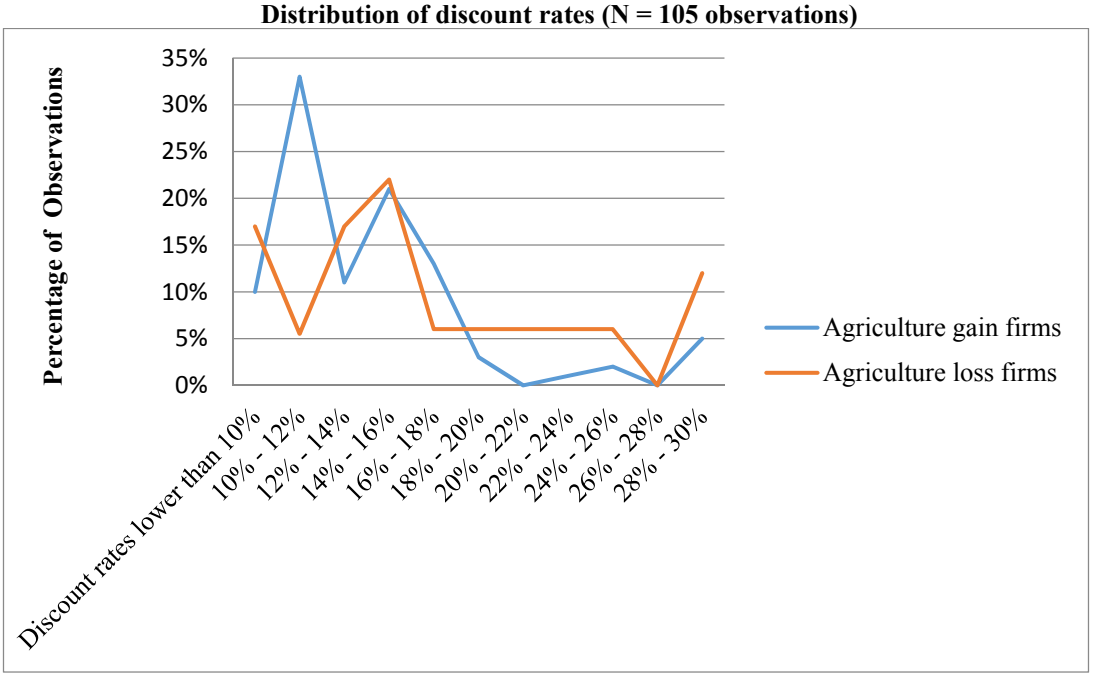
The horizontal axis depicts agriculture gains quantiles in Figure 3.2 (agriculture losses in Figure 3.3) whereas the vertical axis in each panel reports the coefficients on pre-agriculture earnings. In each figure, the bold dotted line represents the OLS coefficient estimate for pre-agriculture earnings and fine dotted lines depict the 90% confidence interval for the OLS estimate. The curved line reports the quantile regression coefficient estimates for pre-agriculture earnings corresponding to various agriculture gains quantiles in Figure 3.2 (agriculture losses quantiles in Figure 3.3) and the shaded band represents the 90% confidence interval for the quantile regression estimates.

Figure 3.4
Movement of average discount rates and yields on government bond



The horizontal axis represents the years whereas the vertical axis represents the range of discount rates/yields on government bond.

Figure 3.5
Distribution of discount rates (N = 105 observations)



The horizontal axis represents the percentage of observations whereas the vertical axis represents the range of discount rates adopted by sample firms to estimate fair value of biological assets.

Chapter 4

(Paper Three)

Fair Value Accounting and Gains from Biological Assets: Executive pay-sensitivity and the Role of Corporate Governance

ABSTRACT

The international accounting standard that governs reporting for biological assets allows management discretion in determining reported fair value of biological assets on the balance sheet. Unrealised gains or losses arising from changes in fair value of biological assets are recognised in the income statement. In this paper, I examine whether executive remuneration, in particular executive bonus, is less related to unrealised agriculture gains than it is to other realised components of earnings. I also examine whether corporate governance plays an effective role in restraining the opportunistic use of discretion around the fair value rules for biological assets. Using Australian data, I find that executive bonus is not related to unrealised agriculture gains. The result is consistent with the explanation that boards of directors distinguish realised earnings from unrealised earnings and reward executives for realised earnings only. I also find that unrealised gains are smaller and less associated with pre-agriculture earnings when female directors are present, suggesting that a gender-diverse board is more able to monitor opportunistic behaviour.

Key words: fair value accounting, agriculture gains, executive bonus, corporate governance

4.1 INTRODUCTION

International Accounting Standard (IAS) 41, *Agriculture*, prescribes biological assets to be measured at fair value. Any changes in the fair value of biological assets are included in the income statement as gains or losses regardless of whether the biological assets have been harvested and sold. The fair value of biological assets is determined by market value, with managerial estimates used as an alternative measure when active markets are not available. There is capacity in the standard for management discretion in determining the value of biological assets. For example, if an entity has access to different active markets, IAS 41 allows the entity to choose the most relevant one (IAS 41, sec. 17). If information from active markets suggests different conclusions as to the fair value of a biological asset, the entity uses its own discretion in reporting the most reliable estimate of fair value (IAS 41, sec. 19). If an active market does not exist, IAS 41 requires management to determine an appropriate discount rate and the expected net cash flows, in order to calculate the estimated value of a biological asset (IAS 41, sec. 20).

Critics of IAS 41 claim that the capacity of discretion, together with the recognition of unrealised gains or losses on biological assets, allows opportunistic behaviour (IASC, 1996; 1998; 2000; IASB, 2012; Elad, 2004; Herbohn, 2006; Herbohn & Herbohn, 2006; Whittington, 2008; Elad & Herbohn, 2011, Fischer & Marsh, 2013; Marsh & Fischer, 2013; Rozentale & Ore, 2013; Goncalves & Lopes, 2014).[46] This view is consistent with the empirical evidence documented in Chapter 3 (i.e. Paper 2) of this thesis, that managers have used the discretion provided in IAS 41 strategically to report gains or

[46] Debate on the implementation of IAS 41 is discussed in Chapter 1 (i.e. Introduction) in detail.

losses on biological assets (agriculture gains, hereafter)[47] that achieve desirable earnings targets.

There are two objectives in this paper. The first is to examine whether executive remuneration, in particular executive bonus, is related to agriculture gains. The second objective is to evaluate whether boards of directors play a monitoring role in determining the size of reported agriculture gains.

In relation to the first objective, this paper aims to examine whether agriculture gains are treated as regular income by remuneration committees. Research shows that executive remuneration is sensitive to accounting earnings (i.e. Sloan, 1993) and earnings-based bonus schemes are a popular means of rewarding managers. Studies which examine executive compensation show that managers will influence earnings to reach explicit bonus-linked targets for reported earnings. For example, the most widely recognised study, Healy (1985), finds that accrual policies selected by managers are related to the income-reporting incentives of their bonus contracts, and that changes in accounting procedures by managers are associated with the adoption or modification of their bonus plans. If directors do not understand the nature of agriculture gains, based on these results, I expect agriculture gains (as a component of reported earnings) to be related to executive bonus.

However, there is another stream of studies showing that directors will review the earnings and adjust compensation in certain circumstances. For example, Dechow et al. (1994) show that boards appear to filter out the effects of restructuring charges when

[47] This income effect is referred to as 'agriculture gains' since gains are more likely in the sample set of this study. Detail descriptive statistics are presented in Table 4.2.

setting cash compensation. Gaver and Gaver (1998) find different compensation sensitivity for reported gains versus losses. Agriculture gains are highly discretionary especially when active markets are not available. Even without management discretion, agriculture gains can be highly uncertain and are not realised in cash flows until future periods. Including agriculture gains in a performance measure for bonus determination may lead to executive bonus overpayment, which arises when managers are paid for expected future cash flows that fail to materialise (Watts, 2003; Barclay et al., 2005; Leone et al., 2006). As pointed out by the popular press (Lublin & Forelle, 2004; Dvorak & Ng, 2006), companies find it difficult to recover bonuses from executives because employment contracts and bonus policies often do not include forfeiture language related to accounting restatements.[48] This phenomenon is defined as the *ex post* settling up problem in Fama (1980). If directors understand the nature of agriculture gains, these results suggest that they could mitigate the *ex post* settling up problem by distinguishing unrealised agriculture gains from other realised earnings and placing less weight on agriculture gains when compensating executives.

In relation to the second objective, this paper aims to examine whether corporate governance mechanisms are an effective means of restraining the opportunistic use of management discretion around the fair value rules for biological assets. Corporate governance provisions, such as greater board independence, ensuring diversity in key leadership roles, optimising board functional size, and the creation of board oversight

[48] Dvorak and Ng (2006) provide anecdotal evidence of boards' failures to reclaim overpaid CEO bonuses. "In April 2001, directors of utility FPL Group Inc. faced a sticky problem. A few months earlier, they'd awarded top executives $62 million in bonuses linked to a merger that would have created the US's biggest electric company. Now the deal had fallen apart and shareholders were clamouring to get the money back. FPL directors scrutinized payment plans. They clashed with executives. Shareholders sued. After three years and millions in legal bills, executive returned $9 million, based largely on a technicality. Insurers paid another $12.5 million."

committees, have developed as effective means of mitigating potential conflicts of interest between managers and owners (known as agency problems), and associated costs (Jensen & Meckling, 1976; Shleifer & Vishny, 1997; Ahmed & Henry, 2012). Although IAS 41 provides ample opportunity for managers to use their discretion in an opportunistic manner, the extent to which the opportunity is taken is affected by many factors. Among them, the effectiveness of corporate governance mechanisms is essential (Klein, 2002; Peasnell et al., 2005; Bergstresser & Philippon, 2006; Waweru & Riro, 2013). If directors are more independent, competent enough to make professional judgements and willing to question accounting policies, the extent of management discretion should be reduced. This study investigates several aspects of corporate governance that represent a board's ability to monitor management discretion. These include board independence, CEO tenure, gender diversity of the board, and institutional ownership.

The empirical analysis of this study is based on data from all agricultural businesses listed on the Australian Securities Exchange (ASX) in the period from 2001 to 2011. I find that bonuses paid to executives are not determined by the level of agriculture gains. This is consistent with the *ex post settling up hypothesis* proposed by Fama (1980) and Leone et al. (2006) that boards of directors attempt to reduce potential costly *ex post* settling up by limiting cash payments for unrealised earnings. In addition, the extent of management discretion is found to be lower when female directors are present on the board, consistent with other findings that a gender-diverse board allocates more effort to monitoring (Adams & Ferreira, 2009; Labelle et al., 2010; Gul et al., 2011; Srinidhi et al., 2011; Gul et al., 2013; Arun et al., 2015; Cumming et al., 2015; Bøhren & Staubo, 2016).

