DRAFT REPORT

Multi-peril crop insurance

Cost benefit analysis of selected support measures

Prepared for

Independent Pricing and Regulatory Tribunal

July 2016

THE CENTRE FOR INTERNATIONAL ECONOMICS

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CANBERRA

Centre for International Economics
Ground Floor, 11 Lancaster Place
Majura Park
Canberra ACT 2609

GPO Box 2203
Canberra ACT Australia 2601

Telephone +61 2 6245 7800
Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au

Website www.TheCIE.com.au

SYDNEY

Centre for International Economics
Suite 1, Level 16, 1 York Street
Sydney NSW 2000

GPO Box 397
Sydney NSW Australia 2001

Telephone +61 2 9250 0800
Facsimile +61 2 9250 0888
Email ciesyd@TheCIE.com.au

Website www.TheCIE.com.au

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Abbreviations

ABARES	Australian Bureau of Agriculture, Resource Economics and Science
ABS	Australian Bureau of Statistics
BCA	Benefit cost analysis
BMP	Best Management Practice
BOM	Bureau of Meteorology
CIE	Centre for International Economics
FBSD	Farm Business Skills Professional Development
IPART	Independent Pricing and Regulatory Tribunal
MPCI	Multi-peril crop insurance
NRDC	Natural Resources Defence Council
POAMA	Predictive Ocean Atmospheric Model for Australia
RAA	NSW Rural Assistance Authority

Executive summary

The CIE was commissioned by the Independent Pricing and Regulatory Tribunal to consider the economic impact of selected multi-peril crop insurance (MPCI) incentive measures.

- MPCI is an insurance product that is utilised internationally, with high levels of government assistance, as a means of managing a broad range of risks facing agricultural producers.
- There are a range of challenges that have limited the financial viability of MPCI in Australia in the past, driven predominantly by the high degree of weather volatility in Australia and the risk of widespread drought.

The current market for MPCI

The current market for MPCI is comprised of a small number of companies developing and trialling new products to select customers. A range of MPCI policies have been offered across Australia that:

- offer an acceptable premium price to attract uptake
- that provide benefits to farm businesses
- limit the exposure of insurers.

We consider that uptake of MPCI is likely to be limited in the absence of government intervention. Indications are that Australia-wide, could be around 200 businesses in 2016-17 growing to 400 in following years.

Rationale for government intervention in the MPCI market

There are a number of possible reasons for the NSW Government to intervene in MPCI markets. These include:

- MPCI may offer a substitute for NSW Government and Australian Government assistance to farmers;
- MPCI may lead to changes to farm productivity that are unanticipated by farmers, by moving farmers towards best management practice (BMP);
- MPCI may accelerate structural adjustment, generating economies of scale in production;
- MPCI may improve access to capital, by providing financiers with greater surety over their loans to farmers;
- There may be information asymmetries that hamper the MPCI market, such as farmers having better information on their risks of crop failure than insurers; and

- There may be existing government interventions in the MPCI market that influence uptake, such as stamp duty.

These reasons constitute either 'market failures' or 'government failures'. This study has investigated these different reasons for government intervention, as these determine whether the government is moving the market towards a more or less efficient outcome. The key conclusions from this are set out in box 1.

1 Conclusions on market and government failures in the MPCI market

This study has found that there are a number of valid reasons for changing government intervention in the MPCI market.

- Stamp duty is an inefficient intervention in the MPCI market, because it is a less efficient means of raising government revenue than other taxes.
- There is the *potential* for significant unanticipated productivity gains for some farmers from uptake of MPCI. This could occur because some farmers are currently conservative in their use of inputs such as fertiliser, and margins could be increased by taking more risks in the use of inputs. MPCI provides insurance against taking these risks.

The study has also found that there are reasons that do not support additional government intervention in the MPCI market.

- High levels of equity and increasing land values, especially for specialist producers, mean that there are not strong reasons for MPCI to improve access to capital in NSW.
- The process of structural adjustment in the grains and mixed grains and livestock sector has been underway for the past 20 years and likely to be ongoing, and is not likely to be changed by uptake of MPCI.
- MPCI for cropping activities is not likely to substitute for other forms of government assistance to farms, such as drought assistance. The grains industry accounts for a modest component of total drought assistance provided by government. Further, the MPCI products likely to be used would not provide cover when start of season soil moisture levels were low, such as in droughts, so as to be able to provide MPCI at lower premiums for farmers. This means MPCI is not a general drought insurance measure.

The most important potential market failure for MPCI is related to the behaviour of farmers and how close they are to BMP. Strictly speaking, this is not so much a market failure as inefficiency in decisions made by farmers. MPCI could improve management by leading farmers to taking a more risk neutral approach to investment, and production decisions. The productivity benefit is most likely to result from a more risk-neutral decision making with respect to input uses. The ongoing decline in the farmers' terms of trade and increased seasonal variability has resulted in widespread reduction in the use of fertiliser, and lower utilisation than appears optimal.

We note that the potential link to improvements in farm decisions in the NSW cropping sector are difficult to link specifically to MPCI.

- Evidence from the United States indicates no linkage between MPCI and improved yields.
- Industry experts indicate that these improvements in practice could be adopted independently of MPCI. However, this has not occurred to date.

Government interventions considered in this analysis

The measures that are evaluated in this study are shown in table 2. The focus of the analysis has been on measures 3 and 4, which are most directly linked to MPCI. For other measures we set out the costs and indicative benefits, based on previous similar investments.

2 Proposed MPCI incentive measures

Measure	Status	Purpose of measure
1. The farm business skills professional development program	Existing measure	▪ Improve accessibility of best practice information to farmers that may include information on addressing risk
2a. Installation of rain gauges and weather stations	Existing measure	▪ Improve information on risk
2b. Sharing of NSW RAA data as a potential source of agricultural production information	Implementation is underway	▪ Improve information on risk
3. Stamp duty waiver for multi-peril crop insurance premiums	New	▪ Reduce costs of insurance for first 5 years
4. Reduced upfront cost of multi-peril crop insurance premiums	New	▪ Reduce costs of insurance for first 5 years

Source: IPART Scope of Work document.

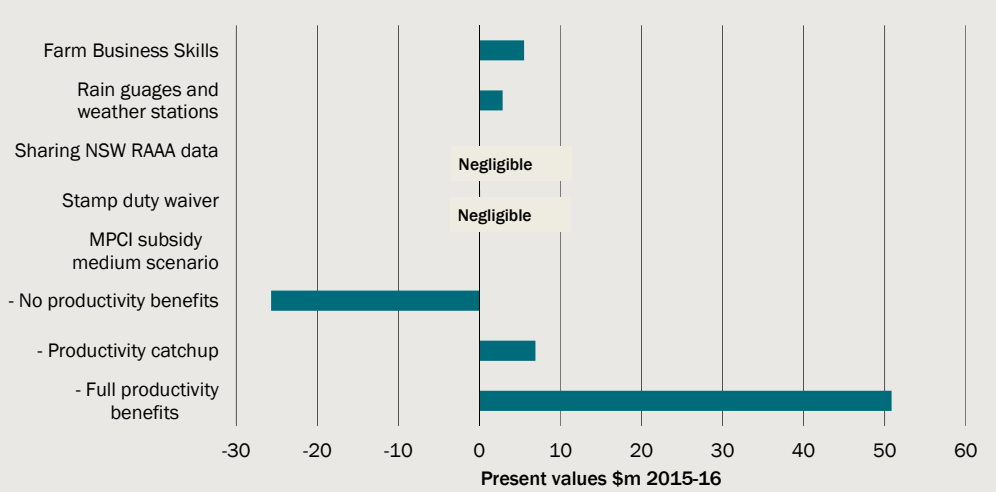
The anticipated cost of the measures to the NSW Government is set out in chart 3. Measure 4 is the most substantial of the measures in terms of its budget impact. Note that we anticipate that the Farm Business Skills Professional Development program expenditure will be well below the $45 million budgeted for this program.

Scope of the analysis

In terms of the measures to reduce the cost of MPCI, the measures are targeted at the winter cereals (primarily wheat, barley and canola) and excludes summer crops such as sorghum.

- Winter cereal crops are already insured for so-called 'named' perils including hail, fire and post-harvest losses.
- MPCI addresses systemic crop failure as a result of seasonal conditions, such as below-average rainfall and prolonged heat events.

