

# Australasian Agribusiness Perspectives - 2014

## Paper 98

ISSN 1442-6951

---

### Australian farm investment: domestic and overseas issues

John Williams<sup>A</sup>, Peter McSweeney<sup>B</sup>, Robert Salmon<sup>C</sup>

---

#### Abstract

Farm investment is required for productivity, efficiency and profitability, but the need-impact relationships are quite complex because of the uncertainties of weather, biological product, and markets. Problems arise because of investment and economic cycles, and are compounded by uncertainties over government fiscal and investment policy. This paper reviews Australian farm investment characteristics, risk, and government policy, with the findings suggesting that the majority of this investment is likely to flow towards the top 25 percent of farms, many of which are irrigated. Foreign investment while not easily quantifiable can support dry-land farm values and may be motivated by diversification, food security and supply chain benefits which are not always profit-related. Risk: return portfolio diversification theories can be very deficient in practical farm investment decision making.

Key Words: farm investment, risk: returns, profitability, taxation, portfolio diversification

#### Introduction

Australian farms began with British foreign direct investment during the 18<sup>th</sup> century (Butlin, 1964), which has largely continued ever since. British investment still remains the second largest foreign direct investment (FDI) in Australian agriculture with 18 percent, behind Canada which has 46 percent (FIRB, 2012). However, British Government foreign direct investment ended with the British Food Corporation financial losses in Central Queensland brigalow farmland in 1948-52 (Queensland Government Inquiry, 1952), which followed the Tanganyika peanut farm abandonment and losses in 1947-51 (Cavendish, 2001).

As domestic private savings and investment increased during the 19<sup>th</sup> century, and as more land was secured either as lease or freehold, both croppers and pastoralists vied for access to domestic funds for buildings, fencing, water conservation, stock, machinery-equipment, and new mergers-acquisitions (Butlin, 1964). The spill-over impact from mining investment occurred until the economic depression of the 1890s.

The economic benefits of historical Australian farm investment include national and regional development (Hooke, 1967), increased taxation receipts that drove Australian Federation, technological innovation, improved productivity, rural and regional employment, development of secondary industry and manufacturing, and export growth and related balance of payments benefits (Wilson, 1931). However, Australian farm investment was never going to be easy with marginal rainfall in many localities (Anderson and Dillon, 1992), regular drought (Foley, 1957), foreigner rejection through the White Australia Policy until the 1960s (racial xenophobia), government interventions that were consolidated through two world wars, trade wars, rabbit fecundity, prickly pear infestations, economic depressions, freight disadvantages, infrastructural problems, and soldier resettlement disasters (Shaw, 1967). In lieu of adequate equity capital investment, farmers were reluctantly forced into debt financing (Butlin, 1964).

There are agricultural investment cycles that are interwoven with other economic cycles which various Australian governments have attempted to neutralize by taxation and investment policies (Hooke, 1967). Net farm investment ranged from AUD\$2.808 billion during the 1920s, AUD\$1.174 billion in the

---

A. John Williams is Senior Researcher at Australian Commodity Research Institute: [comm.trade@bigpond.com](mailto:comm.trade@bigpond.com)

B. Peter McSweeney is Senior Lecturer, Melbourne School of Land & Environments, University of Melbourne

C. Robert Salmon completed his Master of Agribusiness at The University of Melbourne

1930s, to AUD\$0.912 billion in the 1940s. There was a huge increase to AUD\$5.262 billion in the 1950s which was encouraged by special taxation concessions and depreciation allowances for farmers, as well as the formation of the Commonwealth Development Bank in 1959 (Gutman, 1955; Gruen, 1957; O'Hagan, 1958).

Foreign funds have been very reliant on dynamic deregulated global capital and currency markets since the 1970s, with Australian FDI decisions largely determined by global capital market trends and currency exchange conditions. Agricultural investment has to compete for funds with equities, bonds, urban property, debt financing, and other industry investments.

Arguably, the biggest change since the 1980s has been the introduction of mandatory superannuation which resulted in taxation-concession retirement funds (Malcolm, 2011). In contrast, private venture capital funds have a long history, but can be very dependent on the prevailing economic conditions and current taxation policies. Managed Investment Schemes (MIS) arose during the 1980s to take advantage of revised taxation concessions.

Institutional fund managers usually have a diversified portfolio to spread financial return risk, with farms and rural property often being considered as acceptable portfolio inclusions based on their risk: return characteristics (Bryant, 2008; Eves, 2010). Farm investment objectives for institutional investors include having different industry cycle periods, low correlation with other asset categories, and the ability to gain from strong capital growth, all of which are expected to decrease the volatility of the broader portfolio returns. Some institutional investors perceive farm investment as a hedge (Auer, Heymann, Mobert, Schaffnit-Chatterjee, and Stobbe, 2012).

Global investors can have an array of objectives including profit-seeking, diversifying assets, spreading sovereign risk, benefiting from favourable currency and interest rate relativity, building economies of scale, accessing domestic supply chains and markets, and creating food security in the home country (Moir, 2011). Tyler and Dixie (2013) in a World Bank report highlighted the need for establishing a diversified portfolio for global agricultural investment, while adapting to the local prevailing socio-political conditions. However, there are perceptions that transacting business in Australia is not perceived to be easy relative to other countries, with Australia currently ranked 15<sup>th</sup> in terms of the ease in doing business (Doing Business, 2012), behind Singapore (1<sup>st</sup>), New Zealand (2<sup>nd</sup>), USA, (4<sup>th</sup>), and Canada (12<sup>th</sup>). Table 1 summarizes Australia's global rankings from 148 countries in key economic variables that affect investment decisions.

**Table 1. Australia's global ranking on key economic variables: 2013-14.**

Key economic variable	Australia's global ranking (out of 148 countries)
Global Competitiveness Index	21
Total tax rate	109
Extent to which taxes reduce the incentive to invest	80
Extent to which taxes reduce the incentive to work	59
Overall infrastructure assessment	34
Quality of port infrastructure	42
Burden of government regulation on business	128
Extent to which regulation affects foreign direct investment	41
Extent to which foreign direct investment introduces new technology	17
Prevalence of foreign ownership	8
Ease of entrepreneurs to find venture capital	19
Ease of obtaining a loan with business plan but no collateral	28
Ease for companies to raise money by issuing shares in equity markets	8
Extent to which wages are unrelated to worker productivity	113
Impact of regulation on hiring and firing workers	137
Flexibility of wage determination	135
Labour-employer relations	103
Agricultural policy assessment	20

Source: Compiled from World Economic Forum 2013-14 executive survey data

Whilst Australia ranks in the top 10 countries for foreign ownership and ease of raising debt or equity funding, the rankings drop remarkably for taxation, government regulation, and labour issues. Regulation does impact on business activity and investment, which is compounded by mediocre rankings on infrastructure and port efficiency.

According to the Reserve Bank of Australia, non-mining investment in Australia, relative to GDP, is at 50 year lows despite low official interest rates (Lowe, 2013), yet there are currently approximately 80 sovereign country public investment authorities with the capability of global agricultural investment. Qatari Diar alone has US\$35 billion in global real estate excluding the 250,000 ha of Australian properties owned by Hassad Australia. There are also two Australian sovereign funds, namely the Australia Future Fund and the Western Australia Futures Fund, as well as many private equity funds, all of which suggest that there is no shortage of capital investment capability. Investment characteristics and risks associated with Australian farm investment clearly warrant analysis.

Whilst the Australian Senate Inquiry (2013) acknowledged that foreign investment provided a key source of capital for Australian farmers, promoted the growth of the Australian agricultural sector, improved agricultural productivity, generated many opportunities for Australian agricultural businesses, and assisted job creation and economic sustainability for many rural communities, it did establish the need for a review of incentives and barriers for long-term investment in major Australian agricultural developments by Australian investors (Recommendation 26). This study aims to address the need for such a review.