This paper contributes to the accounting literature in two ways. First, unlike prior studies that focus mainly on the implications of IAS 41 from a conceptual standpoint (Elad, 2004; Fischer & Marsh, 2013; Hitz, 2007; Marsh & Fischer 2013), this paper broadens the debate on fair value agriculture accounting to issues such as executive pay-sensitivity, and the monitoring role of the boards of directors. This investigation is especially important given the concerns about management discretion and fair value reliability raised by prior studies (Elad, 2004; Herbohn & Herbohn, 2006; Elad & Herbohn, 2011; Fischer & Marsh, 2013; Marsh & Fischer, 2013; Rozentale & Ore, 2013; Stonciuviene et al., 2015). The findings of this study show that executive compensation contracts are effective, adding to the evidence that boards of directors adjust compensation to prevent executives from engaging in opportunistic behaviour (Dechow et al., 1994; Gaver & Gaver, 1998).

Second, gender diversity of the board has attracted increasing attention from regulatory bodies around the world. For example, the Higgs Report (Higgs, 2003) in the UK argues that gender diversity could enhance board effectiveness, and recommends that firms draw more actively from professional groups in which women are better represented. Sweden proposes a legal requirement that 25% of board seats be taken by women. Norway required 40% female representation by the end of 2008 while Spain required 40% female representation by the end of 2015. In Australia, the ASX Corporate Governance Council also recommends that listed firms have a gender diversity policy and disclose how the objectives for achieving gender diversity are assessed (Rec. 1.5, ASX, 2014). The current study provides evidence of a substantive effect of gender diversity by showing that the level of management discretion in relation to fair value measurements in the agriculture sector appears to be lower when female directors are

included on boards. This finding supports the corporate governance reform suggested by the worldwide regulatory bodies of including women on boards.

The rest of the paper is organised as follows: Section 4.2 reviews the related literature and develops the hypotheses. Section 4.3 details the research design while Section 4.4 describes sample selection. Sections 4.5 and 4.6 present the empirical results and a number of robustness tests. Finally, Section 4.7 summarises and concludes the study.

4.2 RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

4.2.1 Executive compensation contracts and performance measures: related studies

Agency theory (Berle & Means, 1932; Jensen & Meckling, 1976) proposes that executive compensation contracts are designed to address conflicts of interest between shareholders and management by providing managers with incentives to exert effort. Using a performance measure that captures an agent's contribution to a firm in an executive compensation contract improves the efficiency of the contract (Holmstrom, 1979; Gjesdal, 1981). The 'perfect' performance measure for executives, as suggested by Holmstrom (1979), is executives' personal contributions to the value of the firm (Murphy, 2013), which includes the effect that the executives have on the performance of others in the organisation, and the effect that the executives' actions in the current year have on performance in future periods. Nevertheless, executive contribution to firm value is rarely directly measurable because the available measures will inevitably exclude ways that executives create value, and include the effects of factors not due to the efforts of the executives, or fail to reveal ways that the executives destroy value

(Murphy, 2013). Thus, the challenge in designing executive compensation contracts is to select effective performance measures that capture important aspects of executives' contributions to firm value.

While firms use a variety of financial and non-financial performance measures in their executive compensation contracts, almost all firms rely on some earnings-based performance measures to evaluate and reward executives (Murphy, 1999; 2013). The accounting literature in this area has provided a rich portrait of the role of earnings-based performance measures in executive compensation contracts (Murphy, 1985; Lambert & Larcker, 1987; Sloan, 1993; Baber et al., 1996; Baber et al., 1998; Bushman & Smith, 2001; Ittner et al., 2003; Frye, 2004; Chalmers et al., 2006; Merhebi et al., 2006; Matolcsy & Wright, 2007; 2011; Ozkan et al., 2012; Murphy, 2013; Rhodes, 2016). There is evidence of widespread, explicit use of earnings-based performance measures in annual bonus plans and in long-term performance plans of corporate executives. The implicit use of earnings-based performance measures in the board of directors' evaluation and compensation of executives is supported by a robust, positive statistical relation between earnings measures and various measures of executive pay (Bushman & Smith, 2001). For example, using US data, Murphy (1985) finds that executive remuneration is statistically associated with firm performance measured as shareholder return and sales growth. Lambert and Larcker (1987) find a positive association between the cash compensation of CEOs and their firms' contemporaneous earnings performance. Using Australian data, Merhebi et al. (2006) find that, in every respect, the Australian evidence is consistent with international findings. In particular, CEO pay-performance association is positive and statistically significant.

4.2.2 Executive pay-sensitivity to agriculture gains

The widespread use of earnings-based performance measures in executive compensation contracts has prompted concerns that executives may select real earnings management techniques and accounting procedures to maximise their interests, irrespective of the impact on the economic wellbeing of the firm (Watts & Zimmerman, 1986; Kaplan & Atkinson, 1989). These concerns are supported by a large number of studies (Healy, 1985; Watts & Zimmerman, 1986; Balsam, 1998; Bergstresser & Philippon, 2006; Shuto, 2007; Bhattacharyya et al., 2008). For example, in his pioneering empirical paper, Healy (1985) hypothesises that earnings management differs as a function of whether the manager expects earnings to be (i) below the lower bound required to earn any bonus, (ii) above the upper bound after which no further increases in bonuses are obtained, or (iii) between the lower and upper bounds. Healy finds that a strong association between total accruals (his proxy for earnings management) and managers' income-reporting incentives under their bonus contracts. Managers are more likely to choose income-decreasing accruals when their bonus plan upper or lower bounds are binding, and income-increasing accruals when these bounds are not binding. Balsam (1998) finds a positive association between executive cash compensation and positive discretionary accruals, and interprets this as evidence of pay-for-performance. Bhattacharyya et al. (2008) show that executive compensation is positively associated with earnings retention while negatively associated with dividend payout. By examining the latitude managers have to manipulate earnings by recognising unrealised gains from asset securitisations, Dechow et al. (2010) find that boards of directors consider unrealised gains from asset securitisations as normal revenues and thus no adjustment is made to executive bonuses.

While firms reward managers largely based on earnings-based performance measures, a number of studies show that boards of directors will review the earnings and adjust compensation in certain circumstances. For example, Lambert and Larcker (1987) test whether the weight placed on earnings versus returns is a function of their relative signal-to-noise ratios. Their results show that firms place relatively more weight on market performance than on earnings performance in compensation contracts for situations in which (i) the variance of the accounting measure of performance is high, (ii) the firm is experiencing high growth rates in assets and sales, and (iii) the value of a manager's personal holdings of his or her firms' stock is low. Dechow et al. (1994) examine whether remuneration committees adjusted compensation to prevent executives from engaging in opportunistic behaviour, and find that executive cash compensation is adjusted for restructuring charges. Investigating pay-sensitivity to gains versus losses, Gaver and Gaver (1998) find that gains flow through to compensation but losses do not. Consistent with boards of directors exercising discretion to reduce potential costly *ex post* settling up in cash compensation paid to executives, Leone et al. (2006) find that executive cash compensation is twice as sensitive to negative stock returns as it is to positive stock returns.

This study examines whether executive bonus is sensitive to agriculture gains reported in the income statement. Executive bonus is examined because basic salary is usually fixed whereas executive bonus is determined by remuneration committees based on both financial and non-financial performance measures (Murphy 1999; 2013). Reported earnings is known as one of the financial performance measures that would be considered when determine executive bonus. Considering that agriculture gains are unrealised, effective compensation contracts should mitigate the potential *ex post*

settling up problem by limiting cash distributions to managers for agriculture gains that may not be realised later. If remuneration committees reward managers immediately with cash for agriculture gains, but those agriculture gains are not realised later, shareholders would be most unlikely to recover the cash paid if a manager has left the firm (Murphy 1999; 2013). Under the assumption that boards of directors aim to implement firm value-maximising executive compensation contracts, I conjecture that remuneration committees should separate unrealised agriculture gains from pre-agriculture earnings (i.e. earnings before recognising agriculture gains) and only compensate managers for pre-agriculture earnings. This leads to the first hypothesis:

H1: The level of executive bonus is not associated with agriculture gains.

4.2.3 The effectiveness of corporate governance in monitoring management discretion

Effective corporate governance helps to reduce the opportunities that management has to pursue its own interests at the expense of owners (Jensen & Meckling, 1976; Shleifer & Vishny, 1997). The need for effective corporate governance partly arises because of the latitude managers have in applying accounting standards, and conflicts of interest may occur between managers and owners. In recognition of the important role of corporate governance, many countries have introduced corporate governance regulations and guidelines that specify particular characteristics for corporate governance mechanisms (Neesen, 2003; He et al., 2009; Brown et al., 2011). These regulations and guidelines include the Sarbanes-Oxley Act in the United States, the Cadbury Report in the United Kingdom, and in Australia the Principles of Good Corporate Governance and Best Practice Recommendations (PGCG) and the Corporate

Law Economic Reform Program Act (CLERP 9). In 2010, the Australian Government's Corporations and Markets Advisory Committee (CAMAC) also issued a report, *Guidance for Directors*, which implicitly backs the Cadbury Report's view on the control and reporting functions of boards, and on the role of auditors (CAMAC, 2010).

Empirical evidence has also emerged of a direct association between corporate governance and accounting practice, such that firms with effective corporate governance produce higher quality financial reports. For example, Ahmed and Duellman (2007) find a strong positive (negative) relation between conservatism and the percentage of outside directors (inside directors) on the board. Using a large sample of US firms, Garcia Lara et al. (2009) find that strong (weak) governance firms exhibit a higher (lower) degree of conditional conservatism. In Australia, Beekes and Brown (2006) and Beekes et al. (2016) find that better governed firms disclose more information to the securities market. Kent and Stewart (2008) also find that better governed firms disclose more information in annual reports after the adoption of the International Financial Reporting Standards (IFRS). Using managerial discretionary accruals as a measure of reporting quality, a number of studies find that greater board or audit committee independence are negatively associated with discretionary accruals (Davidson et al., 2005, Koh et al., 2007; Kent et al., 2010). By examining the relation between voluntary adoption of selected corporate governance mechanisms and accounting conservatism, Ahmed and Henry (2012) find that voluntary audit committee formation, increasing board independence, and decreasing board size are positively associated with unconditional conservatism and are negatively related to the degree of

conditional conservatism.[49] Overall, the literature shows that corporate governance plays an effective role in improving corporate reporting quality.