3 Cost of measures to the NSW Government and Australian Government



Note: Costs are in 2015-16 dollars and are the net present value over 20 years. Costs include the marginal burden of taxation.
Data source: The CIE.

The demand response for reducing the price of MPCI was evaluated for three different price points: low ($14 per hectare), medium ($22 per hectare) and high ($30 per hectare). Each price point corresponds to a level of coverage of the MPCI product offered.

The analysis was conducted based on an approach that included consultation with market players (insurers and the grains industry), research from international experience and the development of a database and framework for the NSW grains industry.

CBA findings

The key conclusions form the cost benefit analysis are as follows.

A stamp duty waiver will have a benefit cost ratio of around 1:1 for all scenarios (see table 4).

The cost benefit analysis has been conducted on the basis that the stamp-duty waiver is a stand-alone policy, and is not combined with further subsidies.

4 Summary of benefits and costs for measure 3[a]

Price scenario	MPCI related[b]	Other benefits	Total benefits	Costs[c]	Benefit cost ratio
	$m	$m	$m	$m	
Low ($14/ha)	0.3	0.0	0.3	0.3	1.0
Medium ($22/ha)	0.4	0.0	0.4	0.4	1.0
High ($30/ha)	0.5	0.0	0.5	0.5	1.0

[a] Net present of benefits and cost in 2014-15 terms over 20 years, 2016-17 to 3035-36 using a real discount rate of 7 per cent. [b]Total benefits are calculated by the a marginal excess burden of 1.35.[c] Total expenditure by government multiplied by a marginal excess burden of 1.35.

Source: CIE calculations.

For measure 4, three different cases were considered for how productivity benefits would play out:

- Case 1: there are no resulting productivity gains, that is, all the benefits relate to a transfer in risk to the market and are anticipated by farmers
- Case 2: productivity gains that would have occurred anyway are brought forward in time by 5 years
- Case 3: productivity gains would not have been achieved by other means.

A direct subsidy for MPCI would have a BCR of less than 1:1 if it fails to achieve any movement towards best practice or the price point for MPCI is at the high end of the possible range (see table 5).

- If the price point is at the range represented by the low and medium scenarios, then our consultation indicates that there would be expected to sufficient uptake that middle tier farmers would adopt.
- There is the potential for MPCI to drive significant productivity improvements for middle tier farmers, based on industry consultations (corresponding to cases 2 and 3 in table 5). However, there is limited empirical support to this occurring in other jurisdictions.
- Only modest unanticipated improvements in productivity are required for a direct subsidy to MPCI to have a BCR greater than 1:1.

5 Summary of benefits and costs for measure 4[a]

Case and price scenario	MPCI related[b]	Other benefits	Total benefits	Costs[c]	Benefit cost ratio
	$m	$m	$m	$m	
Case 1: no productivity gains					
Low ($14/ha)	19.1	0.0	19.1	40.0	0.5
Medium ($22/ha)	21.0	0.0	21.0	46.7	0.5
High ($30/ha)	15.3	0.0	15.3	32.9	0.5
Case 2: Productivity gains brought forward by 5 years					
Low ($14/ha)	105.0	0.0	105.0	40.0	2.6
Medium ($22/ha)	53.6	0.0	53.6	46.7	1.1
High ($30/ha)	16.8	0.0	16.8	32.9	0.5
Case 3: Productivity gains would not have occurred without MPCI					
Low ($14/ha)	220.1	0.0	220.1	40.0	5.5
Medium ($22/ha)	97.5	0.0	97.5	46.7	2.1
High ($30/ha)	18.9	0.0	18.9	32.9	0.6

[a] Net present of benefits and cost in 2014-15 terms over 20 years, 2016-17 to 3035-36m using a real discount rate of 7 per cent. [b] Includes benefits from increases in consumer surplus as a result of the subsidy to both existing and new policy holders [c] Total expenditure by government multiplied by a marginal excess burden of 1.35.

Source: CIE calculations, NSW Treasury Guidelines for economic appraisal.

Table 6 summarises the benefits and costs for the supporting drought measures.

- The supporting measures (measures 1, 2a and 2b) are likely to have BCRs greater than 1:1, based on the returns from previous similar programs.

6 Summary of benefits and costs across supporting measures 1, 2a and 2b[a]

	MPCI related	Other benefits	Total benefits	Costs[b]	Benefit cost ratio
	$m	$m	$m	$m	
1. Farm Business Skills Professional Development	0.0	17.0	17.0	11.5	1.5
2a. Rain gauges and weather stations	0.0	6.3	6.3	3.4	1.9
2b. Sharing NSW RAA data	0.0	0.0	0.0	0.0	>1
Total across supporting measures	0.0	23.2	23.2	14.8	>1.6

[a] Net present of benefits and cost in 2014-15 terms over 20 years, 2016-17 to 3035-36m using a real discount rate of 7 per cent. [b] Total expenditure by government multiplied by a marginal excess burden of 1.35.

Source: CIE calculations, NSW Treasury Guidelines for economic appraisal.

- The benefits from these programs are not related to changes in MPCI uptake, as we do not anticipate that they will make any noticeable difference to MPCI itself. Instead, their benefits will reflect direct improvements to farm productivity, or policymaking.

Recommendations

To better understanding the potential benefits of accelerating MPCI, given the uncertainty around benefits, a region or district could be used as trial that would enable evaluation of the productivity linkages identified in this report as being critical to support public investment in MPCI.

1 Introduction

Multi-peril crop insurance is a privately offered insurance product that provides a level of income guarantee to cropping enterprises. In general, policies are specified based on an agreed expected yield for the enterprise (agreed between the insurer and the producer) and coverage is provided for a nominated level of loss against that yield and revenue (for example, 40 per cent or 70 per cent). [1]

There are a range of economic objectives being targeted through MPCI, by a number of stakeholders, such as:

- farm businesses: mitigate risks across years and maximise profitability
- insurers: maximise profits based on the assessment and management of exposure to risks across a portfolio
- government: movement of producers towards private risk management activities and limiting public liability in adverse weather events such as declared droughts.

MPCI is offered across a number of countries internationally, but there has been limited experience (both offering and take up) of MPCI in Australia.

The objective of this project is to consider the costs and potential benefits to the NSW cropping sector from four selected government measures.

The Premier requested that IPART review a series of existing and proposed drought assistance measures that have been identified as options to increase uptake of MPCI. However, because the measures are not solely directed at MPCI uptake the cost benefit analysis considers the broader potential for economic benefits, beyond those directly affecting the market for MPCI.

Measures to be evaluated

The Premier requested that IPART review four government support measures for MPCI. These measures, their status and intended purpose are presented in table 1.1.

1.1 Proposed MPCI incentive measures

Measure	Status	Purpose of measure
1. The farm business skills professional development program	Existing measure	▪ Improve accessibility of best practice information to farmers that may include information on addressing risk
2a. Installation of rain gauges and	Existing measure	▪ Improve information on risk

1 Around 75 per cent of policies in the United States are now revenue based products.

Measure	Status	Purpose of measure
weather stations		
2b. Sharing of NSW RAA data as a potential source of agricultural production information	Implementation is underway	▪ Improve information on risk
3. Stamp duty waiver for multi-peril crop insurance premiums	New	▪ Reduce costs of insurance
4. Reduced upfront cost of multi-peril crop insurance premiums	New	▪ Reduce the upfront cost of insurance

Source: IPART Scope of Work document

This review follows a Multi-Peril Insurance Summit held by the NSW Government in 2015 where three key issues were identified:

- gathering and obtaining data to understand the risks and how farmers behave — this is a constraint on insurance companies that are looking to enter the market but have limited access to actuarial data to support the risk and premium calculations;
- the cost of insurance — this issue is driven predominantly by the high level of volatility and systemic risk in the agricultural market meaning that the cost of risk in an insurance premium is high, as well as the need for insurance companies to find a way to overcome often prohibitive adverse selection and moral hazard issues; and
- education and understanding of the benefits of mitigation approaches and multi-peril insurance — the level of demand in the market is driven by both exposure to and understanding of how MPCI would work, as well as the net benefits of MPCI beyond those of self-insurance, risk mitigation and any continued or altered role of government in providing support and/or assistance.