It is also timely to examine Australian farm investment because of recent changes in Asian food consumption. Food demand patterns are changing, based on the shift in home-meal composition as incomes increase (Klohn, 2003). Some commentators have suggested the need for increasing farm investment because Asian food demand is rising (Linehan, Thorpe, Andrews, Kim, and Beaini, 2012), although this need is not very apparent in many Australian farm output prices with persistent positive price skewness (Williams, 2013), an increasing cost-price squeeze (FAO, 2006; Kingwell, 2012), and a relatively high AUD/USD.

This paper analyses the characteristics that influence farm investment (Herr, 1964) and the risks (Schaffnit-Chatterjee, 2012) which can affect both farmers and portfolio managers alike. There is no attempt in this paper to compare farm returns to those of alternate investments, as has been recently done in much of the literature, because of the uniqueness of individual farms (Tegene and Kuchler, 1991), the invalidity of deduction when averaging portfolio investments (Berstein, 1986), and the different variables between investment markets (O'Donnell, Chambers, and Quiggin, 2010). The unique decision making of a portfolio manager will be considered separately at the end under diversification theory examination.

There are four contributions of this paper. Firstly, important characteristics that affect farm investment will be identified, particularly those that have inter-country and inter-regional differences. Secondly, given the pervasiveness of risk surrounding farm investment, the paper analyses the multiple risk considerations underpinning investment decisions. Thirdly, the paper analyses the government policy settings which influence farm investment levels. Fourthly, the paper analyses some of the constraints in the application of portfolio theory, given the strong influence of portfolio diversification theory and its application to farm investment. The outcome will have importance to both farmers and institutional investors.

## **Farm investment characteristics**

Whilst farm investment has been a key to Australian agricultural productivity, efficiency, and profitability, there has been no consistency in the willingness to invest in over 200 years of history (Malcolm, 2011). Investment acceleration that might have been encouraged by tax benefits, subsidies, growth policies to counter balance of payment deficits, land value increases, and favourable prices and profitability has been followed by periods of little investment (Campbell, 1958), which have been caused by low prices, drought, bank foreclosures, economic recession, financial regulation, unfavourable currency exchange, and aggravated by trade wars, protection policies, and general xenophobia.

Australian farm hallmarks. It is very difficult to determine the risk and return characteristics for a single farm when seasons, prices, costs, management attitudes and farm enterprises dramatically change even between successive years (Sefton and Cox, 2005). This can cause invalidity in averaging, difficulty in establishing a typical farm or season, and large margins of error in investment budgets.

However, Australian farms can generally be characterized by less than 10 percent of farms producing approximately 80 percent of farm output (Malcolm, 2011), which mostly represents irrigated farms. Many of the remaining dry-land farms are increasingly being supported by off-farm income, which is a global trend (Hennessy and O'Brien, 2007). The number of Australian farms has decreased from 195,700 in 1968-69 to 135,447 in 2011-12 (ABARES, 2013), which is a decrease of 31 percent in 44 years. If 1997-98 can be considered as a base year, and farmers' terms of trade defined as the index of prices received as a percentage of the index of prices paid, then the farmers' terms of trade fell from 175 in 1971-72 to 93 in 2011-12 (ABARES, 2013). Many farmers might therefore depend on new investors, more so than external investors need farmland. Therein lays a dilemma for an aging population of farmers seeking retirement with uncertain remuneration and farm succession difficulties (Dodson, 2004).

A majority (97 percent) of Australian farms remain family-owned, either through sole proprietorships, partnerships, or private companies, with the remainder either being vertically integrated with supply chain operations or else owned by non-farm equity investors (Malcolm, 2011). Foreigners own 11 percent of Australian farmland, mostly from the UK and North America, with Chinese companies owning less than 1 percent (KPMG, 2013).

Farm profitability. The average rate of return on capital excluding capital appreciation for Australian broadacre farms for the 20 years ending 2011-12 is 1.1 per cent, with the top 25 per cent earning 5.9 per cent (ABARES, 2013). The average return on capital including capital appreciation are 4.0 and 9.7 per cent respectively (ABARES, 2013). In a study of non-random 242 Western Australian broadacre farms that used farm consultants during 2002-2011, Kingwell, Anderton, Islam, Xayavong, Feldman, and Speijers, (2013) found the return on capital (excluding farm appreciation) ranged from 5 percent to minus 1, with return on equity ranging from 11 to 6 percent. Western Australian profit performance depended on lower debt, many managerial factors, innovation adoption, and larger farm size.

Farm investment can be promoted or discouraged by different debt: equity ratios. Low debt can often make a farm profitable and attractive for external investors. In contrast, high farm debt can lower farm asset values through unprofitability and bank foreclosures (Ellinger and Barry, 1987). Farm value increases are often the only tangible asset remaining for some farmers after debt retirement.

Financial returns from marginal dry-land farm investment are expected to vary widely (Kingwell, 2012), with little motivation or cash-flow capability for risk management practices (Kingwell, 2000). Return variability and risk management decision difficulties are compounded by cycles of widespread drought (ABS, 2006), which can destroy many geographical and enterprise diversification plans (Kingwell, Morrison, and Bathgate, 1992). This contrasts somewhat to better weather conditions in the USA (Nasr, Barry, and Ellinger, 1998), but also to the greater surety offered by irrigated farms which can lead to increased motivation for risk management practices (Ada, Malcolm, and Williams, 2006). However, prolonged widespread drought or increased government water costs can undermine the capacity and returns from irrigation (Ho, Armstrong, Doyle, and Malcolm, 2005).

Whilst it has been claimed that Australian superannuation funds, rural property trusts, and private equity partnerships are currently pursuing existing farm profitability motives rather than tax minimization (Malcolm, 2011), the problem is that with only 10 percent of farms producing the majority of output, and only 25 percent of farms with commensurable annual profit, there could be a shortage of suitable Australian farms for investment within acceptable risk limits without compensating taxation advantages. This shortage can be more acute when investment favours irrigated farms in preference to marginal dry-land farms.

Continually shifting weather cycles makes it difficult to identify and retain performance consistency (Kingwell, Morrison, and Bathgate, 1992), particularly with dry-land farms and in high production risk regions (Campbell, 1958a). Merely averaging constantly changing top performers every year within a country is rather meaningless to an external investment manager, especially when the macro and micro-economic externalities are continually changing (Malcolm, 2011a; Tegene and Kuchler, 1991).

The profit risk for marginal dry-land farms can be beyond the normal external investor limit, sometimes even for banks. This contrasts with US farm profits which are expected to be less volatile when farm subsidies and external income support are a large and stable component of farm profit (Bigge and Langemeier, 2004; Moss, Mishra, and Erickson, 2006).

Farm productivity. Productivity is an important component of profitability (Balk, 2003) and sustainable economic development (O'Donnell, 2010), and may be a reflection of innovative adaptability (Nossal, 2012). A slowdown in farm productivity may be a problem in Australia (Sheng, Mullen, and Zhao,

2010) and overseas (Vasavada and Chambers, 1986). However, if increased production does not result in profitability due to a price-cost squeeze, then any concern over farm productivity might be futile (Johnson, and Quance, 1972; Williams, 2013a; Johnson and Pasour, 1981).

There is a link between productivity, profitability, and investment which might be associated with farm efficiency (Tozer, 2010), financial growth (Escalante and Barry, 2002), and sustainability (Escalante and Turvey, 2009), but which is poorly defined in agriculture through the yield-cost-price relationship, asset fixity, input rigidity, and adjustment lags (Agbola, 2005). A question arises as to whether farm investment that merely adjusts output enterprises given changes to inputs and prices can be considered productive (Gow and Stayner, 1995), although it might meet some farm efficiency criteria (Ho, Malcolm, Armstrong, and Doyle, 2006) or farm growth expectations (Luh and Stefanou, 1991). Continual uncertainty that is associated with agriculture in general and dry-land farming in particular can undermine the willingness to invest in farm productivity and efficiency beyond the short term (O'Donnell, Chambers, and Quiggin, 2010).