Building on this literature, I examine whether corporate governance is an effective means to restrain management discretion and thus monitor fair value reliability. In particular, the study examines four corporate governance attributes that represent a board's ability to monitor the opportunistic use of discretion. They are board independence, gender diversity of the board, CEO tenure, and institutional ownership.

Board independence

One governance mechanism available for shareholders to monitor executive performance and reporting choices is the board of directors they elected. Yet, as has been recognised since Smith (1776), and Berle and Means (1932), directors' interests may not be fully consistent with those of shareholders. To make boards work better, one recommendation that has been increasingly suggested by public and private decision-makers is to have independent boards (Hermalin & Weisbach, 2003; Gordon, 2007; Bebchuk & Weisbach, 2010). Weisbach (1988) explains that independent directors can incur reputation costs when they are not accountable to shareholders, which gives them incentives to monitor managerial behaviour carefully. In support of this view, Beasley (1996) and Persons (2006) show that the higher the proportion of independent directors on the board, the lower the likelihood of financial and non-financial reporting fraud respectively. Klein (2002) and Hutchinson et al. (2008) show

[49] Accounting conservatism refers to the downward biasing of the book value of shareholders' equity and earnings. Conditional (or news-dependent) conservatism requires stricter verification requirements for good news relative to bad news resulting in more timely recognition of losses compared to gains. Unconditional (or news-independent) conservatism refers to the systematic understatement of book value or earnings that is applied prior to a related new release (Ahmed & Henry, 2012).

that board independence is associated with lower levels of earnings management. Ahmed and Henry (2012) find that board independence is positively associated with the extent of unconditional accounting conservatism. Circumventing the endogeneity issues faced by corporate governance studies by demonstrating the strong impact of the local director labour market on board composition, Knyazeva et al. (2013) support the extant literature that independent boards serve a valuable monitoring role.

Following the literature, I conjecture the next hypothesis. First, if a higher level of board independence is associated with a lower level of earnings management, independent directors should be able to influence the size of agriculture gains by questioning the measurements or assumptions adopted by managers. In this case, management is less likely to exercise disrection in an opportunistic manner, and thus a negative association should be observed between agriculture gains and the level of board independence assuming that the actual earnings performance is constant. Further, if capacity for opportunistic behaviour is limited when board independence is higher, the association between agriculture gains and pre-agriculture earnings documented in Chapter 3 (i.e. Paper 2) should be weaker.[50] This leads to the second hypothesis:

H2(a): Agriculture gains are smaller for firms with a higher level of board independence.

[50] Parts of the literature support the argument that better corporate governance leads to better corporate performance and thus generates higher agriculture gains (i.e. a positive association). However, this paper looks at whether corporate governance is effective in constraining management discretion. Thus, an earnings management perspective is adopted in develping hypotheses. I predict a negative association between board independence and agriculture gains based on the assumption that better corporate governance prevents and constrains opportunistic behaviour. This assumption applies to the development of remaining hypotheses in this paper.

H2(b): The association between agriculture gains and pre-agriculture earnings is weaker for firms with a higher level of board independence.

Gender diversity of the board

In the psychological and management behaviour literature, it has long been acknowledged that females act differently from males (Johnson & Powell, 1994; Sunden & Surette, 1998; Byrnes et al., 1999; Schubert, 2006; Croson & Gneezy, 2009). For instance, studies suggest that women are generally more risk averse (Eckel & Grossman, 2008) and less keen on being exposed to competition (Gneezy et al., 2003; Hogarth et al., 2012). Females are also found be more sensitive to ethical issues than their male counterparts (Bernardi & Arnold, 1997). These differences are reflected in their financial decision-making (Jianakoplos & Bemasek, 1998), but do not affect their ability to perform (Powell & Ansic, 1997).

Because these differences in attitude between females and males may have potential implications for corporate governance, the issue of gender diversity has begun to receive increasing attention in corporate goverance literature. A review of the literature by Terjensen et al. (2009, p.320) indicates that gender diversity is "about improving corporate governance through better use of the whole talent pool's capital". Effective monitoring requires boards with diverse skills, experience, expertise, and knowledge (Hillman & Dalziel, 2003). Gender diversity, consequently, adds to the demographic and professional diversity of boards, which is necessary for the effective monitoring of

management. Adams and Ferreira (2009) also provide evidence that a gender-diverse board allocates more effort to monitoring.

With regard to the effect of gender diversity on financial reporting quality, MacLeod (2007) argues that women are more risk averse and more trustworthy, and are thereby less likely to engage in opportunistic behaviour than are men. Adams and Funk (2012) find that female directors care less about conformity, suggesting that they are more willing to question managerial behaviour than male directors. Using UK data, Arun et al. (2015) find that firms with a higher number of independent female directors are adopting restrained earnings management practices. These views are also supported by a number of studies in which a positive link is found between financial reporting quality and the presence of gender-diverse boards (Gul et al., 2011; Labelle et al., 2010; Srinidhi et al., 2011), gender-diverse audit committees (Thiruvadi & Huang, 2011), or gender diversity in senior management positions (Barua et al., 2010; Krishnan & Parsons, 2008; Peni & Vahaama, 2010).

Overall, the literature suggests that a gender-diverse board may affect managerial behaviour, and earnings management is more likely to appear when board members are risk-seeking and opportunistic. Consistent with the literature, if women are more conservative, contribute more effort to monitoring, and are less likely to exercise discretion in an opportunistic manner than men are, the financial reporting quality should be higher when female directors are present on the board. Thus, assuming that the actual earnings performance is constant, I conjecture that unrealised agriculture gains would be smaller when the proportion of female directors on the board is higher

and thereby the association between agriculture gains and pre-agriculture earnings is weaker. This leads to the third hypothesis:

H3(a): Agriculture gains are smaller for firms with a gender-diverse board.

H3(b): The association between agriculture gains and pre-agriculture earnings is weaker for firms with a gender-diverse board.

CEO tenure

Research suggests that CEOs have greater incentives to boost earnings in their early years of service than in their later years of service. This is because the market is usually uncertain about the ability of newly appointed CEOs (Gibbons & Murphy, 1992; Hermalin & Weisbach, 2012). To assess new CEOs' abilities, the market tends to rely on their current performances (Fama, 1980; Holmstrom, 1982; 1999; Hermalin & Weisbach, 2012). Thus, earnings reported currently become one of the important indicators of CEO ability. To avoid being labelled as having low ability, which may lead to dismissal, CEOs are likely to have strong incentives to overstate earnings in the early years of their service (Oyer, 2008). In contrast, CEOs in the later years of service are more concerned about protecting the reputation they have built (Diamond, 1989). The market would also assign less weight to current performance when assessing the ability of CEOs in their later years of service than it does to CEOs in their early years of service (Ali & Zhang, 2013). Thus, for CEOs who have long tenure, the benefits from managing reported earnings may be lower than the associated costs. Consistent with this argument, Ali and Zhang (2013) show that reported earnings are more likely to be overstated in the early years than in the later years of CEO service.

Consistent with the literature, if newly appointed CEOs care more about their abilities perceived by the market whereas longer-tenured CEOs care more about their reputation, I would expect that more discretion is used as CEOs decision horizons become shorter. In other words, CEOs, in their later years of service, have less incentive to exercise accounting discretion opportunistically. As a result, smaller agriculture gains should be observed, and the association between agriculture gains and pre-agriculture earnings should be weaker. This leads to the fourth hypothesis:

H4(a): Agriculture gains are smaller for firms with a longer-tenured CEO.

H4(b): The association between agriculture gains and pre-agriculture earnings is weaker for firms with a longer-tenured CEO.

Institutional investors

By virtue of their large stockholdings, Shleifer and Vishny (1986) argue that institutional shareholders would have more incentives to monitor corporate performance than small shareholders because the latter do not "have a big enough stake in the firm to absorb the costs of watching the management" (p.462). Other research also argues that institutional investors have more capacity and are more able to monitor corporate performance than individual investors because they have advantages over individual investors in acquiring and processing value-relevant information (Pound, 1988; Shiller & Pound, 1989; Jiambalvo et al., 2010). Consistent with these views, Bhojraj and Sengupta (2003) link institutional ownership to bond yields and bond ratings. They find that firms with greater institutional ownership enjoy lower bond

yields and higher ratings on their new bond issues. Using all publicly listed firms in Taiwan, Chiang et al. (2013) show that there is a negative relation between institutional ownership and the probability of a firm defaulting. Aggarwal et al. (2011) study the role of international institutional investment as a channel for promoting better governance. They find that firm-level governance is positively associated with international institutional ownership.

Consistent with the literature, if institutional investors play an active role in monitoring corporate performance, they should be able to identify and question the abuse of management discretion over agriculture gains by managers. As a result, smaller agriculture gains should be observed for firms with large institutional shareholders, and thus the association between agriculture gains and pre-agriculture earnings is expected to be weaker.

H5(a): Agriculture gains are smaller for firms with large institutional investors.

H5(b): The association between agriculture gains and pre-agriculture earnings is weaker for firms with large institutional investors.

4.3 RESEARCH DESIGN AND DESCRIPTIVE STATISTICS

4.3.1 The sensitivity of executive bonus to agriculture gains

To examine whether agriculture gains are treated as regular income or whether remuneration committees place less weight on this earnings component when

determining bonuses, reported earnings are decomposed into agriculture gains and pre-agriculture earnings as presented in Eq. (1).[51]

$$EARN_{it} = PREFV_{it} + \Delta FV_{it} \quad (1)$$

here, subscript i and t denote firm and year, respectively. $EARN_{it}$ denotes after-tax operating earnings (before extraordinary items and discontinued operations) of firm i in year t, deflated by average assets. ΔFV_{it} denotes agriculture gains measured by the changes in fair value of biological assets of firm i in year t, deflated by average assets. $PREFV_{it}$ denotes the pre-agriculture earnings derived by deducting ΔFV_{it} from $EARN_{it}$.

I then regress executive bonus on the two earnings components because reported earnings are a typical financial performance measure for executive bonus. An Ordinary Least Squares (OLS) regression is used, pooling the cross-sectional and time series data as presented in Eq. (2).

$$\begin{aligned} lnBONUS_{it} = {} & \alpha_1 + \alpha_2 \Delta FV_{it} + \alpha_3 PREFV_{it} + \alpha_4 RETURN_{it} + \alpha_5 lnASSET_{it} \\ & + \alpha_6 COMMITTEE_{it} + \alpha_7 BSIZE_{it} + \alpha_8 OUTSIDER_{it} \\ & + \alpha_9 EXEOWN_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

in Eq. (2), the dependent variable is the natural logarithm of executive bonus (*lnBONUS*) of firm i in year t. A logarithmic transformation is performed to account for the fact that pay is positively skewed (Conyon & He, 2011; Cordeiro et al., 2013). If remuneration committees distinguish agriculture gains from pre-agriculture earnings, and only reward executives for pre-agriculture earnings, coefficient α_2 will be insignificant and α_3 will be positive and significant.