This report

This report sets out the measures that have been evaluated and the basis of our estimates of costs and benefits.

- Chapter 2 sets out the cost benefit analysis framework that has been used for the study
- Chapter 3 sets out in detail the measures that are expected to increase accessibility of MPCI for farm businesses
- Chapter 4 sets out the other measures evaluated, whose impacts are less closely related to MPCI
- Chapter 5 identifies the baseline used for the analysis
- Chapter 6 quantifies the impact of MPCI pricing measures
- Chapter 7 reports the results of the cost benefit analysis
- Appendix A sets out details on current government assistance measures
- Appendix B provides details on the NSW cropping industry and baseline
- Appendix C lists previous estimates of crop insurance for the Australian market
- Appendix D sets out previous literature on the elasticity of demand for agricultural insurance.

2 Cost benefit analysis framework

Cost benefit analysis (BCA) seeks to measure the value of a project from the perspective of the community overall. In the case of CBA for NSW Government actions, the relevant community is normally taken to be residents of NSW. This chapter explains the cost benefit analysis framework and the general parameters used in the analysis.

Key steps in a CBA

The steps required to undertake a CBA are set out in Box 2.1.

2.1 Key Steps in a CBA

- **Articulating the decision that the CBA is seeking to evaluate**. For example, in relation to MPCI interventions, the decision is whether to undertake each intervention. The way in which the CBA is framed and the information requirements will differ depending on the decision being evaluated.
- **Establishing the reference case** (or 'base case') against which to assess the potential socioeconomic and environmental impacts of changes. One possible base case is no government action beyond that already committed.
- **Quantifying the changes** from the base case resulting from the possible options being considered. This will focus on the incremental changes to economic welfare resulting from the decision. The changes may be known with certainty or could also be defined in probabilistic terms. The quantification should focus on key changes that will be utilised in the valuation stage.
- **Placing values on the changes** and aggregating these values in a consistent manner to assess the outcomes.
- **Generating the Net Present Value (NPV) of the future net benefits stream**, using an appropriate discount rate, and deciding on the Decision Rule on which to assess the different options. The best decision rule is to choose the scenario that has the highest net benefits.
- **Undertaking sensitivity analysis** on a key range of variables, given the uncertainties related to specific benefits and costs.
- **Deciding on which option is better for society**. In practice, additional information, aside from the CBA results, may also be utilised when deciding on the preferred option.

Conceptual framework for government intervention in the MPCI market

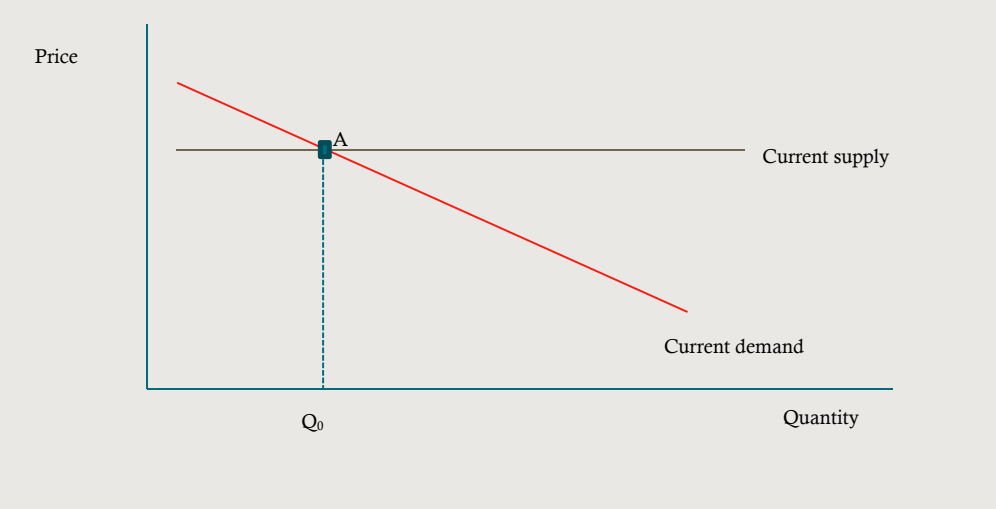
Where a government is intervening in a market, cost benefit analysis should reflect the welfare impacts that accrue in this market.[2] The market for MPCI reflects:

- the demand for MPCI by farmers. The demand will differ depending on factors such as use of other risk management practices.
- the supply or cost curve for MPCI. The marginal cost — that is, the cost for providing MPCI to each additional hectare —will likely be flat or even fall over some sections of the supply curve, as there will be some economies of scale in supply.

In practice, the market for MPCI is more complicated as farmers differ in their level of risk, and an insurer will be trying to appropriately account for this in the premiums and coverage offered. If they cannot do this, then a market may not deliver an optimal (or even any) insurance.[3]

Where there are no 'distortions' in the market, then it would be expected that the market equilibrium, where the cost curve and demand curve cross, is the economically efficient point. This is shown as point A in chart 2.2, as Q_0. In this case, government interventions will by definition move the market to a less efficient outcome.

2.2 The MPCI market



Data source: The CIE.

The market for MPCI is subject to a number of distortions.

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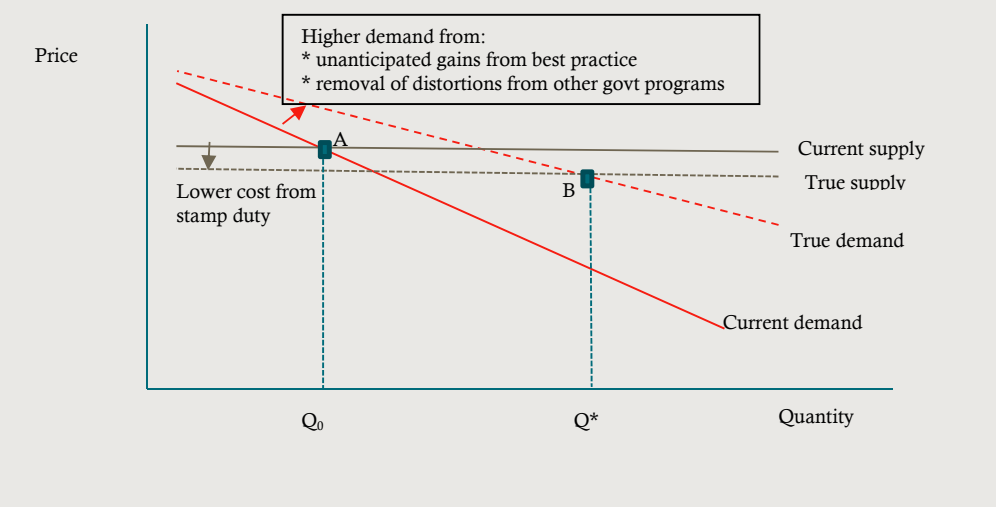
2 Cost benefit analysis does not normally take account of flow-on impacts in other markets. For this CBA, we do account for distortions from the cost of taxation.

3 Pauly M 1974, *Over-insurance and public provision of insurance: the roles of moral hazard and adverse selection*", Quarterly Journal of Economics, Vol. 88 No. 1 February.

- Insurance markets in general suffer from moral hazard and adverse selection. These issues generally lead to a lower level of insurance than is efficient, or increase insurer's costs to manage these issues.
- Stamp duties for insurance push the cost of insurance higher than the true cost of supply.
- The availability of government support such as concessional loans and drought relief may lead to demand for MPCI being lower than would otherwise be the case.
- Potentially, insurance also offers unanticipated gains in farm practices for those farmers not at best practice, through the conditions placed by insurers on their insurance.

An example of the impacts of these distortions is shown in chart 2.3. In this case, the current market outcomes at Q_0 would be below the efficient market outcome at Q*.

2.3 The MPCI market with distortions



Data source: The CIE.