Sales, mergers and acquisitions. Structural consolidation can result in fewer and larger farms in some broadacre regions with the majority of farm output from both larger farmers and corporate owners (Fernandez-Cornejo, Gempshaw, Elterich, and Stefanou, 1992), however some localities in urban proximity could experience subdivisions to meet the demand for part-time or hobby farmers with little farm output (Dodson, 2004). The size and structural change of farms is dynamic (Hallam, 1993) both within and between countries (Shapiro, Bollman, and Ehrensaft, 1987). This can have important repercussions for institutional investors because the number of profitable farmers is becoming fewer, while the number of unprofitable farms is increasing (Boessen, Featherstone, Langemeier, and Burton, 1990), which is reinforced by the preponderance of low prices (Williams, 2013).

Comparative research anomalies. The analogy between Australian farm investment and other countries such as USA or Canada (Painter, 2010) is considered tenuous. There are no farm or insurance subsidies in Australia, unlike those in North America, and very little income support. Multi-peril insurance schemes have struggled in Australia because of actuarial perception of high risk in production volatility and farmer perception of high premiums, with government intervention risk even being perceived to be too high (Hatt, Heyhoe and Whittle, 2012).

Australian weather derivative schemes by Enron, Macquarie, and NAB during 1998-2007 consistently failed because of basis risk (high variance between paddock and official rainfall-temperature measurement), moral hazard through tampering and manipulation, market illiquidity, the costs of device installation, data transmission, instrument monitoring and video surveillance, as well as the potential for large settlement losses by farmers. The US farm security that is characterized by a combination of both farm revenue and yield insurance (Coble and Barnett, 2008) is very unique, which can have positive spill-over effects on other risk management adoption practices by US farm managers (Dheyvetter and Kastens, 1999).

Farm capital asset values would be expected to be higher or artificially inflated whenever investors are attracted by either by government financial transfers (Tegene and Kuchler, 1991) or farm income security that can influence farmland prices more than direct farm profitability (Featherstone, and Baker, 1987). As a consequence, farmland values can be disproportionate to farm enterprise gross margins and financial returns. This has research implications because the US literature on farm attractiveness in investor portfolio selection would seemingly have bias and real estate market distortion, which may destroy any global comparative analysis or suitable analogy. As well, the relative weather certainty of the US Corn Belt would be expected to offer little comparative to the more weather uncertain marginal production farmland in Australia, Argentina, South Africa, Middle East, North Africa, Russia, or the Central Asian countries.

The US farm revenue surety and income protection enables farm purchases for the purpose of subsequent farm rentals, which has a much higher occurrence than other countries. A research problem arises when these farm rents are epitomized as reflecting general farm returns, and is then compounded by making inter-country comparisons.

## **Investment risk**

Knight (1921) suggested that the main driver of investment was risk taking in the expectation of profit, which has been evidenced through Australian agricultural experience (Barnard, 1961). There needs to be sufficient profit reward to offset the high investment risks involved with the uncertainty of yield, quality, cost, delivery, and timing, as well as considerations for cash flow, debt repayment, cash reserves, and investment dividends (Hardin and Cheng, 2002).

The most common measure of US farm risk is the standard deviation of averaged rental returns on farms that are supported by income and crop insurance subsidies. However, farm ownership risk from a more global perspective is difficult to define, whilst farm income depends on management decisions and the uncertainty associated with weather and biological production, regardless of the availability of water (Krause, 1995).

Risk-taking decision making. A rational decision maker could be assumed to be risk averse and avoid a loss-making farm investment, although there can be many secondary reasons why domestic or foreign farmland investment occurs, such as tax minimization, land value speculation, food security, portfolio diversification, or minimum variance in investment returns (Clarke, de Silva, and Thorley, 2013), as well as farm hobby and supposed welfare-health benefits.

Short term farm unprofitability may be considered acceptable, provided that there is farm asset capital value appreciation over time (Escalante and Barry, 2004). It is expected that many Australian farmers perceive their retirement to be funded by farm capital asset value growth speculation rather than from any dramatic change in commodity price skewness or wealth accumulation from farm profitability.

Investor type. Defining a typical farm investor is difficult, especially when globalization has increased the horizons for investing by private wealth funds, venture capitalists, and private equity firms (Bergoldt and Mittal, 2012). Australian institutional investors have recently been involved in direct farm ownership and management, purchase and lease-back arrangements, financing farm operations, and franchising (Malcolm, 2011). Investment motivations and expectations would be expected to vary widely under such differing circumstances (Tegene and Kuchler, 1991).

Investor type could vary considerably between freehold farmers and those with short or long term farm leases and other tenements such as farm renters and share-farmers (Paulson and Schnitkey, 2013). Both farmers and institutional investors can be divided by debt and equity funding, although a lessee or renter is unlikely to be burdened with farm mortgage repayments (Cole, Janssen, and Johnson, 2004).

The type of investor may largely determine the expected return and purpose of farm investment. An agriculturally-focused freehold low debt farmer might be willing to accept low annual financial profitability in return for high long-term asset capital growth in land value. This contrasts with a lessee or renter who would be seeking immediate farm returns and profitability to justify investment. It would also differ from a diversified portfolio manager with multiple client investor goals seeking an annual financial income for dividend distribution commensurable with other portfolio assets, and who might be unwilling to wait for very long term capital growth. Such disparity in the reasons for investment may explain why some farmers succeed and why some institutional investors fail.

Location and enterprise risk. There are many risk categories in real estate diversification investment (Hartzell, Hekman, and Miles, 1986). Inputs, outputs, and productivity differ immensely between farms with the same farm enterprises, even within the same geographic locality (Ball, 1985). A high risk farm can coexist in the same locality with low risk farms.

Farm location is usually important in determining farm returns and capital asset growth, but not necessarily together. Regional differences in weather and soils would be expected to impact on farm profitability, land values, and therefore investment attractiveness (Moss, Mishra, and Erickson, 2006). Growth in US farm wealth would be expected to be influenced by differences in government income support between industries and different cash transfers between regions (Tegene and Kuchler, 1991; Featherstone, and Baker, 1987)

Urban fringe farmland may decrease the importance of farm productivity and profitability, whilst increasing the importance of maximize capital asset growth (Lins, Sherrick, and Venigalla, 1992). Zoning land can influence farmland values, but much depends on size and location (Gottlieb, and Adelaja, 2009).

Clustering of end users can be important in determining the value of farm output to local supply chains (Williams, 2012), and hence to farm value. A US corn farm near a corn-ethanol manufacturer would be expected to benefit from both stronger price (basis) and lower freight costs (Fort and Parcell, 2006), and therefore a higher farm value (Henderson, and Gloy, 2009), compared to a more distant grower with weaker basis and higher freight costs.

Farm profit can be inflated through government licensing such as water rights, or deflated because of water cost. Government water policy can therefore directly impact on both farm profitability and asset capital value (National Water Commission, 2011). Trading government licenses such as water rights can sometimes be far more profitable than actual farming operations, thus creating artificially high

farm asset values and distorting farmland prices. Under such circumstances, investors can seek cash flow and financial returns from government transfers and asset trading in lieu of farm productivity gains and profitability.

Geographic proximity can be a factor influencing some investments relating to food security. Australia's proximity to Asia is perceived by some investors to be an advantage. Hassad Food was influenced by the availability of adequate Australian exporting facilities for fat lambs and wheat for shipment to Qatar (Evans 2010).

Investment diversification can occur across many geographic locations and farm enterprises (Firstenberg, Ross, and Zisler, 1988) for the purpose of risk spreading. The success of enterprise specialization or diversification can depend on the region, soil type, topography, and weather risks (Purdy, Langemeier, and Featherstone, 1997).

However, such diversification may not change the underlying goal conflict within large organizations or by institutional investors with complex portfolios, especially when uncertainty is high or variable (Conrath, 1967). Risk spreading may actually increase organizational risk, and thereby increase portfolio risk (Shapira, 1993). Organizational risk can further increase business environment uncertainty (Duncan, 1972), which can affect portfolio returns (Miles and McCue, 1982).

Management risk. Farm management differs widely among both farmers and institutional investors (Allen and Lueck, 2003). Farm managers can vary from individuals to families, partners, private or public companies across all categories of freehold, lease, or rent (Giles and Stansfield, 1990). Institutional investors could invest in farms either through direct management control, or use external manager professionals, or rent out farms (Barry, Sotomayor, and Moss, 1999).