[51] The decomposition here is to determine the role of agriculture gains in influencing executive bonus. This study does not attempt to compare the weighting of agriculture gains with that of pre-agriculture earnings in determining executive bonus.

Other than accounting-based performance measures, directors may also consider market-based performance measures when rewarding executives (Murphy, 1985; Jensen & Murphy, 1990). Thus, market adjusted monthly returns on investment (*RETURN*) are controlled for. In addition, firm size may also be important in shaping executive pay since an effective managerial labour market will assign more talented executives to higher positions in the corporate hierarchy. Pay may rise more steeply with company size because large firms require better managers (Conyon, 1997). To control for this impact, the natural logarithm of assets (*lnASSET*) is included in Eq. (2) for firm size.

There have been claims that corporate governance is also important in shaping executive pay (Williamson, 1985; Conyon, 1997; Young et al., 2008; Conyon & He, 2011; Dicks, 2012; Reddy et al., 2015). For example, it is found that an independent remuneration committee is the appropriate forum for considering the appropriate design of the reward structure for executives (Conyon, 1997). An absence of this committee would "appear to allow executives to write their own contracts with one hand and sign them with the other" (Williamson, 1985, p. 313). It is also found that firms with more independent directors on the board have a higher pay-for-performance link (Conyon & He, 2011). Further, when major shareholders are also executives of the company itself, although shareholders have the power to supervise executives effectively and compensate them accordingly, shareholders may also have an incentive to connive with those executives, reducing the effectiveness of monitoring (Young et al., 2008; Renders & Gaeremynck, 2012; Baixauli-Soler & Sanchez-Marin, 2015). In addition, board size is found to be associated with executive pay. Executives are more likely to receive lower

levels of performance-based incentives when board size is small (Yermack, 1995; Coakley & Iliopoulou, 2006; Petra & Dorata, 2008).

To control for the impacts on executive pay mentioned above, four corporate governance attributes are also included in the regression. They are the existence of a remuneration committee (*COMMITTEE*), which is an indicator variable that takes the value of 1 if the firm has a remuneration committee, and otherwise zero; board size (*BSIZE*), measured by the number of directors on the board; independent directors (*OUTSIDER)*, measured by the percentage of independent directors on the board; and executive ownership (EXEOWN), measured by the percentage of ownership held by executive directors. ε_{it} is the mean zero disturbance term.

4.3.2 The role of corporate governance

Board independence, gender diversity of the board, CEO tenure, and institutional ownership are each examined to see if they play an effective role in restraining management discretion. Board independence (*OUTSIDER*) is measured by the percentage of independent directors on the board. Gender diversity (*FEMALE*) is an indicator variable, taking a value of 1 if there is a female who sits on the board, and 0 otherwise. CEO tenure (*TENURE*) is measured by the number of years the CEO has served the firm as a CEO while institutional ownership (*INOWN*) is measured by the percentage of ownership held by institutional shareholders.

The two earnings components, agriculture gains and pre-agriculture earnings, are usually independent from each other. However, if managers have the desired level of earnings they would like to report, they may adjust the reported agriculture gains depending on the level of pre-agriculture earnings. Thus, I regress agriculture gains (*ΔFV*) on pre-agriculture earnings (*PREFV*), one of the four corporate governance attributes (*CG*), and their interaction term. The OLS regression is presented below:

$$\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 CG_{it} + \alpha_4 (CG_{it} \text{ x } PREFV_{it})$$

$$+ \alpha_5 INDUST\_\Delta FV_{it} + \alpha_6 IND_{it} + \alpha_7 LEV_{it} + \varepsilon_{it} \quad (3)$$

If managers report larger agriculture gains when pre-agriculture earnings are lower, α_2 would be negative. If better governed firms report lower agriculture gains, α_3 is expected to be negative for *H2(a)*, *H3(a)*, *H4(a)*, and *H5(a)*. Whether the examined corporate governance attributes are able to monitor management discretion is indicated by α_4. If managers in better governed firms are less likely to exercise discretion to influence the size of agriculture gains, agriculture gains should be independent from pre-agriculture earnings. Thus, α_4 should be positive and be able to offset the negative α_2. To examine the effectiveness of corporate governance, an *F*-test is conducted to determine whether $\alpha_2 + \alpha_4 = 0$. An insignificant *F*-statistic suggests that the specific corporate governance attribute eliminates the smoothing between agriculture gains and pre-agriculture earnings (i.e. *H2(b)*, *H3(b)*, *H4(b)*, and *H5(b)*).

Control variables are the median level of agriculture gains in the industry (*INDUST_ΔFV*), whether or not independent appraisal estimates are adopted (*IND*), and leverage (*LEV*). *INDUST_ΔFV* reflects the agriculture gains reported by firms in the industry and is measured by the median level of agriculture gains deflated by average

assets in the industry by year, where industries are defined at the eight-digit Global Industry Classification Standard (GICS) codes level.[52] A positive association is expected between *INDUST_ΔFV* and *ΔFV* due to common economic factors affecting all firms in the industry. *IND* is included as a control because fair value determination in Australia agricultural sector often involves independent external valuers (Elad & Herbohn, 2011). It is expected that independent external valuers can provide objective estimations on the fair value of biological assets. To control for risk, *LEV* is also included in the OLS regression.

4.4 SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

The initial sample of this study comprises all ASX listed firms that held biological assets in the period from 2001 to 2011. This includes 46 listed agribusinesses and 338 firm-year observations. Due to the change in accounting standards from Australian Accounting Standards Board (AASB) 1037, *Self-Generating and Regenerating Assets* (SGARA),[53] to AASB 141, *Agriculture*,[54] after 1 July 2005, only observations that fall within the definition of biological assets in both standards are included in the analyses.[55] This procedure reduces the sample to 333 firm-year observations. Further reductions

[52] Since agricultural products in agriculture are very diverse in nature, defining observations at the eight-digit GICS code level enables the author to group agricultural products of a similar nature together, so that *INDUST_ΔFV* in each group truly reflects the median level agriculture gains for products of a similar nature.

[53] AASB 1037 was developed and became operative in Australia for reporting periods beginning on or after 30 June 2001. It was the first standard in the world to apply fair value accounting to the agriculture sector. IAS 41/AASB 141 is highly consistent with its predecessor AASB 1037 in most respects. Detailed discussion is provided in Chapter 1 of the thesis.

[54] AASB 141 is the Australian equivalent of IAS 41. For consistency, IAS 41 is used throughout the paper.

[55] For instance, blood cells or viruses for medical experiments or living animals for racing are treated as biological assets under AASB 1037 but not under AASB 141. These observations are removed from the sample.

result from the use of historical cost[56] and missing values of variables. The final sample includes 261 firm-year observations obtained either from the DatAnalysis Premium or hand-collected. Details for sample selection are presented in Table 4.1. Panels A and B delineate the sample selection process and the distribution of observations over the years. Panel C shows the industry composition and the frequency of firm-year observations by the GICS codes. Panel D shows the valuation measurement used by firms to determine the fair value of biological assets. As shown, 31% of the observations use market-determined prices whereas nearly two-thirds of the observations (63.7%) use managerially estimated fair value. Some sample firms use both measurement attributes because they operate in multi-industries (5.4%).

[Insert Table 4.1 here]

As presented in Panel A of Table 4.2, 151 firm-year observations use the earnings-based bonus scheme. Each indicates a generality about how the bonus is determined mainly on financial measures of performance. Noting some extreme values, the winsorisation technique (covering the top 1% of values to the 99th-percentile and the bottom 1% to the 1st-percentile) is employed to ensure that extreme values do not bias the results.[57] As presented, the average executive compensation (*COMP*) including bonus is $3.81 million. Total bonus paid to executives, on average, is $0.69 million, and is weighted to 18% of the total compensation. Consistent with the literature, both *COMP* and *BONUS* are skewed right confirming that it is appropriate to undertake a logarithmic

[56] IAS 41 allows an entity to rebut the presumption that fair value can be determined for all agricultural assets. Historical cost is permitted in cases where fair value cannot be determined reliably.

[57] The results are largely consistent when I delete these observations or do not employ the winsorisation technique.

transformation (Conyon & He, 2011; Cordeiro et al., 2013). Both *ΔFV* and *PREFV* have a positive mean. The relatively smaller mean of 0.008 for *PREFV* compared with the standard deviation (0.116) shows that there is substantial variation in *PREFV* across firms and over the years. Agribusinesses included in the sample set generate an average return on investment of 4.6%. The descriptive statistics on the corporate governance variables show that the average board size is six. Among them, 58% are independent directors.

Panel B of Table 4.2 shows the correlations between variables. *BONUS* is positively correlated with *PREFV* while negatively correlated with *ΔFV*. In line with previous studies, firm size (*lnASSET*) and the number of board members are correlated with the level of executive bonus. *ΔFV* appears to be lower when *PREFV* is higher. Some of the corporate governance variables are correlated at statistically significant levels which may indicate the presence of multicollinearity (Banghøj et al., 2010). Thus, a robustness check is undertaken, as reported in Section 4.6.1, to see if the main results are affected by the presence of multicollinearity.

[Insert Table 4.2 here]

Panel A of Table 4.3 provides descriptive statistics on variables examined in Eq. (3). As presented, 54% of board members are independent directors while 20% are female directors. The average CEO tenure is seven years while 34% of shares are held by institutional investors. The descriptive statistics reveal significant variance in all the corporate governance attributes between firms. Panel B of Table 4.3 provides correlations between variables. Agriculture gains are higher when pre-agriculture

earnings are lower, but the corporate governance attributes are not correlated with agriculture gains. Higher pre-agriculture earnings are reported when more independent directors are present on the board, and when the CEO has served the firm for a long period.