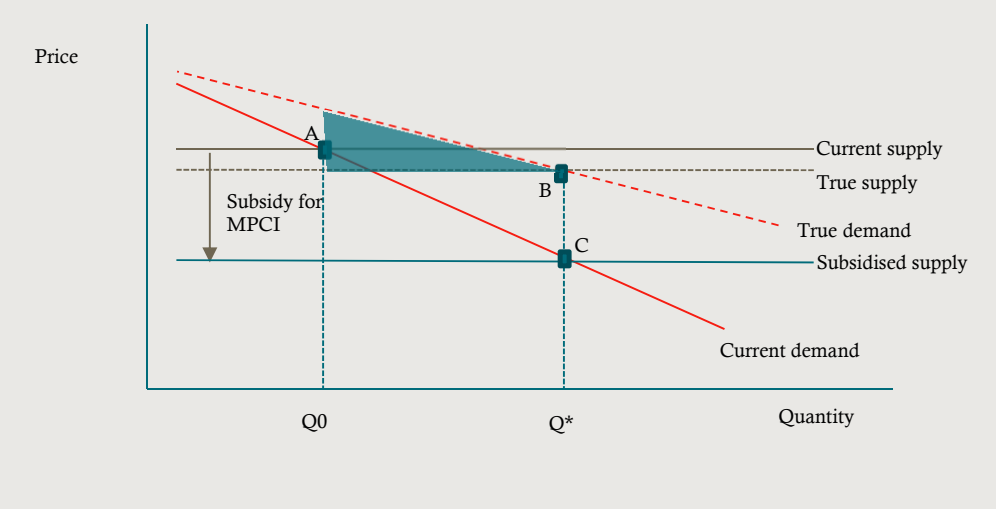
In this framework, government interventions that are likely to move the market towards the efficient point will generally have net benefits, and those that move the market further from the efficient point will have net costs.

To give a tangible example of applying welfare analysis in this framework, chart 2.4 shows the welfare impacts of a subsidy in a distorted MPCI market. In this example, the gain from a subsidy to the MPCI market is the shaded triangle. This triangle comprises:

- the increase in consumer surplus for purchasers of MPCI, which is the shaded triangle plus the amount of the subsidy, less
- the cost to Government of the subsidy.

To this MPCI-market impact other non-MPCI market impacts should be added. These would include costs in other markets associated with having to raise money from taxes to pay for MPCI subsidies, and implementation/administration costs for Government.

2.4 Impacts of a subsidy



Data source: The CIE.

Types of costs and benefits accruing to stakeholder groups

To achieve the objectives of quantifying the net benefits of each of the measures, table 2.5 identifies the nature of the benefits and related costs from the perspective of two broad stakeholder groups:

- direct stakeholders including farm businesses, broadacre agriculture more generally, and insurers; and
- the NSW government and the state more widely.

The benefits and costs of each measure are quantified independently to provide a benefit cost ratio (BCR). Some measures will be substitutes — for example, removing stamp duty and providing a subsidy may move the market beyond the efficient level of MPCI.

2.5 Benefits and costs identified by this report

Measure and impacted group	Potential benefits	Potential costs
1. The farm business skills professional development program		
Cropping and general broadacre sector	▪ Unanticipated productivity/farm income improvement across adopting businesses	▪ None
Government/state economy	▪ None	▪ Cost of program delivery
2a. Installation of rain gauges and weather stations		
Cropping sector/broadacre sector and insurers	▪ Improved climate / rainfall forecasting capability for regional NSW	▪ None
Government/state economy	▪ None	▪ Cost of providing rain gauges and weather stations

Measure and impacted group	Potential benefits	Potential costs
2b. Sharing of NSW RAA data as a potential source of agricultural production information		
Insurers	▪ Increased accessibility and transparency of NSW and Commonwealth assistance	▪ Negligible
Government/state economy	▪ Use by policymakers such as DPI	▪ Small implementation costs
3. Stamp duty waiver for MPCI premiums		
Cropping sector	▪ Higher consumer surplus because of less expensive MPCI premiums ▪ Transfer of risk to the market ▪ Productivity/farm income improvement across adopting businesses (note this is not measured for this policy)	▪ Cost of MPCI premium
Government/state economy	▪ None	▪ Foregone revenue for NSW government
4. Reduced upfront cost of MPCI premiums		
Cropping sector	▪ Higher anticipated consumer surplus because of a subsidised price ▪ Transfer of risk to the market ▪ Productivity/farm income improvement across adopting businesses	▪ Cost of MPCI premium ▪ Compliance costs with MPCI policies
Government/state economy	▪ Reduced dependence on existing assistance methods	▪ Subsidy provided by NSW government

Source: The CIE.

General assumptions used in the CBA

CBA requires the use of general assumptions such as the discount rate, approach to risk and time period for valuation. Our assumptions are set out in table 2.6.

2.6 General components of CBA

Assumption	Assumption
Discount rate	7 per cent
Time period	20 years

Source: The CIE.

The policy instruments being evaluated also lead to impacts on government revenue, which flow through to distortions through having to raise other taxes above what would otherwise be the case. Table 2.7 sets out the evidence on the marginal excess burden of selected taxes. The marginal excess burden measures the overall economic cost for each additional dollar of revenue raised. State taxes are generally less efficient than Australian

2.7 Relative efficiency of selected taxes

KPMG Econtech [a]		KMPG Econtech		Commonwealth Treasury	
2010	MEB [b]	2011	MEB [b]	2015	MEB [b]
Municipal rates	0.02	Land tax	0.09	Broad based land tax	-0.1
GST	0.08	GST	0.12	Personal income tax (labour & capital)	0.16
Land taxes	0.08	Personal income tax	0.24	Broad based GST	0.17
Labour income tax	0.24	Motor vehicle stamp duty	0.33	Current GST	0.19
Conveyancing stamp duties	0.34	***Payroll tax***	***0.35***	Labour income tax	0.21
Motor vehicle stamp duties	0.38	Company tax	0.37	Company tax	0.50
Corporate income tax	0.40	Commercial transfer duty	0.74	Stamp duty on conveyances	0.72
Payroll tax	0.41	Residential transfer duty	0.85		

[a] Modelling and results were prepared for and incorporated into the Henry Tax Review. [b] Marginal excess burden is the cost of the tax due to changing it by a small amount (usually such that total government revenue increases by $1).

Sources: KPMG Econtech 2010, CGE analysis of the current Australian tax system, prepared for Department of Treasury, 26 March; KPMG Econtech 2011, Economic analysis of the impacts of using GST to reform taxes; Australian Treasury 2015, Understanding the economy-wide efficiency and incidence of major Australian taxes

Government taxes. Also note that the estimated marginal excess burden in these studies for state taxes is for changing taxes across all states at the same time — changes made by one state will tend to have higher distortions than changes made by all state at the same time.

- **For State government expenditure, we base our analysis on an excess burden of 35 cents per dollar of revenue raised. That is, $1 of expenditure costs the state $1.35. This reflects the cost of payroll tax from KPMG 2011. Our presumption is that this is the most efficient of the major NSW taxes.**

Note that there are more efficient Australian Government taxes available. Land tax would also have a lower marginal excess burden. IPART has previously used lower estimates for the purposes of its public transport review.

3 Market and government failures in the market for MPCI

The rationale for government intervention in MPCI rests on their being forms of market or government failure that government intervention can address. These include:

- MPCI may offer a substitute for NSW Government and Australian Government assistance to farmers
- MPCI may lead to changes to farm productivity that are unanticipated by farmers, by moving farmers towards BMP
- MPCI may accelerate structural adjustment, generating economies of scale in production
- MPCI may improve access to capital, by providing financiers with greater surety over their loans to farmers
- there may be information asymmetries that hamper the MPCI market, such as farmers having better information on their risks of crop failure than insurers; and
- there may be existing government interventions in the MPCI market that influence uptake, such as stamp duty.

Our conclusions on these forms of market and government failure in relation to MPCI are set out in Box 3.1. The rest of this chapter expands on the basis for our conclusions.

Improving management practices and reducing risk aversion

- **There are a number of plausible pathways through which MPCI could encourage the uptake of best management practices and improve productivity. However, there is limited empirical evidence that supports these drivers being able to make a discernible impact on the sector.**

Proponents of MPCI, both in Australian and overseas, identify the promotion of greater uptake of best management practices (BMP) and resulting increases in long term productivity as the primary benefits of government intervention in MPCI markets.

Recent Australian experience

The potential for BMP to improve productivity across the broadacre grains sector is often highlighted in terms of the differences between observed yields and potential yields, based on available soil moisture and water use efficiency (WUE) benchmarks.