The structure of farm management can impact on both returns and risk (Webb and Rubens, 1988). Whilst there have been many studies linking farm management to financial performance (Ford and Shonkwiler, 1994; Gloy, Hyde, and LaDue, 2002), there are many other factors that can contribute to management outcomes (Mishra, El-Osta, and Johnson, 1999). Management performance and farm efficiency can often depend on the fortunes of weather cycles and good timing (Cotton, Langemeier, and Featherstone, 1998), however good outcomes that are weather-dependent can often mask management incompetence (Kritzman, 1986). This has implications as to whether family farms are more efficient and even more productive than corporate farms.

Whilst the organizational structure of farm operations is important for single farms, it becomes crucial when there are multiple farm operations. There are advantages and disadvantages with both centralized and decentralized operations (Mintzberg, 1979). The size of the farm may not always be associated with productivity and efficiency (Langemeier and Bradford, 2006).

## **Influence of government policies**

Farmers and institutional investors can have quite different investment objectives when taxation is considered. Portfolio investment managers may be seeking financial return and risk diversification with tax concession advantages (Friedman, 1971), while farmers might want income-spreading tax advantages between different tax years, or be juggling income and government transfers (Brenna, Lusk, and Briggeman, 2010).

Following in the wake of Gruen, (1957), Herr (1964), Glau (1971), Waugh (1977), and Powell (1982), the Australian Government in 1988 found that the cost of capital was the major determinant of Australian farm investment (BAE, 1987), and that the marginal rate of taxation on income was a major determinant of the cost of capital. It was considered that taxation concessions on agricultural investment would drive rural industry development (Lewis, Hall, Savage, and Kingston, 1988), which proved to be a correct diagnosis with the rise of agricultural investment schemes.

Taxation concession schemes. Managed investment schemes (MIS) in Australia developed during the 1980s largely to minimize the marginal taxation rates of urban high income earners through full and immediate deductibility of long-term development expenditures (Malcolm, 2011). MIS proved the benefits of lower taxation on high risk-taking investment by Australian domestic investors. The paradox was that MIS was too successful, with Timbercorp alone having approximately 120,000 ha of timber, almonds, olives, grapes, mangoes, avocados, and citrus before government ended the taxation benefit in 2007.

Resource distortion was claimed to occur when MIS encroached on 'valuable' farmland, creating artificially high farmland values, and utilizing scarce irrigation water in drought years. It can be argued that the actual problem lay in discriminating tax rates elsewhere and inadequate infrastructure in

water resources, but rather than fix the tax-infrastructure problems or wait until the drought ended, the government largely eliminated the tax incentive that was required to offset the high risk-taking for domestic urban dwellers to invest in agricultural development.

Either fortuitously or by policy design, foreign investors filled the Australian domestic farm investment gap that was created by removing domestic tax concessions in 2007. There was only AUD\$7.9 million of foreign investment in agriculture during 2005-06, and AUD\$104 million in 2006-07 (FIRB Annual Reports). However, by 2011-12, total foreign investment had increased to AUD\$3,596 million (including \$3,088 million in FDI), with 39 percent from Canada (46 percent of FDI). This suggests that any prevention of foreign investment without corresponding taxation concessions to domestic investors could leave a farm investment void that could result in a farm asset value collapse which would have seriously flow-on repercussions on bank mortgages and farm debt repayment conditions.

One problem with tax-driven agricultural investment lies in its lifespan uncertainty. Farming is a long term investment under biological and management uncertainty even without the added burden of taxation policy uncertainty. Project planning with budgets based on internal rates of return and tax concessions become meaningless when governments arbitrarily remove such concessions. Investors may not persist in any industry which has unnecessary uncertainty, particularly when policy changes result in bankruptcy and prolonged legal proceedings (Woodcroft-Brown v Timbercorp, 2013).

Foreign investment. The need for foreign investment can arise because of an unwillingness or inability of domestic investors to meet the demand for farm investment (Moir, 2011). Perceptions of uncertainty (Hardin and Cheng, 2002), market risk (Froland, Gorlow, and Sampson, 1986), variability and return volatility (Kingwell, Anderton, Islam, Xayavong, Feldman, and Speijers, 2013), inadequate wealth growth (Sefton and Cox, 2005), change in government policy (Tegene and Kuchler, 1991), taxation imposts (Lewis, Hall, Savage, and Kingston, 1988), very dynamic business environment (Malcolm, 2011), and inadequate infrastructure and inefficiency (Langemeier and Bradford, 2006) can discourage domestic investment in farms.

Farms and regional growth can stagnate if the investment void is not filled by foreign investment, particularly when taxpayers prevent subsequent government transfers to offset rural decline through fiscal policy restrictions. Again it could be argued that Australian farmers and governments need foreign investment more than the foreign investor needs Australian farms, particularly for an aging farmer population with farm succession difficulties, and governments with fiscal problems.

Foreign investment into Australian farms is likely to be highly elastic with investors choosing countries based on the least risk: resistance pathway because of the highly uncertain returns (Dunning, 1991; Culem, 1988). Preventing such foreign direct investment in a highly elastic global capital investment market can result in shifts to international competitors, which might also include technological transfers and international competitiveness (Kumar, 1998).

Foreign direct investment is more likely to be attracted towards domestic farms in a falling currency market and discouraged in a rising currency market (Blonigen, 1997). Sufficient foreign investment needs to occur when local currency exchange rates are falling and when investment is urgently required for export industries, to compensate for the lack of foreign investment when local currency exchange rates are rising and there is strong competition from substitutable imports. To deny foreign investment is to hinder export development when currency exchange rates are falling, and decrease local competitiveness against substitutable imports when currency exchange rates are rising.

Foreign investment is only likely to flow to countries with political and economic stability, an independent judiciary, quality of regional infrastructure, some expertise and managerial talent, and moderate controls of capital movement (Alfaro, Chanda, Kalemli-Ozcan, and Sayek, 2010). The corollary suggests that government regulation, market distortion, corruption, inadequate infrastructure, and poor inter-sector linkages could prevent foreign investment contributing to economic growth. Extra regulation or burdensome approval conditions as might be suggested by the Australian Senate Inquiry (2013) could deprive agriculture of critical investment in an elastic and cyclical investment market that is influenced by global currency relativities and capital flows that are based on inter-country interest rate relativities and competing markets.

## **Investment portfolio diversification**

Markowitz's (1952) 'efficient frontier' approach to asset portfolio selection has been influential in analysing farm investment performance. Kaplan (1985) refined this approach to find those combinations of US cropping regions that had the lowest risk for given rates of financial return. Eves (2011) and Noland, Norvell, Paulson, and Schnitkey (2011) broadened the analysis by constructing



'optimal' portfolios with the major asset classes including and excluding farmland investment. However, there are some important differences between financial asset portfolio selection and farm-locality selection, which challenge the appropriateness of portfolio diversification theory to agriculture.

Complexity of farm returns. The financial return in the original Markowitz (1952) model was based on known or (currently) expected share-equity dividends, and was not applied to real estate (Gold, 1995). Share-equity dividends are very different from farm returns which might be an amalgam of farmland capital value increases, farm asset appreciation, on-farm profit or losses, with differing farm accounting systems and difficulty in separating on and off farm income and expenditure.

Efficiency under certainty with full knowledge would require specializing in that singular investment which maximized returns. Investment diversification may therefore be a second-best solution because the future return on each investment is unknown (assuming no insider knowledge). There is the speculative hope in any diversified investment decision making that the averaged return is greater than any singular return. It is the uncertainty of future returns and the associated risks which drives investment managers into portfolios of diversified assets (Hardin and Cheng, 2002). Specialization may drive innovativeness and first-mover advantages, but it is uncertainty that drives both markets (Williams, 2013a) and asset diversification. Efficiency and performance measurement have a ubiquitous relationship with such variable factors in management (Ferguson, 1986).