[Insert Table 4.3 here]

4.5 EMPIRICAL RESULTS

4.5.1 Executive pay-sensitivity to agriculture gains

The results of the OLS regression, presented in Table 4.4, show that the coefficient on agriculture gains, α_2, is negative but not significantly different from zero. In contrast, the coefficient of pre-agriculture earnings, α_3, is positive and significant at the 1% level. In line with expectations, executive bonus is not associated with agriculture gains even though it is part of reported earnings. With regard to control variables, return on investment does not seem to be considered when deciding executive bonus pay in the agricultural sector. Firm size and executive ownership are positively associated with executive bonus at the 1% and 5% significant levels respectively. Owing to the small sample size, standard errors are clustered by firm only.[58]

The same model is rerun for CEO bonus specifically to see if CEO bonus is influenced by the level of agriculture gains. Although the coefficient of agriculture gains is now

[58] When there are only a few clusters in time, clustering by the more frequent cluster (i.e. firm) yields results that are almost identical to clustering by both firm and time (Pertersen, 2009).

positive, it is not significantly different from zero. Thus, CEO bonus does not appear to be affected by agriculture gains. Overall, the findings indicate that agriculture gains are not treated as regular income by agricultural firms. Boards of directors will distinguish unrealised agriculture gains from pre-agriculture earnings and reward executives for pre-agriculture earnings only. These findings are consistent with boards of directors implementing firm value-maximising executive compensation contracts. Thus, *H1* is supported.

[Insert Table 4.4 here]

4.5.2 The role of corporate governance

Table 4.5 presents the regression results concerning the monitoring role of corporate governance in management discretion. The coefficient α_2 is negative and significantly different from zero across all regressions, indicating that managers use the discretion allowed under IAS 41 opportunistically in order to achieve desired goals. The coefficient α_3 indicates whether lower agriculture gains are more likely to be reported for firms with a higher level of board independence, a gender-diverse board, a longer-tenured CEO, and large institutional investors. Of the four corporate governance attributes, only gender diversity appears to affect the size of agriculture gains. Thus, *H3(a)* is supported whereas *H2(a)*, *H4(a)* and *H5(a)* are not.

The *F*-test is then undertaken to see if $\alpha_2 + \alpha_4 = 0$ for each of the examined corporate governance attributes. As shown, gender diversity is the only attribuite for which both α_2 and α_3 are significantly negative, α_4 is significantly positive, and the *F*-test does not

reject that $\alpha_2 + \alpha_4 = 0$. It suggests that when there is at least one female director, agriculture gains are smaller and less likely to smooth pre-agriculture earnings. Other corporate governance attributes do not appear to play a role in reducing the smoothing between agriculture gains and pre-agriculture earnings. Thus, *H3(b)* is supported whereas *H2(b), H4(b),* and *H5(b)* are not. Overall, Table 4.5 provides weak support for the effective role of corporate governance in restraining the opportunistic use of accounting discretion over agriculture gains by managers.

[Insert Table 4.5 here]

Considering that a composite meausre can do better in measuring the overall quality of a firm's corporate governance than a single corporate governance attribute does (Brown et al., 2011), a corporate governance composite index, *GOV*, is generated to summarise the four corporate governance mechanisms (Gompers & Metrick, 2003; Defond et al., 2005; Aldamen & Duncan, 2012). To compute the governance index, the individual attribute measures are transformed to a binary scale by allocating a value of 1 or zero based on the following principles:

- board independence – equal to 1 if more than 60% of directors on the board are independent directors, otherwise zero (60% is chosen because the PGCG recommends a majority of the board of a listed entity should be independent directors – rec. 2.4, PGCG, 2014);
- gender diversity – equal to 1 if there is a female director on the board, otherwise zero;
- CEO tenure – equal to 1 if above the median, otherwise zero;
- institutional ownership – equal to 1 if above the median, otherwise zero.

The four dichotomous variables are then summed to produce the index, which has a maximum value of 4 (strong governance) and a minimum value of zero (weak governance). The four corporate governance attributes are eqaully weighted in the index. Panel B of Table 4.6 shows that the aggregated level of corporate governance varies across firms from a minimum of zero to a maximum of 4 on the *GOV* index. The mean of *GOV* is 1.675, representing the average aggregated level of corporate governance of the sample firms (medium to weak). Largely consistent with the results reported for individual corporate governance attributes, Panel C of Table 4.6 shows that the aggregated level of the examined corporate governance attributes play limited role in constraining the size of agriculture gains and the smoothing between agriculture gains and pre-agriculture earnings.

[Insert Table 4.6 here]

4.6 ROBUSTNESS TESTS

4.6.1 Multicollinearity

As noted in Section 4.4, some of the corporate governance variables used in the pay-sensitivity regression (i.e. Eq. (2)) are correlated at statistically significant levels which indiate the presence of multicollinearity. To ensure the findings are not affected by multicollinearity, a robustness test is undertaken by excluding one corporate governance variable at a time. As presented in Table 4.7, the results of the reduced models remain similar to the reported results based on the full model.

[Insert Table 4.7 here]

4.6.2 Endogeneity

Equation (3) examines the role of corporate governance in monitoring management discretion, in which corporate governance attributes are assumed to be exogenous. However, if they are in fact endogenously determined, the OLS regression results might be misspecified.[59] The specific problem is potential correlation between the suspect endogenous variables and the error term, ε.

The most popular way of dealing with endogeneity is to identify a set of valid instruments for corporate governance and estimate the model consistent using the two-stage least squares (2SLS) approach. Due to the lack of data availability, underlying theories, or pure assumptions, a common approach is to use the lagged suspect endogenous corporate governance variables (by one or more periods) as instruments. However, Brown et al. (2011) argue that "this approach is unlikely to be credible due to the stickiness of corporate governance characteristics" (Brown, et al., 2011, p.108).

Some corporate governance studies use the generalised method of moments (GMM) to address endogeneity. For example, Ng (2005) and Cheng et al. (2012) use the GMM to estimate the relationship between ownership and performance. They argue that the GMM is better than the 2SLS method because the former does not require information of the exact distribution of the disturbances and it is robust to heteroskedasticity and/or autocorrelation of unknown form.

[59] Brown et al. (2011) and Larcker and Rusticus (2010) provide detail discussion on endogeneity issue in relation to corporate governance.

Consistent with Ng (2005) and Cheng et al. (2012), this study applies the GMM to examine whether the OLS regression results are affected by the endogeneity issue. The following system of simultaneous equations are estimated:

$$\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 OUTSIDER_{it} + \alpha_4 FEMALE_{it} + \alpha_5 TENURE_{it} + \alpha_6 INOWN_{it} + \alpha_7 LEV_{it} + \alpha_8 INDUST\_\Delta FV_{it} + \alpha_9 IND_{it} + \varepsilon_{it} \quad (4)$$

$$OUTSIDER_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 FEMALE_{it} + \alpha_5 TENURE_{it} + \alpha_6 INOWN_{it} + \alpha_7 LEV_{it} + \varepsilon_{it} \quad (5)$$

$$FEMALE_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 OUTSIDER_{it} + \alpha_5 TENURE_{it} + \alpha_6 INOWN + \varepsilon_{it} \quad (6)$$

$$TENURE_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 OUTSIDER_{it} + \alpha_5 INOWN_{it} + \alpha_6 LEV_{it} + \alpha_7 FEMALE + \varepsilon_{it} \quad (7)$$

$$INOWN_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 OUTSIDER_{it} + \alpha_5 TENURE_{it} + \alpha_6 LEV_{it} + \alpha_7 FEMALE_{it} + \varepsilon_{it} \quad (8)$$

In developing the system of equations, it is assumed that corporate governance attributes are interrelated with corporate performance (i.e. *ΔFV* & *PREFV*). In Eq. (4), agriculture gains (*ΔFV*), as part of the reported earnings, is expressed as a function of pre-agriculture earnings (*PREFV*), the four corporate governance attributes, leverage (*LEV*), the median level of agriculture gains in the industry (*INDUST_FV*), and the existence of independent appraisal (*IND*). These are all the variables used in Eq. (3) as presented in Table 4.5.

In Eq. (5), if board independence measured by the percentage of independent directors (*OUTSIDER*) is endogenous, firms with a gender-diverse board (*FEMALE*), good performance (*PREFV*, *ΔFV*), and high institutional ownership (*INOWN*) may appoint more independent directors. Equation (6) assumes the gender-diverse board (*FEMALE*) is endogenous, then the size of the board, the percentage of independent directors, the CEO tenure and the percentage of ownership held by institutions may affect the number of female directors on the board. Equation (7) assumes CEO tenure (*TENURE*) is endogenous, firm performance would directly affect the survival of the CEO at the firm. A higher proportion of independent directors creates a higher risk of CEO dismissal. The debt level of the firm (*LEV*) and institutional ownership may also affect CEO tenure. In Eq. (8), if institutional ownership is endogenous, firms with better performance and effective monitoring of board directors may attract more investment from institutions.

Table 4.8 shows the results of the regression of the simultaneous equations. It is found that *OUTSIDER* is interrelated with the two earnings components, gender diversity, and CEO tenure. Firms with good performance (*PREFV* and *ΔFV*) appear to appoint more independent directors. In addition, CEO tenure and gender diversity of the board are affected by the number of independent directors and vice versa.

Of particular interest is whether a gender-diverse board is interrelated with agriculture gains because it is the only corporate governance attribute found to be statistically significant in Eq. (3). The results of Eq. (4) and Eq. (6) show that the size of agriculture gains are affected by gender-diverse boards, but not vice versa. These results indicate

the endogeneity issue does not exist between these two variables. Thus, the main findings are robust.

[Insert Table 4.8 here]

4.7 CONCLUSION

This paper examines the pay-sensitivity of executive bonus to agriculture gains, and the role of corporate governance in monitoring management discretion. Using all agricultural firms listed on the ASX in the period from 2001 to 2011, I find that boards of directors appear to be aware of the nature of agriculture gains because they do not base executive bonuses on the agriculture gains component of earnings. In relation to the monitoring role of corporate governance, the overall evidence is weak. However, I find that a gender-diverse board plays a monitoring role in restraining management discretion. Agriculture gains are found to be smaller and less smoothed to pre-agriculture earnings when female directors are present on the board. This finding provides empirical evidence to support global corporate governance reforms in relation to the inclusion of women on boards.

The findings of this study have implications for investors, executives and directors who have been closely monitoring the impact of unrealised earnings on executive pay, and the role of corporate governance in restraining management discretion. Firstly, executive compensation contracts are designed to provide managers with incentives to exert effort. However, the earnings-based performance measures generate concerns that managers may pursue their own interests at the expense of shareholders (Watts &

Zimmerman, 1986; Kaplan & Atkinson, 1989). The findings of this study, to some extent, provide shareholders with some confidence that executive compensation contracts in the Australian agricultural sector are effective. The e*x post* settling up problem is not prevalent.

Secondly, investors rely on boards of directors to monitor executive performance. Effective corporate governance mechanisms help to reduce opportunistic behaviours (Jensen & Meckling, 1976; Shleifer & Vishny, 1997) and produce a higher quality of financial reports (Davidson et al., 2005; Beekes & Brown, 2006; Ahmed & Duellman, 2007; Garcia Lara et al., 2009; Kent et al., 2010; Beekes et al., 2016). However, the findings of this study reveal that some corporate governance mechanisms play a limited role in monitoring management discretion in the Australian agricultural sector and, create concerns about the reliability of fair value reported under IAS 41.