3.1 Conclusions on market and government failures in the MPCI market

This study has found that there are a number of valid reasons for changing government intervention in the MPCI market.

- Stamp duty is an inefficient intervention in the MPCI market, because it is a less efficient means of raising government revenue than other taxes.
- There is the *potential* for significant unanticipated productivity gains for some farmers from uptake of MPCI. This could occur because some farmers are currently conservative in their use of inputs such as fertiliser, and margins could be increased by taking more risks in the use of inputs. MPCI provides insurance against taking these risks and also may address an information gap that leads to conservative decisions.

The study has also found that there are reasons that do not support additional government intervention in the MPCI market.

- High levels of equity and increasing land values, especially for specialist producers, mean that there are not strong reasons for MPCI to improve access to capital in NSW.
- The process of structural adjustment in the grains and mixed grains and livestock sector has been underway for the past 20 years and likely to be ongoing, and is not likely to be changed by uptake of MPCI.
- MPCI for cropping activities is not likely to substitute for other forms of government assistance to farms, such as drought assistance. The grains industry accounts for a modest component of total drought assistance provided by government. Further, the MPCI products likely to be used would not provide cover when start of season soil moisture levels were low, such as in droughts, so as to be able to provide MPCI at lower premiums for farmers.

This means MPCI is not a general drought insurance measure.

How this technical potential can be realised tends to be multifactorial. The key drivers of productivity growth and key components of best management practices are access to technologies and inputs — capital and fertiliser.

Previous work for the grain industry by CIE [4] identified that for Victoria, between 80 and 90 per cent of the variability in wheat yields over time can be accounted for by soil moisture. Accounting for differences in yields at a district level was significantly more difficult. The study also found that the links between economic drivers, the adoption of best practice and productivity improvements are complex, inter-related and can involve timeframes of 20 years or more. For example, conservation farming was only widely adopted in response to the two major droughts in the 2000s despite being available for 20 years.

4 Unpublished. Prepared for the Victorian Department of Economic Development. Jobs, Transport and Resources.

A more variable climate in conjunction with declining terms of trade has made broadacre farmers more conservative over time. It may be completely rational for farmers to take a low-risk low-productivity approach to their business especially where the owner is approaching retirement and looking to exit the industry. Similarly, other businesses will take a high-risk approach, which may result in crop failure.

- If MCPI were widely available in NSW, proponents believe that farmer risk-aversion would be reduced, resulting in higher levels of input use.
- Similar arguments for marketing and financial decision-making are put forward by MCPI proponents.
- That is, entering into MPCI would move businesses closer towards best management practices.

The key question is by how much does this risk aversion reduce yields below those that would prevail with more objective, risk-neutral approach?

International experience

There is limited international experience from the literature on the link between MPCI and increased productivity. There is however, a large-scale econometric analysis of insurance market variables and crop yield observation in the United States that attempted to identify evidence of moral hazard.[5] The study utilised a differences in differences approach to control for constant impacts on yield for given farms, and measured the observed differences between farm and regional average yields at two points in time.

- The study found that there were very limited and highly isolated pieces of evidence that indicated a moral hazard type reaction for newly insured farmers (that is, a reduction in yields observed to coincide with insurance uptake for the first time, but not correlated regionally, or observed later in time when insurance continues or is discontinued).
- While the study was centred on considering moral hazard, or negative, responses to insurance, the ultimate finding was that there was no statistically significant link between crop yields and the take up of MPCI.

The mechanisms through which a MPCI product would be able to directly affect risk management practices and the uptake of best management practices will be directly linked to the policy terms and conditions, and whether or not there is a clear pricing signal provided in the premium to provide incentives for these elements.

In 2013, a discussion paper by the Natural Resources Defence Council (NRDC), an international non-profit environmental organisation, discussed the implications of premium setting formulae used in the United States. Two key issues were identified:

- the premium rate setting process attracted high-risk producers to the insurance pool — through subsidisation; and

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5 Roberts M, O'Donoghue E and Key N 2007, *Does crop insurance affect crop yields? Economic research Services*, USDA. Prepared for presentation at the Annual Meeting of the AAEA, July 29-Aug 1 2007.

- the payout process provided incentives for production methods that damage natural resources and increase the risk of crop losses — where these practices are lower cost than best management practices that protect the long term capacity of the farm. [6]

The implications that can be drawn from these limited findings include:

- there are a large range of factors that affect crop yields over the longer term that are difficult to determine in general, and it is even harder to isolate the effect of insurance; and
- insurance policies that focus on yield and losses, without reference to risk management practices or environmental sustainability will have limited influence on these activities.

However, it is important to understand that focus on crop yields is a very narrow perspective to take when considering the potential for wider productivity benefits of MPCI. Indeed, it is possible that crop yields may remain stable, but operating costs are reduced thereby increasing overall productivity and profitability of the operations.

While the international literature has found limited evidence to support direct increases in crop productivity from the uptake of MPCI, there is some evidence that suggests that access to MPCI is positively correlated with increased farm level debt. However, it is not clear what these increased debt levels are used for which limits the conclusions that may be drawn on the effectiveness of MPCI to promote technology and best management practice type investments.

In the context of US crop insurance program, Kirwan (2014) considered the change in farm level debt associated with insurance uptake. This was used as an indicator of the ability of MPCI to drive changes in risk preferences and operational efficiency. The results found a positive relationship between farm level financial debt and crop insurance coverage, but were not able to discern the ultimate use of the increased debt taken up by farmers as a result of MPCI. [7]

The final conclusion of the study was that there was no discernible increase in farm level profitability associated with the increased debt levels. The implication is that the crop insurance and increased debt levels appear to work together to crowd out other risk management strategies without improving farm productivity.

Equity and average farm value

- **High levels of equity and increasing land values, especially for specialist producers, mean that there are not strong reasons for MPCI to improve access to capital in NSW.**

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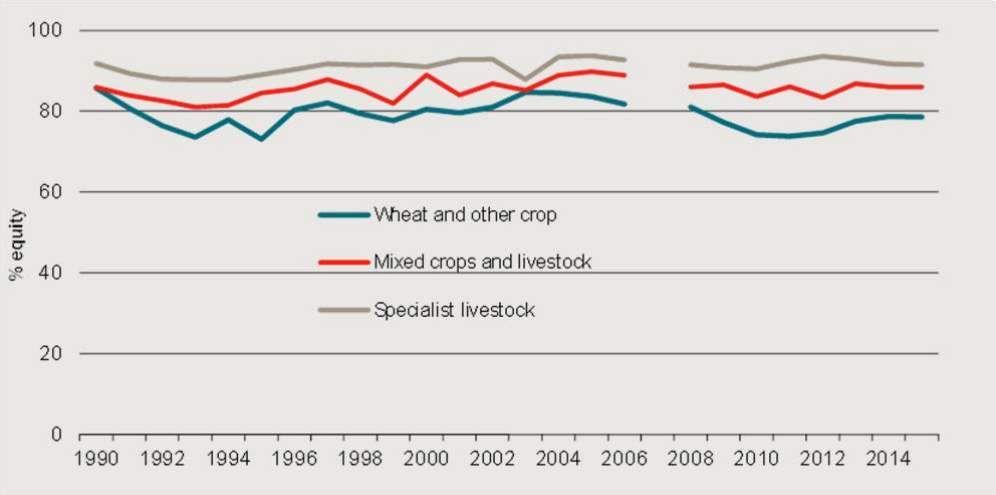
6 NRDC 2013, *Soil Matters: How the Federal Crop Insurance Program should be reformed to encourage low-risk farming methods with high-reward environmental outcomes.* NRDC Issues Paper August

7 Kirwan, B 2014, *The crowd-out effect of crop insurance on farm survival and profitability*, University of Illinois, prepared for presentation at the AAEA Annual Meeting July 27-29.

How farmers approach risk in the baseline also depends on their financial security. Despite perceptions of farm businesses having low equity and being highly geared to debt, available statistical and anecdotal information suggests that farmer's equity remains high and steady. Even after accounting for the possibility of sample bias that could overstate average levels of equity, chart 3.2 shows that equity for specialist cropping and mixed grains livestock farms has remained around 80 per cent since 1990.