Investment portfolio theory generally assumes homogeneity in farm returns, whereas Tegene and Kuchler (1991) make the analogy of US farms to a heterogeneous 'used-car market', despite the financial commonality under successive US Farm Bills. There is a wide disparity in US farm returns (Ang, Nabar, and Wald, 2013) with little commonality between regions (Mishra, Moss, and Erickson, 2009) or survey method (Kuethé and Ifft, 2013; Zakrzewicz, Brorsen, and Briggeman, 2012; Shultz, 2006). As such, there is inadequate information available, which some perceive as creating portfolio risk and the need to add risk premiums to prices-values (Barry and Brown, 1986), presuming demand inelasticity. If problems occur within a more concentrated cropping and centralized US farm real estate situation, they will be compounded by greater farm diversity and regional decentralization in other countries.

There is the large occurrence of farm rentals in the mid-west of USA (Paulson and Schnitkey, 2013), which may simplify the US agricultural return calculation in the investment portfolio model (Painter, 2000; Tegene and Kuchler, 1991), but which is globally atypical from a farm management perspective (Hardin and Cheng, 2002), and distorted by income support under the US Farm Bill, government subsidized insurance schemes, and insurable yields in relative secure rainfall regions (Moss and Katchova, 2005). Complexity therefore increases with more marginal production regions that have no government or insurance support, and compounded by different farm lease and share-farming arrangements which can dilute the financial returns (Cole, Janssen, and Johnson, 2004).

On-farm profit cannot be known in advance of finally selling farm output that consists of a biological and generally inconsistent product in a dynamic price-taking market, whilst farm asset values are often only accurate when an actual sale transaction occurs, possible under a crisis or stress situation (Auer, Heymann, Mobert, Schaffnit-Chatterjee, and Stobbe, 2012). This makes farm return forecasting very difficult (Carroll, 2010), unlike those financial investment alternatives that have liquid forward markets. Hindsight determination of an efficiency frontier is not an effective forward decision making tool in agricultural portfolio investments (Barry, 1980). Using variance (standard deviation) over a subjectively selected historical time frame of farm returns that are not likely to be repeated is unlikely to create accuracy in any portfolio investment decision making (Libbin, Kohler, and Hawkes, 2004).

Despite no identifiable farm real estate market, farmland values are expected to differ due to farm demand and supply elasticities, with land values increasing with scarcity, and decreasing with surpluses (Macquarie Agricultural Funds Management, 2013). Global farmland values generally would be expected to be determined or influenced by farm size, on-farm asset valuations, labour availability and mobility, government financial assistance including farm insurance subsidies, monetary policy, capital markets, interest rate trends, farmland subdivision policies, insurance premiums, weather conditions, relative prices, currency movements, farm input costs, interest rates, investor attitudes, and foreign investor policies. Such an array of variables complicates agricultural portfolio decisions.

The goal of long term capital growth of farmers may be the opposite to the short term aim of institutional investors requiring annual financial contributions through regular profit or dividends (Treadway, 1969). Some farms can be long term asset rich but be short term cash poor, which can

seriously impact on investment decisions and undermine any Markowitz return theory. Kaplan's (1985) portfolio optimizer outcome developed over a 33 year period would have been the same had the portfolio yielded negative annual financial results from the farm sample and positive annual financial outcomes from the financial sectors. A rational portfolio manager would be expected to reject an investment with annual losses, and accept the investment with annual gains, regardless of long term capital asset gains, especially if time is of the essence. Perhaps standard deviation as a measure of risk needs to be performed on cash flow and annual profit rather than on long term capital asset returns or farm rental income. However, this would remove much of the academic method of risk calculation.

Complexity of farm risk. Markowitz (1952) never considered the risks involved with real estate in general (Froland, Gorlow, and Sampson, 1986) or specific agricultural risks. The original Markowitz (1952) model was based on financial borrowing risk (interest rate risk) that had comparative relativities with risk-free (government treasury) bonds and the prevailing cash market rates, both of which have liquid forward markets in most developed countries with the ability to manage forward risk. Contrast this to the array of weather and biological-related risks in agriculture, as well as financial risks such as interest rates, debt, and cash flow, which can reduce any forward decision making to speculation (Krause, 1995), even on irrigated farms. Agricultural risks are therefore very difficult to manage (Williams, 2013a) compared to interest rate risk. This inability to clearly identify and manage the agricultural risk makes Kaplan's generalized farm risk: return approach highly impractical (O'Donnell, Chambers, and Quiggin, 2010; Gong and Sun, 1995).

A farm real estate market contrasts with markets for capital, equities, currencies, and commodities where product homogeneity and forward markets drive critical volume low-cost centralized transactions (Webb and Rubens, 1988) with both spot and forward price-value discovery. This makes inter-sector comparison such as between farm versus non-farm very difficult (Shiha and Chavas, 1995), complicating investment choices amongst potential portfolio divisions.

Investment elasticity is defined as the ease in which investment shifts between various asset classes, and between regions and countries. Agricultural investment elasticity would be expected to be initially high because of the ease of movement before decisions are made, but become highly inelastic after agricultural investment has occurred because of asset fixity (Shih-Hsun and Ching-Cheng, 1990). This complicates investment decision making, and contrasts with the ease of investment movement between bonds, equities, and currencies.

Investment outcomes can depend on the risk attitude and risk management of the organization (Painter, 2010). Some risk taking investment managers pursue high risk for high return, while others pursue low but consistent return which may be associated with lower risk taking. However, the paradox might suggest that the risk taker might manage risk better than the risk avoider, and therefore have lower net risk compared to the more conservative manager (Williams, 2013a).

Carroll (2010) suggested that it might be possible to theoretically map a risk: expected return pathway between low risk: low return and high risk: high return assuming constancy of all other variables. However, such unrealistic assumptions undermine the validity of mapping.

Whilst risk taking and the potential for profit are associated (Knight, 1921), the problem in farming is correctly aligning individual risk with financial returns in a cause-effect relationship. Measuring exactly how much did each risk contribute to net farm profit or loss is extremely difficult to determine in most years. But without such specific association, mapping of generalized risks and returns is meaningless from an investment decision making perspective. Risk: return mapping is highly specific to each year and can only be done in hindsight, and would be unlikely to be repeated in subsequent years under changed business circumstances and altered external conditions.

## Conclusions

The real dilemma for Australian farms may not lay with the top 25 percent that are largely with irrigation and profitability, but rather with the 75 percent that are dry-land with marginal uncertain profits caused by high production risk. Geographic and enterprise diversification choices are often constrained, unlike the USA which has the added benefits of Farm Bill support, greater concentration of markets and end user industries, and more regular rainfall.

Government policy strongly influences farm investment, which was evident in the 1950s with special taxation concessions and depreciation allowances, and during the period 1985-2007 when Managed Investment Schemes arose in response to marginal tax concessions to high income earners. Recent domestic investment gaps during 2008-2013 have been filled by foreign investment, as evidenced by

Foreign Investment Review Board approvals, which are perceived to have supported many recent farm asset values.

Without such foreign investor buying, the gap between the top performing minority and the bottom performing majority might be expected to widen, however more research is required to prove this. Any prevention of foreign investment in Australian farms through extra regulation and burdensome approval conditions, as suggested by the Australian Senate Inquiry (2013), may reduce competition amongst farm buyers who are required to support farm asset values, especially in dry-land farming regions. This may negatively impact on low profitability aging farmers who are relying on increases to farm land-asset values to fund succession and retirement plans.

Foreign investment into Australian agriculture might be motivated by a range of objectives such as food security in the home country, economies of scale in global operations, benefits through currency or interest rates, market access, and spreading sovereign risk. Whilst foreign government agricultural investment in Australia has had a long history of failure to achieve their desired objectives for their home country, the current foreign government initiatives in Australian agriculture await future performance auditing.