Due to the limited disclosure, I assume that the quality of bonus plans is identical across firms in analysing executive pay-sensitivity. Yet Banghøj et al. (2010) argue that the pay-to-performance relation is a function of the quality of the bonus plan. They list four areas that need to be addressed when designing a bonus plan and propose a quality measure for bonus plans. Further research might obtain the necessary information using surveys or interviews, and examine the difference in pay-sensitivity of agriculture gains between firms with higher and lower quality of bonus plan. In addition, more and more firms prefer rewarding executives using equity-based compensation. It is worthwhile knowing whether equity-based compensation is sensitive to agriculture gains.

The weak evidence found in regard to the monitoring role of corporate governance may be driven by the ineffective proxies used in the current study for a board's ability to monitor opportunistic behaviour. Future research could examine a broader set of corporate governance attributes to enhance understandings of this issue. Further, the current research design does not take into consideration the scale of a company's opeartions involving biological assets relative to other business segment. For example, some companies derive only a small percentage of their total revenue from biological assets whereas other companies earn a significantly higher percentage of their total revenue from biological assets. Future research could control for the scale of revenue from biological assets and see if the negative association between agriculture gains and pre-agriculture earnings holds.

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Table 4.1
Sample overview

Panel A: Sample collection

Procedures	**Obs.**
Observations having biological assets from 2001 to 2011	338
After excluding observations that hold blood cells or viruses	333
After excluding observations with missing value of fair value variables	282
After excluding observations using historical cost	277
After excluding observations with missing value of corporate governance variables	261

Panel B: Observation distribution over years

Year	**Obs.**	**Year**	**Obs.**
2001	28	2008	21
2002	29	2009	17
2003	30	2010	14
2004	28	2011	13
2005	28		
2006	27		
2007	26	Total	261

Panel C: Industry distribution by firm-year observation

Industry	**GICS code**	**Sub-industry**	**GICS code**	**Obs.**	**Obs. (%)**
Paper & forest products	151050	Forest products	15105010	42	16%
Beverages	302010	Brewers	30201010	7	3%
		Distillers & Vintners	30201020	71	27%
Food Products	302020	Agricultural Products	30202010	58	22%
		Meat, Poultry & Fish	30202020	40	15%
Observations in multi sub-industries				43	17%
				261	100%

Panel D: Valuation of biological assets by firm-year observation

Measurement attribute	**Firm-year obs. (%)**
Market-determined prices (i.e. market price for identical or similar assets, recent market transaction price)	81 (31%)
Managerially estimated fair value	166 (63.7%)
Use both measurement attributes	14 (5.4%)
	261 (100%)

Table 4.2
Descriptive statistics and correlations - the sensitivity of executive bonus to agriculture gains

Panel A: Distributional statistics

Variable	Obs.	Mean	St. dev.	Min.	Median	Max.	Skewness
COMP ($million)	151	3.810	4.142	0.271	2.295	22.268	7.775
BONUS ($million)	151	0.692	11.268	0.006	0.267	6.719	3.078
lnBONUS	151	5.431	0.616	4.105	5.426	6.793	2.586
ΔFV	151	0.020	0.045	-0.067	0.005	0.259	3.361
PREFV	151	0.008	0.116	-0.412	0.039	0.188	5.815
RETURN	151	0.046	0.499	-1.955	0.057	1.133	4.256
lnASSET	151	8.592	0.679	7.095	8.473	10.019	2.491
BSIZE	151	6.079	1.556	3.000	6.000	10.000	3.082
OUTSIDER	151	0.577	0.189	0.000	0.571	0.889	2.883
EXEOWN	151	0.076	0.147	0.000	0.003	0.856	10.756

Panel B: Pearson (Spearman) correlations below (above) the diagonal

	BONUS	*ΔFV*	*PREFV*	*RETURN*	*lnASSET*	*COMMITTEE*	*BSIZE*	*OUTSIDER*	*EXEOWN*
BONUS		*-0.144*	**0.337**	0.094	**0.659**	**0.265**	**0.399**	*0.194*	-0.152
ΔFV	**-0.261**		**-0.273**	***0.178***	-0.067	0.074	-0.026	0.151	0.121
PREFV	**0.385**	**-0.401**		**0.281**	**0.069**	0.128	0.048	0.027	0.084
RETURN	0.101	0.093	**0.298**		0.023	0.042	0.087	-0.002	-0.017
lnASSET	**0.665**	*-0.189*	*0.191*	0.006		**0.380**	**0.585**	**0.502**	-0.209
COMMITTEE	**0.234**	0.065	0.116	0.021	**0.400**		**0.240**	**0.364**	-0.089
BSIZE	**0.462**	-0.141	0.127	0.110	**0.589**	*0.231*		**0.250**	-0.148
OUTSIDER	*0.199*	0.016	0.032	-0.021	**0.522**	**0.421**	**0.215**		-0.067
EXEOWN	*-0.035*	-0.044	-0.001	-0.013	**-0.235**	**-0.280**	**-0.290**	-0.236	

This table presents descriptive statistics and Pearson (Spearman) correlations for the variables. Definitions of variables: *COMP* is defined as the total compensation that consists of salary, bonus, and equity-based compensation as reported in the firm's remuneration report for the fiscal year; *BONUS* is the total bonus paid to executives as reported in the firm's remuneration report for the fiscal year; *ln* is the natural logarithm; *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *RETURN* is market adjusted monthly return on investment for the fiscal year; *lnASSET* is the natural logarithm of total assets as reported in the firm's balance sheet for the fiscal year; *BSIZE* is defined as the number of directors on the board; *OUTSIDER* is defined as the percentage of independent directors on the board; *EXEOWN* is defined as the percentage of ownership held by executive directors. *COMMITTEE* is an indicator variable equal to 1 if the firm has a remuneration committee, and 0 otherwise. Figures in bold font are significant at the 1% level. Figures in italic font are significant at the 5% level.

Table 4.3
Descriptive statistics and correlation - the role of corporate governance

Panel A: Distributional statistics

Variable	Obs.	Mean	St. dev.	Min.	Median	Max.	Skewness
ΔFV	261	0.027	0.077	-0.295	0.008	0.485	2.963
PREFV	261	-0.023	0.144	0.736	0.022	0.255	-1.641
OUTSIDER	261	0.536	0.222	0.000	0.556	1.000	-0.396
FEMALE	261	0.199	0.400	0.000	0.000	1.000	1.506
TENURE	261	6.736	6.731	1.000	4.000	32.000	1.349
INOWN	261	34.280	23.104	0.000	32.036	97.598	0.540
INDUST_ΔFV	261	0.006	0.042	-0.0007	0.008	0.567	11.157
IND	261	0.192	0.394	0.000	0.000	1.000	1.567
LEV	261	0.472	0.186	0.018	0.478	1.484	0.931

Panel B: Pearson (Spearman) correlations below (above) the diagonal

	ΔFV	*PREFV*	*OUTSIDER*	*FEMALE*	*TENURE*	*INOWN*	*INDUST_FV*	*IND*	*LEV*
ΔFV		**-0.290**	*0.139*	-0.078	-0.019	-0.052	**0.198**	-0.089	**-0.167**
PREFV	**-0.410**		0.096	**0.164**	**0.261**	0.019	0.105	-0.090	-0.003
OUTSIDER	0.075	*0.146*		**0.215**	**0.162**	0.001	0.090	0.098	*0.143*
FEMALE	0.060	0.083	**0.218**		0.018	0.057	0.003	-0.072	0.104
TENURE	-0.089	**0.210**	*0.144*	-0.020		0.008	*0.145*	-0.108	*0.166*
INOWN	0.039	0.083	-0.009	0.102	0.048		0.069	-0.087	**0.319**
INDUST_ΔFV	0.036	0.020	0.024	0.013	-0.023	*0.124*		**-0.184**	-0.055
IND	-0.037	-0.079	0.114	-0.072	**-0.174**	-0.009	-0.06		0.102
LEV	**-0.162**	-0.090	0.116	0.059	0.114	*0.128*	-0.012	0.116	

This table presents descriptive statistics and Pearson (Spearman) correlations for the variables used in *Eq*. (3). Definitions of variables: *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *OUTSIDER* is defined as the percentage of independent directors on the board; *FEMALE* is an indicator variable equal to 1 if there is a female who sits on the board, and 0 otherwise; *TENURE* is the number of years the CEO has served the firm as a CEO; *INOWN* is defined as the percentage of ownership held by institutional shareholders; *INDUST_ΔFV* is the median level of agriculture gains in the industry in year *t*; *IND* is an indicator variable equal to 1 if the firm use fair value information provided by an independent party; *LEV* is the leverage measured by total liabilities divided by total assets. Figures in bold font are significant at the 1% level. Figures in italic font are significant at the 5% level.

Table 4.4
Results of regressions - the sensitivity of executive bonus to agriculture gains

Panel data – OLS regression

Eq. (2): $lnBONUS_{it} = \alpha_1 + \alpha_2 \Delta FV_{it} + \alpha_3 PREFV_{it} + \alpha_4 RETURN_{it} + \alpha_5 lnASSET_{it} + \alpha_6 COMMITTEE_{it} + \alpha_7 BSIZE_{it} + \alpha_8 OUTSIDER_{it} + \alpha_9 EXEOWN_{it} + \varepsilon_{it}$

Variable	Predicted sign	Executive bonus	CEO bonus
Intercept		0.294	0.593
ΔFV	?	-0.316	1.477
PREFV	+	1.249***	1.280***
RETURN	+	0.020	0.022
lnASSET	+	0.593***	0.479***
COMMITTEE	-	0.038	0.087
BSIZE	+	0.041	0.044
OUTSIDER	-	-0.494	-0.107
EXEOWN	+	0.494**	0.143
R^2		55.06%	66.14%
Overall *p*-value		0.000***	0.000***
Clustered errors		Yes	Yes
Obs.		151	101

This table presents the results of standard OLS regressions concerning the sensitivity of executive/CEO bonus to agriculture gains. Definitions of variables: *BONUS* is the total bonus paid to executives/CEO as reported in the firm's remuneration report for the fiscal year; *ln* is the natural logarithm; *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *RETURN* is market adjusted monthly return on investment for the fiscal year; *lnASSET* is the natural logarithm of total assets as reported in the firm's balance sheet for the fiscal year; *COMMITTEE* is an indicator variable equal to 1 if the firm has a remuneration committee, and 0 otherwise; *BSIZE* is defined as the number of directors on the board; *OUTSIDER* is defined as the percentage of independent directors on the board; *EXEOWN* is defined as the percentage of ownership held by executive directors. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm. Outliers have been defined and adjusted using the winsorisation technique.