The recent fall in equity for specialist cropping reflects the process of ongoing industry adjustment where specialist cropping businesses acquire debt principally to purchase additional land (industry consolidation).

3.2 Level of equity held by NSW farms[a]



[a] Value of owned capital, less farm business debt at June 30 expressed as a percentage of owned capita. In 2006-07, not calculated due to insufficient sample size.

Data source: ABARES Agricultural survey

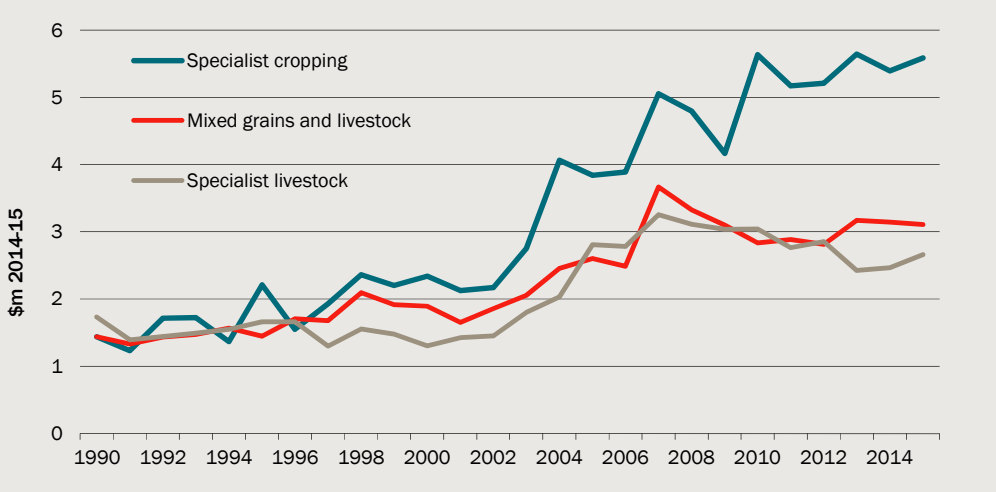
Advice from industry experts indicates that the vast majority of farms are in reasonable financial condition and have sufficient equity to comfortably afford investment expenses in the region of $500 000 for activities such as upgrades to recent technology for tractors and implements.

This relatively comfortable equity position is primarily due to strong growth in the value of assets, particularly land and fixed improvements. Chart 3.3 shows that the average value of specialist cropping land per enterprise has grown significantly faster than for mixed cropping land since the 2000s despite seasonal variability. This increase in asset value is a major contributor to modest rate of return for the sector.

Opportunities for structural adjustment for high risk farms

- **The process of structural adjustment towards larger specialist cropping enterprises is expected to continue of the medium to longer term in NSW.**
- **It would be very difficult to quantify how uptake of MPCI would impact on the current consolidation of the farm sector.**

3.3 Average value of land and improvements across NSW farms[a]



[a] In 2014-15 dollars.

Data source: ABARES Agricultural survey.

In the case of proponents of MPCI considering the potential for structural adjustment, the most likely mechanism is through the amalgamation of lower productivity and higher risk enterprises by higher productivity and lower risk enterprises — resulting in an overall increase in average enterprise size, productivity and sustainability of operations.

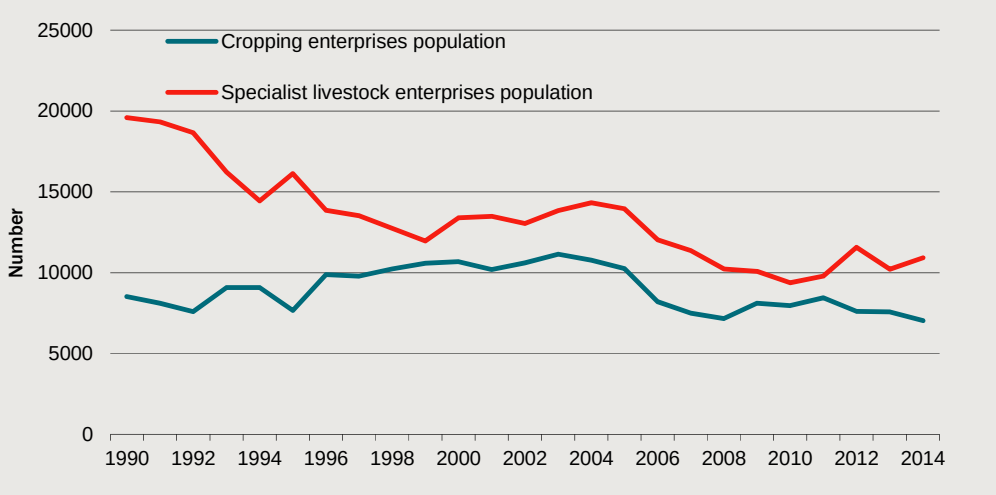
Structural adjustment has also been occurring in Australia's cropping sector since the mid-1990s. Any impact that MPCI may have on further structural adjustment will necessarily be made at the margin, beyond what the industry is currently achieving and is expected to continue to achieve.

Across NSW in 2014 there were an estimated 18 000 farms (with an estimated value of agricultural operations above $40 000 annually) — 7 000 of which were cropping enterprises of varying degrees of specialisation and 11 000 of which were specialist livestock enterprises, involved in either or both of sheep or beef production. As can be seen in chart 3.4, the number of specialist livestock enterprises has fallen considerably since 1990 when there were an estimated 19 500 enterprises operating in NSW. The number of cropping enterprises in NSW has reduced by approximately 18 per cent over the period 1990 to 2014.

Chart 3.5 maps changes in the average farm size of cropping enterprises and specialist livestock enterprises in NSW over the period 1990 to 2014. [8]Over the same time period that the number of enterprises has halved for both categories, the average farm size has approximately doubled. While the trend in cropping enterprises has been relatively steady over time, specialist livestock enterprises have experienced a greater degree of annual variability in average size.

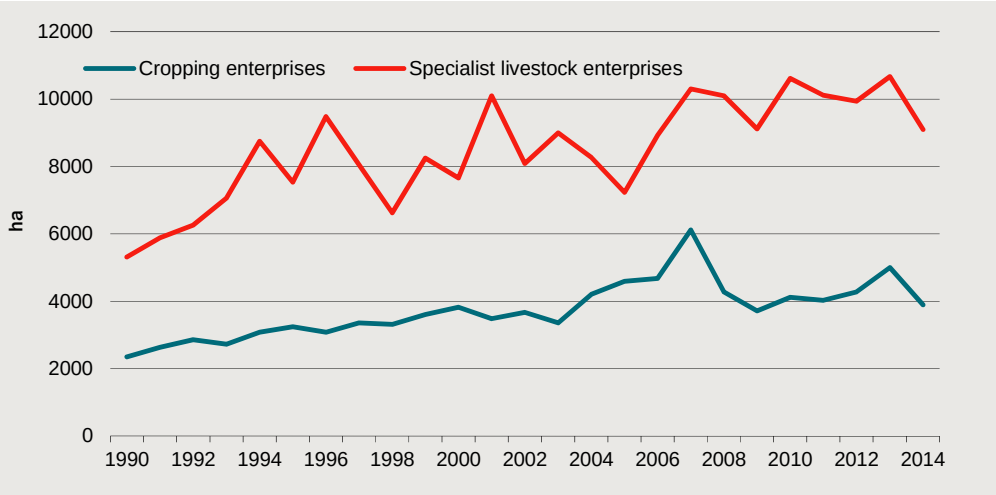
8 When considering farm survey estimates, it is important to consider the trends. Variability of the sample over time drawn from the population and movement of the sample between categories leads to variability that is greater than would be expected.

3.4 Number of cropping and specialist livestock enterprises in NSW



Data source: ABARES Broadacre survey.