Asset portfolio diversification modelling in agriculture is severely restricted because of the complexity of both farm returns and farm risks. Based on the assumption that farm returns and risks can be actually defined, sufficiently identifiable, and adequately measured, there is a need for an acceptable risk: return association of cause and effect. Generalizing risk and return in an agricultural asset portfolio diversification model that ignores cause and effect relationships is usually useless for investment decision making, especially when it is based on historical occurrences that have a low probability of repeatability. More research is required to prove that domestic institutional investors are discouraged from Australian agricultural investment because of their short term focus on profit and dividends, the uncertainties of marginal agriculture, and the failure of modelling to accurately predict farm risk and returns. In lieu of such domestic investment, Australian agriculture would be expected to remain very dependent on foreign investment to maintain both farmland and farm asset values.

## References

- ABS. 2006, Impact of the drought on agricultural production in 2006-07. Australian Bureau of Statistics, Canberra.
- ABARES. 2013, Australian farm survey results 2010-11 to 2012-13. ABARES, Canberra.
- Ada, T., Malcolm, B. and Williams, J. 2006, A survey of price risk management in the Australian cotton industry. *Australasian Agribusiness Review* 14(4): 1-25.
- Agbola, F.W. 2005, Optimal intertemporal investment in Australian agriculture: An empirical investigation. *Agricultural Economics Review* 6(2): 5-15.
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and Sayek, S. 2010, Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics* 91(2): 242-256.
- Allen, D. W. and Lueck, D. 2003, The nature of the farm: contracts, risk, and organization in agriculture. MIT Press, Cambridge, Massachusetts.
- Anderson, J.R. and Dillon J.L. 1992, Risk analysis in dryland farming systems. FAO, Rome.
- Ang, A., Nabar, N. and Wald, S.J. 2013, Searching for a common factor in public and private real estate returns. *Journal of Portfolio Management* 39(5): 120-133.
- Auer, J., Heymann, E., Mobert, J., Schaffnit-Chatterjee, C. and Stobbe A. 2012, Real assets: a sought-after investment class in times of crisis. Deutsche Bank Research, Frankfurt.
- Australian Senate Inquiry. 2013, Foreign investment and the national interest. Rural and Regional Affairs and Transport Committee, Canberra, 26<sup>th</sup> June.

- BAE (Bureau of Agricultural Economics). 1987, Farm survey report. Australian Government Printing Service, Canberra.
- Balk, B.M. 2003, The residual: On monitoring and benchmarking firms, industries and economies with respect to productivity. *Journal of Productivity Analysis* 20: 5-47.
- Ball, V. E. 1985, Output, input, and productivity measurement in U.S. agriculture, 1948-79. *American Journal of Agricultural Economics* 67: 475-486.
- Barnard, A. 1961, Visions and profit. Melbourne University Press, Melbourne.
- Barry, P.J. 1980, Capital asset pricing and farm real estate. *American Journal of Agricultural Economics* 62: 549-553.
- Barry, C. B. and Brown, S.J. 1986, Limited information as a source of risk. *Journal of Portfolio Management* 12(2): 66-72.
- Barry, P. J., Sotomayor, N.L. and Moss, L.E. 1999, Professional farm managers' views on leasing contracts and land control: An Illinois perspective. *Journal of the American Society of Farm Managers and Rural Appraisers* 63(1): 15-19.
- Bergoldt, C. and Mittal A. 2012, Betting on world agriculture: US private equity managers eye agricultural returns. The Oakland Institute, Oakland, USA.
- Berstein, P.L. 1986, Diversification's critical variable. *Journal of Portfolio Management* 12(4): 1-3.
- Bigge, H. M. and Langemeier, M.R. 2004, Relative profitability and risk of Kansas farms and S&P 500. *Journal of the American Society of Farm Managers and Rural Appraisers* 67(1): 57-63.
- Blonigen, B.A. 1997, Firm-specific assets and the link between exchange rates and foreign direct investment. *American Economic Review* 87: 447-465.
- Boessen, C.R., Featherstone, A.M., Langemeier, L.N. and Burton, R.O. 1990, Financial performance of successful and unsuccessful farms. *Journal of the American Society of Farm Managers and Rural Appraisers* 54(1): 6-15.
- Brenna, D. E., Lusk, J. L. and Briggeman, B.C. 2010, Taxpayer beliefs about farm income and preferences for farm policy. *Applied Economic Perspectives and Policy* 32(2): 338-354.
- Butlin, N.G. 1964, Investment in Australian economic development 1861-1900. Cambridge University Press, Melbourne, Part B.
- Bryant, D. 2008, The agricultural boom – A real opportunity to benefit your portfolio. Portfolio Construction Conference Due Diligence Forum paper, Sydney, 27-28 August.
- Campbell, K.O. 1958, Some reflections on agricultural investment. *Australian Journal of Agricultural Economics* 2(2): 93 - 103.
- Campbell, K.O. 1958a, The challenge of production instability in Australian agriculture. *Australian Journal of Agricultural Economics* 2(1): 3 - 23.
- Carroll, M. 2010, The other side of the fence - how does agriculture stack up as an investment? *Australasian Agribusiness Perspectives Paper* 87: 1-4.
- Cavendish, R. 2001, Britain abandons the groundnut scheme. *History Today* 51(1): 1.
- Clarke, R., de Silva, H. and Thorley, S. 2013, Risk parity, maximum diversification, and minimum variance: an analytical perspective. *Journal of Portfolio Management* 39(3): 39-53.
- Coble, K. H. and Barnett, B.J. 2008, Implications of Integrated Commodity Programs and Crop Insurance. *Journal of Agricultural and Applied Economics* 40(2): 431-442.

- Cole, J. D., Janssen, L. L. and Johnson, B.B. 2004, Equity and Risk Associated with Share and Cash Leasing: A Nebraska and South Dakota Case Study. *Journal of the American Society of Farm Managers And Rural Appraisers* 67(1): 127-134.
- Conrath, D.W. 1967, Organizational decision making behavior under varying conditions of uncertainty. *Management Science* 13:B487-500.
- Cotton, M.K., Langemeier, M.R. and Featherstone, A.M. 1998, Effects of weather on multi-output efficiency of Kansas farms. *Journal of the American Society of Farm Managers and Rural Appraisers* 62: 85-91.
- Culem, D.G. 1988, The locational determinant of direct foreign investment among industrialised countries. *European Economic Review* 32: 885-904.
- Dheyvetter, K. C. and Kastens, T.L. 1999, Linkages between crop insurance and pre-harvest hedging. *Journal of Agricultural and Applied Economics* 31(1): 41-56.
- Dodson, C. B. 2004, Farmland Ownership Transitions, *Journal of the American Society of Farm Managers and Rural Appraisers* 67(1): 19-26.
- Doing Business, 2012, Doing Business in a More Transparent World. World Bank, Washington.
- Duncan, R.B. 1972, Characteristics of organizational environments and perceived environmental uncertainty, *Administrative Science Quarterly* 17(3): 313-327.
- Dunning, J. H., 1998, in Part 3 of Kumar, N., Dunning, J. H., Lipsey, R. E., Agarwal, J. P. and Urata, S. 1998, Globalization, foreign direct investment, and technology transfers: Impacts on and prospects for developing countries. Routledge, London.
- Ellinger, P.N. and Barry, P.J. 1987, The effects of tenure position on farm profitability and solvency: an application to Illinois farms. *Agricultural Finance Review* 47: 106-118.
- Escalante, C. L. and Barry, P.J. 2002, Business growth strategies of Illinois grain farms. *Agricultural Finance Review* 62(1): 69-79.
- Escalante C. L. and Barry, P.J. 2004, Growth-enhancing capital and operating plans of small and large grain farms. *Journal of the American Society of Farm Managers and Rural Appraisers* 67(1): 41-48.
- Escalante, C. L. and Turvey, C.G. 2009, Farm business decisions and the sustainable growth challenge paradigm. *Agricultural Finance Review* 69(2): 228-247.
- Evans, C. 2010, Foreign Investment in Agriculture. Agribusiness Association of Australia paper, Melbourne, December 2010.
- Eves, C. 2010, NSW rural land performance: 1990-2008. *Australasian Agribusiness Review* 18(1): 85-102.
- Eves, C. 2011, The role of institutional rural property in diversified investment portfolios in NSW, Australia. *Pacific Rim Property Research Journal* 17(2): 215-229.
- FAO. 2006, Can supply management halt the decline in agricultural commodity prices? Food and Agriculture Organization of the United Nations Commodity Market Briefs No. 1, October, Rome.
- Featherstone, A.M. and Baker, T. 1987, An examination of farm sector real asset dynamics: 1910-85. *American Journal of Agricultural Economics* 69: 532-546.
- Ferguson, R. A. 1986, The trouble with performance measurement. *Journal of Portfolio Management* 12(3): 4-9.