Table 4.5
Results of regressions - the role of corporate governance

Panel data – OLS regression

Eq. (3): $\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 CG_{it} + \alpha_4 (PREFV \text{ x } CG)_{it} + \alpha_5 INDUST\_\Delta FV_{it} + \alpha_6 IND_{it} + \alpha_7 LEV_{it} + \varepsilon_{it}$

Variable	Predicted sign	Board independence	Gender diversity	CEO tenure	Institutional ownership
Intercept		0.039**	0.021**	0.054***	0.049***
PREFV	-	-0.236***	-0.256***	-0.131***	-0.177***
CG	-	0.027	-0.108**	-0.001	0.010
(*PREFV x CG*)	+	0.332	0.414***	0.008	0.012
INDUST_ΔFV	+	0.025	0.024	0.035	0.028
IND	-	-0.002	-0.003	-0.006	-0.003
LEV	-	-0.066**	-0.067**	-0.066*	-0.067**
F-test $\alpha_2 + \alpha_4 = 0$		10.34 (0.0025)***	1.95 (0.1695)	7.65 (0.011)**	3.91 (0.055)*
R^2		24.99%	16.82%	17.15%	18.77%
Overall *p*-value		0.001***	0.000***	0.005***	0.006***
Clustered errors		Yes	Yes	Yes	Yes
Obs.		261	261	261	261

This table presents the results of standard OLS regressions concerning the role of corporate governance in monitoring management discretion. Definitions of variables: *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *CG* is the four corporate governance attributes examined in the paper, each of these attributes is examined individually; *INDUST_ΔFV* is the median level of agriculture gains in the industry in year *t*; deflated by average assets; *LEV* is the total liabilities divided by total assets of firm *i* for year *t*; *IND* is an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm.

Table 4.6
Corporate governance composite index and regression results

Panel A: GOV index description

CG attributes	Binary scale transformation
Board independence	Equals to 1 if more than 60% of directors on the board are independent directors, otherwise zero (60% is chosen because the ASX Corporate Governance Principles recommend a majority of the board of a listed entity should be independent directors – Rec. 2.4)
Gender diversity	Equals to 1 if there is a female director on the board, otherwise zero
CEO tenure	Equals to 1 if above the median, otherwise zero
Institutional ownership	Equals to 1 if above the median, otherwise zero

Panel B: Distributional statistics

Variable	N	Mean	Median	Std. dev.	Min.	Max.
GOV	261	1.675	2.000	0.997	0.000	4.000

Panel C: regression results

Panel data – OLS regression

Modified Eq. (3): $\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 GOV_{it} + \alpha_4 (PREFV \text{ x } GOV)_{it} + \alpha_5 INDUST\_\Delta FV_{it} + \alpha_6 IND_{it} + \alpha_7 LEV_{it} + \varepsilon_{it}$

Variable	Predicted sign	Eq.(3)
Intercept		0.052***
PREFV	-	-0.122***
GOV	-	0.002
PREFV x *GOV*	+	0.031
INDUST_ΔFV	+	0.031
IND	-	-0.004
LEV	-	-0.071
F-test		4.59
$\alpha_2 + \alpha_4 = 0$		(0.038)**
R^2		17.45%
Overall *p*-value		0.001***
Clustered errors		Yes
Obs.		261

This table presents the results of standard OLS regressions concerning the role of aggregated corporate governance in monitoring management discretion. Definitions of variables: *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *GOV* is a corporate governance composite index that captures the four corporate governance attributes; *INDUST_ΔFV* is the median level of agriculture gains in the industry in year *t*; deflated by average assets; *LEV* is the total liabilities divided by total assets of firm *i* for year *t*; *IND* is an indicator variable equal to 1 if the fair value of biological assets of firm *i* in year *t* is determined by independent appraiser, and 0 otherwise. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm.

Table 4.7
Multicollinearity - the sensitivity of executive bonus to agriculture gains

Panel data – OLS regression
Modified Eq. (2): $lnBONUS_{it} = \alpha_1 + \alpha_2 \Delta FV_{it} + \alpha_3 PREFV_{it} + \alpha_4 RETURN_{it} + \alpha_5 lnASSET_{it} + \alpha_6 CG_{it} + \varepsilon_{it}$

Variable	Predicted sign	Executive bonus	Executive bonus	Executive bonus	Executive bonus
Intercept		-0.017	-0.131	0.297	0.149
ΔFV	?	-0.368	-0.379	-0.572	-0.580
PREFV	+	1.567***	1.565***	1.615***	1.614***
RETURN	+	0.014	0.019	0.014	0.014
lnASSET	+	0.643***	0.670***	0.578***	0.643***
COMMITTEE	-		0.007	-0.054	-0.040
BSIZE	+	0.018		0.027	0.007
OUTSIDER	-	-0.406	-0.431		-0.448
EXEOWN	+	0.501**	0.474**	0.544***	
R^2		52.61	52.49%	51.58	51.38
Overall *p*-value		0.000***	0.000***	0.000***	0.000***
Clustered errors		Yes	Yes	Yes	Yes
Obs.		151	151	151	151

This table presents the results of standard OLS regressions concerning the sensitivity of executive bonus to agriculture gains. Definitions of variables: *BONUS* is the total bonus paid to executives as reported in the firm's remuneration report for the fiscal year; *ln* is the natural logarithm; *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *RETURN* is market adjusted monthly return on investment for the fiscal year; *lnASSET* is the natural logarithm of total assets as reported in the firm's balance sheet for the fiscal year; *COMMITTEE* is an indicator variable equal to 1 if the firm has a remuneration committee, and 0 otherwise; *BSIZE* is defined as the number of directors on the board; *OUTSIDER* is defined as the percentage of independent directors on the board; *EXEOWN* is defined as the percentage of ownership held by executive directors. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Standard errors are clustered by firm. Outliers have been defined and adjusted using the winsorisation technique.

Table 4.8
Results of the GMM simultaneous equations

Eq. (4): $\Delta FV_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 OUTSIDER_{it} + \alpha_4 FEMALE_{it} + \alpha_5 TENURE_{it} + \alpha_6 INOWN_{it} + \alpha_7 LEV_{it} + \alpha_8 INDUST\_\Delta FV_{it} + \alpha_9 IND_{it} + \varepsilon_{it}$
Eq. (5): $OUTSIDER_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 FEMALE_{it} + \alpha_5 TENURE_{it} + \alpha_6 INOWN_{it} + \alpha_7 LEV_{it} + \varepsilon_{it}$
Eq. (6): $FEMALE_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 OUTSIDER_{it} + \alpha_5 TENURE_{it} + \alpha_6 INOWN_{it} + \varepsilon_{it}$
Eq. (7): $TENURE_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 OUTSIDER_{it} + \alpha_5 INOWN_{it} + \alpha_6 LEV_{it} + \alpha_7 FEMALE_{it} + \varepsilon_{it}$
Eq. (8): $INOWN_{it} = \alpha_1 + \alpha_2 PREFV_{it} + \alpha_3 \Delta FV_{it} + \alpha_4 OUTSIDER_{it} + \alpha_5 TENURE_{it} + \alpha_6 LEV_{it} + \alpha_7 FEMALE_{it} + \varepsilon_{it}$

	FV **Eq. (4)**	***OUTSIDER*** **Eq. (5)**	***FEMALE*** **Eq. (6)**	***TENURE*** **Eq. (7)**	***INOWN*** **Eq. (8)**
Intercept	0.029*	0.407***	-0.045	3.344**	0.262***
ΔFV		0.701**	-0.325	-5.777	0.304
PREFV	-0.178***	0.329***	0.085	8.826***	0.156
OUTSIDER	0.050***		0.408***	3.772**	-0.089
FEMALE	-0.017***	0.118***		-1.129	0.061
TENURE	-0.000	0.004**	-0.004		0.002
INOWN	0.017	-0.076	0.181	1.299	
LEV	-0.074	0.199***			0.216**
INDUST_ΔFV	0.016				
IND	-0.010				

This table presents the results of the GMM simultaneous equations dealing with the endogeneity issue. Definitions of variables: *ΔFV* is gains or losses from changes in fair value of biological assets of firm *i* in year *t*, deflated by average assets; *PREFV* is pre-agriculture earnings of firm *i* in year *t* obtained from deducting *ΔFV* from reported earnings; *OUTSIDER* is defined as the percentage of independent directors on the board; *FEMALE* is an indicator variable equal to 1 if there is a female who sits on the board, and 0 otherwise; *TENURE* is the number of years the CEO has served the firm as a CEO; *INOWN* is defined as the percentage of ownership held by institutional shareholders; *LEV* is the leverage measured by total liabilities divided by total assets; *INDUST_ΔFV* is the median level of agriculture gains in the industry in year *t*; *IND* is an indicator variable equal to 1 if the firm use fair value information provided by an independent party. *, **, and *** represent significance level of 0.10, 0.05 and 0.01, respectively.

Chapter 5

Concluding Remarks

5.1 INTRODUCTION

IAS 41 represents a set of rules for measuring and recognising biological assets. Under the standard, fair value accounting is applied in the agricultural sector. IAS 41 was developed by the IASB on the principle that fair value is the best measurement alternative, and in some cases the only, accounting measurement basis that can faithfully represent biological transformation (IASB, 2012). By reporting biological assets at fair value, the IASB expected that more relevant information about the future prospects of an entity can be provided to investors. However, there has been much opposition concerning the application of IAS 41. Concerns have been expressed about the difficulty in practice,[60] the high degree of management discretion in determining fair value of biological assets, and the consequences of recognising unrealised agriculture gains or losses in the income statement (Elad, 2004; Herbohn, 2006; Herbohn & Herbohn, 2006; Elad & Herbohn, 2011; Fischer & Marsh, 2013; Marsh & Fischer, 2013; Goncalves & Lopes, 2014; Stonciuviene et al., 2015).

Motivated by the different views on the application of fair value accounting in the agricultural sector, this thesis empirically assesses the implementation of IAS 41 in the agricultural sector in Australia where fair value rules have been applied across a broad range of agricultural businesses for a long period. By means of three research papers found in Chapter 2, 3, and 4, this thesis provides a portrait of the decision-usefulness and reliability problems surrounding fair value accounting in the agricultural sector, and

[60] The difficulty in practice refers to the high cost of obtaining fair value of biological assets and the difficulty to measure fair value of biological assets when active markets are not available.

extends the discussion of fair value accounting to executive compensation, and corporate governance in the agricultural sector.