3.5 Average farm size of NSW broadacre farms in NSW

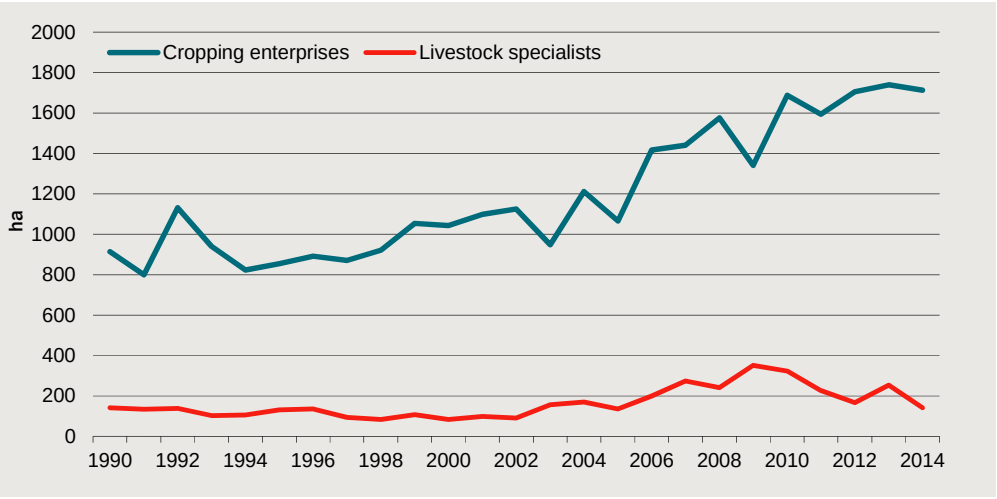


Note: When considering farm survey estimates, it is important to consider the trends. Variability of the sample over time drawn from the population and movement of the sample between categories leads to variability that is greater than would be expected.

Data source: ABARES Broadacre survey.

The implied total area of land cropped in NSW has increased from approximately 7.7 million hectares in 1990 to just over 12 million hectare in 2014. This reflects the average size of cropped area has approximately doubled (chart 3.6), while the number of cropping enterprises has declined by almost 20 per cent.

3.6 Average cropped area per farm by broadacre in NSW



Note: When considering farm survey estimates, it is important to consider the trends. Variability of the sample over time drawn from the population and movement of the sample between categories leads to variability that is greater than would be expected.

Data source: ABARES Broadacre survey.

Reduced dependence on government assistance

- **The current level of assistance from the NSW Government and Australian Government to cropping is small relative to livestock. The programs also cover a variety of activities that are not obvious substitutes for MPCI, such as the Farm Innovation Fund, which covers infrastructure expenditure.**
- **MPCI as currently envisaged is not likely to provide a substitute for drought assistance measures. MPCI products, at the prices set out in this report, would not provide insurance when soil moisture is very low (such as droughts), as farmers would not be insured for crops planted in these circumstances.**

NSW farmers are already able to access an array of government funded drought assistance measures. In general, these drought assistance measures can be classified as either risk management measures or drought response measures:

- risk management measures — are targeted at assisting farmers to manage the known risks in their operations, particularly associated with climate and weather; and
- drought response measures — are only initiated in times of drought and are targeted at assisting farmers to maintain their properties and livelihoods during drought conditions.

There is the potential that government assistance could crowd out private insurance.[9] A recent Western Australian study considered the willingness to pay for crop insurance in Western Australia. While the study was not able to directly translate the findings to

9 Raschky P, Schwarze R and Schwindt M, 2010, *Uncertainty of governmental relief and the crowding out of insurance*, Monash University Discussion Paper 05/10.

MPCI, they did find that in general, government emergency assistance reduces the willingness to pay for insurance.[10]

Deloitte Access Economics articulated this issue in relation to MPCI in Australia noting that government assistance also distorted the incentives for taking out insurance, as well as other risk management activities by farmers:

> … both NSW and Commonwealth Government provide a range of assistance measures to help farmers deal with the impacts of weather related perils, in particular drought, creating a price wedge. The rules around when ex-post support is provided are often unclear or are not always adhered to so that expectation by farmers and government around when ex-post support is being provided are not aligned. This may result in farmers underinsuring and, in turn, creating pressure on government to help finance those losses.[11]

This finding was also identified across Austria and Germany in relation to their respective agricultural assistance packages, although somewhat more nuanced. A 2010 discussion paper found that the design of the government relief program was an important factor — assured partial relief schemes drive a stronger crowding out of private insurance when they can be relied upon prior to an adverse event than more ad hoc relief programs that may not be relied upon in nature or scale.[12]

Table 3.7 provides an outline of the NSW and Commonwealth government assistance measures that could impact on risk management choices of crop farmers or their response during a time of drought.

3.7 Government drought assistance measures for crop farms

Program	Administration	Type of measure	Function
New South Wales Government Risk Management measures			
Farm Innovation Fund	Rural Assistance Authority (NSW)	Low interest loans for in-drought and drought preparedness activities	Loan funding to meet the cost of carrying out permanent capital works that will benefit the land, long term profitability and address adverse season conditions. Four categories: ▪ -drought preparedness, -environment, -farm infrastructure, -natural resources. Loan amount up to 100% of net GST exclusive cost of works. Capped at $250 000 per project. 20 year term, fixed interest rate.
Seasonal conditions report	Department of Primary Industries (NSW)	Information	A quarterly report on rainfall, temperature, other climatic indicators, soil moisture, pasture growth and biomass and water levels and allocations. It is intended to help farmers make informed

10 Khuu A and Weber E, 2012, *How Australian farmers deal with risk*, University of Western Australia, Business School, Discussion paper 12.07, p13

11 Deloitte Access Economics 2015, *Scoping study on Multi-peril Insurance and its application to Agricultural industries in NSW* Prepared for the Department of Primary Industries, p21.

12 Raschky P, Schwarze R and Schwindt M, 2010, *Uncertainty of governmental relief and the crowding out of insurance*, Monash University Discussion Paper 05/10..

Program	Administration	Type of measure	Function
			decisions on how they manage operations, and prepare for seasonal conditions and drought.
Farm Business Skills Professional Development program (measure 1)	Rural Assistance Authority	Rebate for professional development in farm business skills	Approved participants are able to claim a reimbursement of 50% for costs of an approved farm management/professional development training course/activity focused on: ▪ risk management ▪ financial and business management ▪ farm business planning/drought preparedness. A maximum reimbursement of $5,000 (covering all courses/activities over the life of the program) applies for any farmer with reimbursements capped at $9,000 per farm business.
New South Wales Government Drought Response measures			
Natural disaster relief scheme	Rural Assistance Authority (NSW)	Low interest loans and grants in some cases	Loans up to $130,000 to meet essential working capital needed until receipt of the next major source of income, replace and repair of damage not covered by insurance. Additional assistance in the form of Recovery Grants may also be made available following extreme and widespread disaster events.
Rural Financial Counselling Service	Rural Assistance Authority (NSW)	Financial counselling service	The NSW Financial Rural Counselling Service is a free and confidential service which provides information and assistance on financial position, budgets and submitting applications.
Commonwealth Government Risk Management measures			
Farm management deposits and taxation measures	Australian Tax Office	Risk-management tool to help farmers deal with uneven income	Allows farmers to make farm management deposits between $1,000 and $400,000 and claim a tax deduction. Withdrawals made later are included as assessable income. Deposits are made with a FMD provider who must be an authorised deposit-taking institution. Changes have been announced for the FMD Scheme. Changes commence on 1 July 2016: - doubling of the cap on deposits from $400 000 to $800 000 - re-establishment of an early access trigger during times of drought - allowing FMDs to be used to offset the interest costs on primary production business debt.
Commonwealth Drought Response measures			
Rural Financial Counselling Service	Department of Agriculture and Water Resources (Cth)	Financial counselling service	Free rural financial counselling to farmers, fishing enterprises, forestry growers and harvesters, and small, related businesses

Program	Administration	Type of measure	Function
Farm Household allowance	Department of Human Services	Support payments for financial hardship	Paid fortnightly at a rate equivalent to Newstart (or Youth Allowance if under 22yrs). Access up to 3 years of payment, plus a health card and a dedicated case worker.
Concessional loans	Department of Agriculture and Water Resources (Cth) Rural Assistance Authority (NSW)	Farm Finance – Loans to restructure existing debt	- Maximum loan terms of 5 years - Up to 50% of eligible debt to maximum of $650,000. - Variable concessional interest rate - Concessional interest period of 5 years - Interest only payments - At the end of the loan term, the farm business must repay or refinance the remaining loan balance.
		Drought – Loans to restructure existing debt, provide new debt for operating expenses or drought recovery and preparation activities	- Maximum loan terms of 5 years - Up to 50% of eligible debt to maximum of $1m. - Variable concessional interest rate - Concessional interest period of 5 years - Interest only payments - At the end of the loan term, the farm business must repay or refinance the remaining loan balance.
		Drought Recovery – loans planting and/or restocking drought recovery activities	- Maximum loan terms of 10 years - Up to 50% of eligible debt to maximum of $1m. - Variable concessional interest rate - Concessional interest period of 10 years - Interest only payments for the first 5 years with P & I repayments for years 6-10 based on a 10 year term - At the end of the loan term, the farm business must repay or refinance the remaining loan balance.
Managing farm risk programme	Department of Agriculture and Water Resources	Rebate	A one-off 50% rebate up to $2,500. Rebate is for costs incurred by eligible farm businesses for preparing and applying for new insurance policies.