- Fernandez-Cornejo, J., Gempeshaw, C.M., Elterich, J.G. and Stefanou, S.E. 1992, Dynamic measures of scope and scale economies: an application to German agriculture. *American Journal of Agricultural Economics* 74: 329-342.
- FIRB. 2013, Annual report 2011-12. Foreign Investment Review Board, Canberra.
- Firstenberg, P.M., Ross, S.A. and Zisler, R.C. 1988, Real estate: the whole story. *Journal of Portfolio Management* 14: 22-32.
- Foley, J.C. 1957, Droughts in Australia – A Review of Records from the Earliest Years of Settlement to 1955. Commonwealth Meteorological Bureau Bulletin, 43, Melbourne.
- Ford, S.A. and Shonkwiler, J.S. 1994, The Effects of Managerial Ability on Farm Financial Success. *Agricultural and Resource Economics Review* 23: 150-157.
- Fort, C. and Parcell, J. 2006, A case study on the impact of an ethanol plant on corn price. *Journal of the American Society of Farm Managers and Rural Appraisers* 69(1) 26-30.
- Friedman, H.C. 1971, Real estate return and portfolio theory. *Journal of Financial and Quantitative Analysis* 6(2): 861-874.
- Froland, C., Gorlow, R. and Sampson, R. 1986, The market risk of real estate. *Journal of Portfolio Management* 12(3): 12-19.
- Giles, T. and Stansfield, M. 1990, The farmer as the manager. CAB, Wallingford, UK.
- Glau, T.E. 1971, The impact of tax policy on agricultural investment in Australia. Department of Agricultural Economics, University of Sydney, Report 5.
- Gloy, B.A., Hyde, J. and LaDue, E.L. 2002, Dairy farm management and long-term farm financial performance. *Agricultural and Resource Economics Review* 31: 233-247.
- Gold, R.B. 1995, Why the efficient frontier for real estate is fuzzy. *Journal of Real Estate Portfolio Management* 1: 59-66.
- Gong, L. and Sun, B. 1995, Efficiency measurement of production operations under uncertainty. *International Journal of Production Economics* 39: 55-66.
- Gottlieb, P. D. and Adelaja, A. 2009, The impact of down-zoning on land values: A theoretical approach. *Agricultural Finance Review* 69(2): 206-227.
- Gow, J. and Stayner, R. 1995, The process of farm adjustment: a critical review. *Review of Marketing and Agricultural Economics* 63: 272-283.
- Gruen, F.H. 1957, Capital formation in Australia. *Australian Journal of Agricultural and Resource Economics* 1(1): 92-105.
- Gutman, G.O. 1955, Investment and Production in Australian Agriculture. *Review of Marketing and Agricultural Economics* 23(4): 237-310.
- Hallam, A. (Ed.) 1993, Size, structure and the changing face of American agriculture. Westview Press, Boulder, Colorado.
- Hardin, W. and Cheng, P. 2002, Farmland investment under conditions of certainty and uncertainty. *Journal of Real Estate Finance and Economics* 25(1): 81-98.
- Hartzell, D., Hekman, J.S. and Miles, M. 1986, Diversification Categories in Investment Real Estate. *Journal of the American Real Estate and Urban Economics Association* 14: 617-637.

- Hatt, M., Heyhoe, E., and Whittle, L. 2012, Options for insuring Australian agriculture. Department of Agriculture, Fisheries and Forestry, and ABARES, Canberra.
- Henderson, J. and Gloy, B.A. 2009, The impact of ethanol plants on cropland values in the great plains. *Agricultural Finance Review* 69(1): 36-48.
- Hennessy, T. and O'Brien, M. 2007, Is off-farm income driving on-farm investment? Rural Economy Research Centre Working Paper Series 07-WP-RE-04, Teagasc, Ireland.
- Herr, W. 1964, Capital formation: its importance and determinants. *Australian Journal of Agricultural Economics*, 8:2, 97 - 111.
- Ho, C. K., Armstrong, D.P., Doyle, P. and Malcolm, L.R. 2005, Impacts of changing water price and availability on irrigated dairy farms in northern Victoria. *Australian Farm Business Management Journal* 2(2): 96-103.
- Ho, C. K., Malcolm, L.R., Armstrong, D.P. and Doyle, P.T. 2006, A case study of changes in economic performance of an irrigated dairy farm in northern Victoria. *Australian Farm Business Management Journal* 3(1): 11-20.
- Hooke, A.W. 1967, Farm investment, in D.B. Williams, Agriculture in the Australian Economy, Sydney University Press, Sydney.
- Johnson, G. L. and Quance, C.L. 1972, The overproduction trap in U.S. agriculture - resources for the future. John Hopkins University Press, Baltimore, Maryland.
- Johnson, M. A., and Pasour, E.C. 1981, An opportunity cost view of fixed asset theory and the overproduction trap. *American Journal of Agricultural Economics* 63: 1-7.
- Kaplan, H. 1985, Farmland as a portfolio investment. *Journal of Portfolio Management* 11:73-79.
- Kingwell, R. 2000, Price risk management for Australian broadacre farmers: some observations. *Australian Agribusiness Review* 8(2): 1-12.
- Kingwell, R. 2012, Revenue volatility faced by some of the world's major wheat producers. *Farm Policy Journal* 9(4): 23-33.
- Kingwell, R., Anderton, L., Islam, N., Xayavong, V., Feldman, D. and Speijers, J. 2013, A decadal assessment of farm performance: any learnings? GRDC Update Papers, Canberra.
- Kingwell, R.S., Morrison, D.A. and Bathgate, A.D. 1992, The effect of climatic risk on dryland farm management. *Agricultural Systems* 39(2): 153-175.
- Knight, F. H. 1921, Risk, uncertainty and profit. Houghton Mifflin, Boston and New York.
- Klohn, W. 2003, Agriculture, food and water. World Water Development Report, FAO, Rome.
- KPMG, 2013, Demystifying Chinese investment in Australian agribusiness. China Study Centre, University of Sydney, Sydney.
- Krause, M. 1995, Rural property planning – risk management. Inkata Press, Butterworth-Heinemann, Melbourne.
- Kritzman, M. 1986, How to detect skill in management performance. *Journal of Portfolio Management* 12(2): 16-20.
- Kueth, T. H. and Ifft, J. 2013, The information content of farmland value surveys. *Agricultural Finance Review* 73(1): 45-57.