Specially, Paper 1 (Chapter 2) tests an expectation of the IASB on fair value accounting by examining the forecasting power of fair value of biological assets for future operating cash flows. Paper 2 (Chapter 3) considers the issue of reliability raised by opponents of fair value accounting by investigating the opportunistic use of discretion provided in IAS 41. Paper 3 (Chapter 4) considers the effectiveness of executive compensation contracts by examining whether remuneration committees are able to distinguish unrealised earnings components from realised earnings components. The paper also considers the monitoring role of corporate governance in the reliability of fair value information by examining a number of corporate governance mechanisms that represent the board's ability to restrain the opportunistic use of discretion provided in IAS 41.

The summary of findings from each of the three papers is presented in Section 5.2, followed by the conclusions for the entire thesis in Section 5.3. The limitations of this thesis together with suggestions for future research are discussed in Section 5.4.

5.2 SUMMARY AND FINDINGS

5.2.1 Paper 1: The decision-usefulness of fair value for future operating cash flows: evidence from the Australian agricultural sector

The IASB expected the application of fair value accounting in the agricultural sector would help investors with the estimation of future economic benefits. Using all agricultural firms listed in Australia for the period from 2001 to 2012, this study evaluates whether fair value accounting in the agricultural sector is decision-useful for forecasting future operating cash flows.

The findings reveal that a majority of sample firms uses managerial estimates in determining fair value of biological assets, indicating that market-determined prices are not available for most biological assets in Australia. The study also finds that fair value of biological assets does not contain forecasting power for future operating cash flows. This result does not support the expectation of the IASB that measuring biological assets at fair value can provide decision-useful information to investors for estimating future economic benefits. Further, market-determined prices do not seem to be superior to managerial estimates in relation to providing useful information for future operating cash flows.

Fair value accounting was implemented by the IASB in the agricultural sector with an attempt to provide more useful information about future values. The insignificant results found by this study, however, do not indicate that this expectation is being met. Although market-determined prices are generally perceived as more useful than

managerially estimated fair value for decision-making, the findings of this study indicate that neither of the two fair value measurements make a difference in relation to forecast future operating cash flows. Overall, the findings of this study might provide important feedback to standard-setters for reassessing the implementation of fair value accounting in the agricultural sector.

5.2.2 Paper 2: Investigating the reliability of fair value information: evidence from the Australian agricultural sector

The objective of this study is to evaluate the reliability of accounting information reported under IAS 41. In particular, the paper examines whether managers have used the discretion provided in IAS 41 opportunistically to achieve desired reported agriculture gains or losses. This paper also investigates the role of discount rate selection in opportunistic behaviour when managerial estimates are applied.

Using all agricultural firms listed in Australia for the period from 2001 to 2011, the results show that agriculture gains are relatively larger when pre-agriculture earnings are lower, or below the prior level. In contrast, if agriculture losses are reported, managers tend to report larger agriculture losses when pre-agriculture earnings are lower. Further, the results show that management discretion is exercised when fair value of biological assets is determined by managerial estimates. Firms use a wide range of discount rates to achieve their various desired goals. It is found that managers who select higher discount rates tend to report unusually large agriculture gains or loss.

5.2.3 Paper 3: Fair value accounting and gains from biological assets: executive pay-sensitivity and the role of corporate governance

This study investigates the pay-sensitivity of executive compensation to agriculture gains or losses, and whether the board of directors is effective in monitoring the reliability of accounting information reported under IAS 41. In particular, this study examines whether managers are rewarded for unrealised gains or losses on biological assets. Further, this study examines a number of corporate governance mechanisms that represent a board's ability to monitor the opportunistic use of discretion provided in the standard.

The most notable result of this study is that executive bonus is not sensitive to gains or losses on biological assets. This finding indicates that although firms rely on earnings-based performance measures to evaluate and reward executives, managers would not get higher pay when gains on biological assets are greater than prior year's level. This result provides strong support for the notion that board of directors will reward executives for realised earnings only.

Another interesting result of this paper is that the extent of management discretion is found to be lower when female directors are present. This result indicates gender-diverse boards play an important role in monitoring management discretion, supporting the global corporate governance reforms in relation to the inclusion of women on boards. However, the insignificant results found on board independence, CEO tenure, and institutional ownership indicate that overall, the examined corporate governance attributes play a limited role in monitoring management disrection.

5.3 IMPLICATIONS

The findings of this thesis have a number of implications. First, the findings should be of interest to standard-setters because the results reveal the problems that need to be considered and addressed in the future development of the standard. IAS 41 seeks to introduce major changes to traditional agricultural reporting practices. However, a number of issues emerge with the implementation of the standard, such as the high degree of management discretion, the substantial unrealised gains or losses included in reported earnings, and the different masurements of fair value of biological assets. Based on these results, standard-setters need to rethink whether the implementation of fair value accounting in the agricultural sector necessarily represent an improvement in reporting practice.

Further, this thesis has implications for the ongoing shift of financial reporting standards towards fair value accounting. Since the mid-1980s, both the IASB and FASB have increased the use of fair vaue accounting. Starting out as the main measurement for financial assets, fair value accounting has increasingly been implemented for measurement of non-financial assets. The shift to fair value accounting is driven by the presumed decision-usefulness of market-based measures (Hitz, 2007). Both the IASB and FASB stress fair value's ability to provide information about future economic benefits in an efficient manner. Although the decision-usefulness of fair value accounting for financial assets has been examined and demonstrated, it cannot be assumed that the same benefit can also be obtained when fair value accounting is used for non-financial assets, in particular, for biological assets. The findings of this thesis suggest that fair value reporting in the agricultural sector contains limited information

about future economic benefits. This might interest global standard-setters if they re-evaluate what assets are suitable for fair value accounting.

In addition, the findings of this thesis have implications for auditors. Conflicts of interest can exist between managers and related parties after contracting (Jensen & Meckling, 1976). Managers have incentives to make themselves better off at the expense of other parties, for example to manage reported earnings opportunistically. In practice, the determination of managerially-estimated fair value involves a high degree of management discretion, which is demonstrated in this case to be problematic. It is the role of auditors to ensure that managers conform with accounting standards and that managers' estimations are free from bias. The findings of this thesis provide a snapshot of management discretion practices, and thus show the necessarity to auditors to develop detail audit procedures for the agricultural sector to ensure the quality of financial reporting.

Finally, the findings also delivers some important messages to investors. Fair value of biological assets reported by agribusinesses may contain little informaion helping investors with assessing future economic benefits. In some cases, considerable management discretion is also involved which could result in misleading information. Although boards of directors will review the earnings before paying executives, enhanced disclosure requirements under IFRS 13, *Fair Value Measureemnt*, may also reduce the concerns, investors should use other information as well as fair value when making economic decision regarding investments in agricultural firms.

5.4 LIMITATIONS AND FUTURE RESEARCH

The findings presented in this thesis are subject to a number of limitations, and also act as a precursor to future avenues of research. First, this thesis uses data from listed agricultural firms in Australia. Although agriculture is one of the important sectors in Australia, most agribusinesses are unlisted. Thus, data from listed agricultural firms may not be representative of unlisted agricultural firms. Future research may be able to obtain the required data to extend the assessment to unlisted agricultural firms in Australia.

Further, rather than directly getting feedback from users of fair value information in the agricultural sector, Paper one's findings are largely based on accounting information disclosed in annual reports with an assumption that users would use this accounting information to predict future operating cash flows. As a result, the findings may not represent the perspective of the users of fair value information in the agricultural sector. Given the financial information is prepared for external users, such as investors and financial analysts, their perceived usefulness of fair value information are important in evaluating the effectivenss of IAS 41. Future research can target the users of this accounting information and seeks their feedback in relation to the decision-usefulness aspect of IAS 41.

In addition, Paper two examines the reliability of fair value information reported under IAS 41. In particular, the paper looks at a largely unknown area, that is, the association between discount rate selection and reported agriculture gains or losses. Future studies can attempt to obtain more understanding of how managers select discount rates to

achieve desired reported agriculture gains or losses. Researchers may be able to interview business executives to get some insider reflections on the overall process and the factors that are considered in determining the discount rates, and thus provide insights that are not available in empirical archival research.

Finally, Paper three finds weak results in relation to the effectiveness of board of directors in monitoring opportunistic behaviour. Rather than implying that corporate governance is ineffective, these results may indicate that the corporate governance mechanisms examined in the study do not best reflect the monitoring capacity of board of directors. Future studies can extend the examination to other corporate governance mechanisms, such as the existence of an audit committee, ownership concentration, and the presence of financial experts on boards.

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Appendix A

List of Companies

ASX code	Company name
AAC	Australian Agriculture Company Limited
AAQ	Australis Aquaculture LImited
AFF	Australian Food & Fibre Limited
ANE	Auspine Limited
ATP	Atlas Pearls and Perfumes Limited
AUX	Yates Limited
AWL	Australian Wine Holdings Limited
BRL	BRL Hardy Limited
CEW	Cranswick Premium Wines Limited
CHQ	Chiquita Brands South Pacific Limited
CKR	Cockatoo Ridge Wines Limited
CNR	Coonawarra Premium Vineyards Limited
CSS	Clean Seas Tuna Limited
DMY	Dromana Estate Limited
EAC	East African Coffee Plantations Limited
ETW	Evans & Tate Wine Limited
FCL	Elders Limited
FEA	Forest Enterprises Australia Limited
FGL	Foster's Group Limited
FLR	Frankland River Olive Company Limited
GNS	Gunns Limited
GTP	Great Southern Plantations Limited
GWV	Global Wine Ventures Limited
ITF	Integrated Tree Cropping Limited
LNN	Lion Nathan Limited
MBF	MBF Carpenters Limited
MGW	Brian McGuigan Wines Limited

Appendix A continued

ASX code	Company name
NHH	Newhaven Park Stud Limited
OLE	Olea Australis Limited
PBV	Pipers Brook Vineyard Limited
PHW	Tomizone Limited
PLW	Peter Lehmann Wines Limited
RIC	Ridley Corporation Limited
RUR	Kangaroo Island Plantation Timbers Limited
RYW	Reynolds Wines Limited
SGV	Simon Gilbert Wines Limited
SHV	Select Harvests Limited
SRP	Southcorp Limited
TAN	Tandou Limited
TFC	TFS Corporation Limited
TGR	Tassal Group Limited
TIM	Timbercorp Limited
TNN	Fletcher Challenge Forests Limited
WBA	Webster Limited
WFL	Willmott Forests Limited
WRF	Viento Group Limited