- Kumar, N. 1998, in Part 2 of Kumar, N., Dunning, J. H., Lipsey, R. E., Agarwal, J. P. and Urata, S. 1998, Globalization, foreign direct investment, and technology transfers: impacts on and prospects for developing countries. Routledge, London.
- Langemeier, M. and Bradford, K. 2006, An examination of the relationship between overall inefficiency and farm characteristics. *Journal of the American Society of Farm Managers and Rural Appraisers* 69(1): 59-66.
- Lewis, P.E., Hall, N.H., Savage, C.R. and Kingston, A.G. 1988, Taxation, cost of capital, and investment in Australian agriculture. *Australian Journal of Agricultural Economics* 32(1):15-21.
- Libbin, J.D., Kohler, J.D., and Hawkes, J.M. 2004, Does modern portfolio theory apply to agricultural land ownership? Concepts for farmers and farm managers. *Journal of the American Society of Farm Managers and Rural Appraisers* 67(1): 85-107.
- Linehan, V., Thorpe, S., Andrews, N., Kim, Y. and Beaini, F. 2012, Food demand to 2050: opportunities for Australian agriculture. ABARES Conference, Canberra.
- Lins, D. A., Sherrick, B. J. and Venigalla, A. 1992, Institutional portfolios: diversification through farmland investment. *Journal of the American Real Estate and Urban Economics Association* 20(4): 549-571.
- Lowe, P. 2013, Investment and the Australian economy. Address to the CFA Australia Investment Conference, Melbourne, 24 October.
- Luh, Y.H. and Stefanou, S.E. 1991, Productivity growth in U.S. agriculture under dynamic adjustment. *American Journal of Agricultural Economics* 73: 1116 - 1125.
- Malcolm, B. 2011, Financing matters. *Australian Farm Business Management Journal* 8(1):11-18.
- Malcolm, B. 2011a, Changing business environment: implications for farming. *Australian Farm Business Management Journal* 8(2): 73-78.
- Markowitz, H. 1952, Portfolio selection. *Journal of Finance* 7(1): 77-91.
- Macquarie Agricultural Funds Management. 2013, The case for investing in agriculture. Macquarie Group, Sydney.
- Miles, M. and McCue, T. 1982, Historic returns and institutional real estate portfolios. *Journal of the American Real Estate and Urban Economics Association* 10(2): 184-199.
- Mintzberg, H. 1979, The structuring of organizations. Prentice Hall, New Jersey.
- Mishra, A.K., El-Osta, H.S. and Johnson, I.D. 1999, Factors contributing to earnings success of cash grain farms. *Journal of Agricultural and Applied Economics* 31(3): 623-637.
- Mishra, A. K., Moss, C. B. and Erickson, K.W. 2009, Regional differences in agricultural profitability, government payments, and farmland values: implications of DuPont (model) expansion. *Agricultural Finance Review* 69(1): 49-66.
- Moir, B. 2011, Foreign investment and Australian agriculture. RIRDC, Canberra.
- Moss, C. B. and Katchova, A.L. 2005, Farmland valuation and asset performance. *Agricultural Finance Review* 65(2): 119-130.
- Moss, C. B., Mishra, A. K. and Erickson, K.W. 2006, Rates of return on U.S. farm investments, 1940-2003: a comparison of imputed returns versus residual income approaches. *Agricultural Finance Review* 66(1): 91-107.
- Nasr, R., Barry, P.J. and Ellinger, P.N. 1998, Financial structure and efficiency of grain farms. *Agricultural Finance Review* 58: 33-48.



National Water Commission. 2011, Water markets in Australia: a short history. Canberra.

Noland, K., Norvell J., Paulson, N. and Schnitkey, G. 2011, The role of farmland in an investment portfolio: analysis of Illinois endowment farms. *Journal of ASFMRA* 74(1): 149-161.

Nossal, K. 2012, Innovative capacity and productivity: an empirical analysis of Australian grain growers. Australian Agricultural and Resource Economics Society 56<sup>th</sup> Conference, Fremantle, 7-10 February.

O'Donnell, C.J. 2010, Measuring and decomposing agricultural productivity and profitability change. *Australian Journal of Agricultural and Resource Economics* 54: 527-560.

O'Donnell, C.J., Chambers, R.G. and Quiggin, J. 2010, Efficiency analysis in the presence of uncertainty. *Journal of Productivity Analysis* 33(1): 1-17.

O'Hagan, J.P. 1958, Agricultural investment in Australia. *FAO Monthly Bulletin of Agricultural Economics and Statistics*, 7(6), June, Rome.

Painter, M.J. 2000, Should Saskatchewan farmland be part of your investment portfolio? *Canadian Journal of Agricultural Economics* 48: 39-50.

Painter, M.J. 2010, The portfolio diversification impact of a farmland real estate investment trust. *International Business and Economics Research Journal* 9(5): 115-123.

Paulson, N. D. and Schnitkey, G.D. 2013, Farmland rental markets: trends in contract type, rates and risk. *Agricultural Finance Review* 73(1): 32-44.

Powell, R.A. 1982, Farm investment. In Williams D.B. (Ed.), *Agriculture in the Australian Economy*. 2<sup>nd</sup> Edition, Sydney University Press, Sydney.

Purdy, B.M., Langemeier, M.R. and Featherstone, A.M. 1997, Financial performance, risk, and specialization. *Journal of Agricultural and Applied Economics* 29: 149-161.

Queensland Government. 1952, Committee of Inquiry into the Queensland-British Food Corporation. Department of Agriculture and Stock, State Archives Series ID: 8401.

Schaffnit-Chatterjee, C. 2012, Foreign investment in farmland: no low hanging fruit. Deutsche Bank Research, Frankfurt.

Sefton, C.A. and Cox, R.J. 2005, A business performance index model that measures wealth change in Australian farm businesses. *Australian Farm Business Management Journal* 2(2): 122-135.

Shapira, Z. 1993, Ambiguity and risk taking in organizations. *Journal of Risk and Uncertainty* 7: 89-94.

Shapiro, D., Bollman, R.D. and Ehrensaft, P. 1987, Farm size and growth in Canada. *American Journal of Agricultural Economics* 69(2): 477-483.

Shaw, A.G. 1967, History and development of Australian agriculture. In Williams, D.B. (Ed.) *Agriculture in the Australian Economy*. Sydney University Press, Sydney.

Sheng, Y., Mullen, J.D. and Zhao, S. 2010, Has growth in productivity in Australian broadacre agriculture slowed? Australian Agricultural and Resource Economics Society 54<sup>th</sup> Conference, Adelaide, 10-12 February.

Shiha, A.N. and Chavas, J.P. 1995, Capital market segmentation and U.S. farm real estate Pricing. *American Journal of Agricultural Economics* 77: 397-407.

Shih-Hsun, H. and Ching-Cheng, C. 1990, An Adjustment-Cost Rationalization of Asset Fixity Theory. *American Journal of Agricultural Economics* 72(2): 298-308.

- Shultz, S. 2006, Differences between agricultural land value surveys and market sales. *Journal of the American Society of Farm Managers and Rural Appraisers* 69(1): 142-149.
- Tegene, A. and Kuchler, F.R. 1991, A description of farmland investor expectations. *Journal of Real Estate Finance and Economics* 4: 283-296.
- Tozer, P.R. 2010, Measuring the efficiency of wheat production of Western Australian growers. Australian Agricultural and Resource Economics Society 54<sup>th</sup> Conference papers, Adelaide, February 10-12.
- Treadway, A.B. 1969, On rational entrepreneurial behavior and the demand for investment. *Review of Economic Studies* 36: 241-258.
- Tyler, G. and Dixie, G. 2013, Investing in agribusiness: a retrospective view of a development bank's investments in agribusiness in Africa and Southeast Asia and the Pacific. Agriculture and Environmental Services Discussion Paper 01, Washington.
- Vasavada, U. and Chambers, R.G. 1986, Investment in US agriculture. *American Journal of Agricultural Economics* 68: 950-960.
- Waugh, D.J. 1977, The determinants of investment in Australian agriculture – a survey of issues: with particular reference to the Australian sheep industry. *Quarterly Review of Agricultural Economics* 30(2): 133-149.
- Webb, J.R. and Rubens, J.H. 1988, The effect of alternative return measures on restricted mixed-asset portfolios. *Journal of the American Real Estate and Urban Economics Association* 16: 123-137.
- Williams, J. 2012, Competition and efficiency in international food supply chains: improving food security. Earthscan-Routledge, Abingdon, UK.
- Williams, J. 2013, *Wheat and corn price skewness and volatility: Risk management implications for farmers and end users*. Australasian Agribusiness Review 21(6): 101-120.
- Williams, J. 2013a, *Agricultural Supply Chains and the Challenge of Price Risk*. Earthscan-Routledge, Abingdon, UK.
- Wilson, R. 1931, Capital imports and the terms of trade. Melbourne University Press, Melbourne.
- Woodcroft-Brown v Timbercorp. 2013, Victorian Supreme Court Appeal. Melbourne, 10<sup>th</sup> October.
- Zakrzewicz, C., Brorsen, B.W. and Briggeman, B.C. 2012, Comparison of alternative sources of farmland values. *Agricultural Finance Review* 72(1): 68-86.