Source: Pers Comm, IPART, 19th April 2016, and the CIE.

In 2014-15 the Rural Assistance Authority of NSW administered just over $150 million in assistance payments to NSW farms from the above programs. These payments were a mix of NSW government funded programs, Commonwealth government funded programs, drought related and non-drought related activities.

Table 3.8 categorises NSW farm payments by government funding type, drought association and by risk management or drought response mechanism.

The Farm Innovation Fund is most relevant NSW program to crop enterprises. It can be categorised as an ex ante risk management program, aimed at increasing the responsiveness of farms to adverse weather conditions, including drought, with the objective of increasing the sustainability and potentially productivity in the industry.

3.8 RAA administered payments in NSW in 2014-15

	Approved	Payments made	Classification
	no	$m	
NSW government funding			
Farm innovation fund	304	43.4	Ex-ante general risk management
Natural Disaster Reimbursement Grants	46	0.4	Ex-post hail and wind damage
Transport assistance	3473	8.9	Ex-post scheme for livestock
Flying fox netting subsidy	82	4.3	Ex-post scheme for orchards
Joint NSW and Commonwealth funding			
Natural Disaster Relief Assistance Loans	8	0.7	Ex-post scheme flood response
Natural Disaster Relief Recovery Grants	6	0.1	Ex-post scheme flood response
Emergency Water Infrastructure Rebate	3441	26.6	Ex-post scheme for livestock
Commonwealth government funding			
Farm Finance conditional loans	19	7.5	Ex-post drought response
Drought concessional loans	94	62.3	Ex-post drought response
Drought Recovery concessional loans	2	2.3	Ex-post drought response
Total expenses including losses	7475	156.3	

Source: RAA annual report, 2014-15

All three Commonwealth government funded programs administered by the RAA are associated with ex-post drought related relief for farms, including cropping enterprises.

Additional data provided by the RAA identifies the following characteristics of payments to NSW farms, across all RAA administered payments in 2014-15:

- drought related payments accounted for 75 per cent of administered payments
  - $6.8 million from the Farm Innovation Fund payments
  - $8.8 million from Transport Assistance payments
  - $26.6 million from Emergency Water Infrastructure payments
  - $72.1 million from Commonwealth funded concessional/conditional loans
- wheat/coarse grains (specialist) enterprises accounted for $13.4 million or 9 per cent of administered payments
  - Drought related payments to wheat/coarse grains enterprises accounted for $7.3 million or 5 per cent of administered payments,
- mixed grains/livestock farming enterprises accounted for $34.7 million or 23 per cent of administered payments
  - Drought related payments to mixed farming enterprises accounted for 14 per cent or $21.3 million, with the majority attributed to the livestock activities of these enterprises.

If we assume (conservatively) that between 50 and 80 per cent of assistance provided to mixed farms is attributable to livestock, then the grains sector would account for between $20.3 and $30.7 million or 13 to 20 per cent of all payments made in 2014-15 (of which 60 per cent are drought-related).

Table 3.9 provides the same picture over the past 5 years of data — $422 million of state and commonwealth assistance was provided to NSW farmers over this period. Using the same assumptions as for 2014-15, this means that total assistance to the grains sector was between $67.8 and $106.5 million over 5 years.

Appendix A provides more detail across each program providing assistance focused on drought recovery or preparation for drought.

3.9 Total Commonwealth and State assistance to NSW — 2010-11 to 2014-15

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	11 549	170	656	18
Wheat/coarse grains	607	36	37	6
Mixed farming	2 595	114	132	15
Other	1 401	57	218	5
Total	16 152	377	1 043	45
—Wheat/coarse grains %	4	10	4	14
—Mixed farming %	16	30	13	34

Source: RAA provided data.

Over the 2010-11 to 2014-15 period, the grains sector was significantly less dependent on government assistance than the livestock sector.

One of the objectives of MPCI products is that they could substitute for government assistance. Our conclusion is that this is not relevant for cropping, given the likely MPCI to be offered at low price points that would not provide insurance when soil moisture is very low (such as droughts), as farmers would not be insured for crops planted in these circumstances.

4 Establishing the baseline for the MPCI sector

This chapter brings together the key components of the baseline for NSW broadacre grain growers from which to measure the impact of the proposed measures relevant for MPCI. Appendix B summarises the structure of, and the recent trends across, the NSW grains industry.

Anticipated uptake of MPCI insurance

The quantitative baseline utilised to estimate the potential costs and benefits of NSW government approaches to MPCI is determined by three main elements:

- structural change assumptions — drawing on an understanding of current and expected trends in the NSW cropping sector that would continue irrespective of any changes in the market for MPCI, as well as identifying any potential impacts on this rate of structural adjustment due to a MPCI market
- selected approach to regions and crops being considered — the quantitative model has focussed on winter cereals, oilseeds and pulses crops and the largest production regions for analysis to ensure that the model is able to provide the greatest insights without incorporating complexities that do not enhance the analysis
- the adoption path of MPCI without any government assistance for MPCI, and continuing levels of government assistance from other programs for the cropping sector.

Structural change components in the baseline

The period between 2000 and 2015 was a period of significant structural change in NSW agriculture as land moved principally from livestock enterprises to cropping enterprises.

As noted, during this time average farm sizes of specialist croppers doubled while the mixed farming sector also consolidated. Going forward, we anticipate that over the timeframe of the assessment, 20 years, that these pressures for adjustment would continue but at a slower rate. It has been assumed that:

- the total amount of cropping land as of 2014-15 remains constant going forward but with further consolidation of specialist cropping at the expense of mixed grains/livestock
- average farm sizes of specialist cropping and mixed livestock are anticipated to grow at rates slower than what has been observed over the past 20 years.

Due to the high degree of structural adjustment that has already occurred over the past 15 years, and the underlying rate of structural adjustment that is assumed to continue in the NSW cropping sector over the coming years, there is not considered to be a notable contribution that MPCI could make in this area.

- A key consideration that has been used to support this conclusion is the high degree of selectivity being proposed by some MPCI companies that would limit their exposure to low risk enterprises.

Regions and crop types for analysis

The analysis focuses on winter grain, oilseed and pulses and excludes summer crops (principally sorghum), rice and cotton. For these crops, there are two key determinants that mean they are not key markets for MPCI:

- there is either lack of a market (sorghum);
- they are irrigated and already have specialist 'named' products available for their principle risk factor (such as hail for cotton).

The three key regions of NSW that are responsible for over 90 per cent of winter broadacre crop production are the North West Slopes, the Central West and the Riverina area (see appendix B). The analysis considers regional impacts on these three regions individually, and then an aggregated analysis on remaining regions.

Uptake of MPCI without assistance

Without a stamp duty waiver or a reduction in upfront cost, uptake of MPCI is expected to increase over time as insurers develop their market. As of June 2016, Australia-wide, this study was aware of existing MPCI policies and imminent trial of additional polices together making a maximum of 180 policies. By June 2017, it is expected that there would continue to be some organic growth in the market without government support. In the baseline (table 4.1), the following assumptions have been made:

- there will be a different baseline for each of the price scenarios and all of those who uptake are in specialist cropping enterprises
- insurers will limit policies to the east coast, with the number of those insured in NSW proportional to the number of specialist businesses
- uptake will double over the 5 years to 2020-21 with market penetration remaining at that share of total number of specialist cropping businesses
- those who uptake will experience business-as-usual productivity.

By 2020-21, total baseline uptake will be between 102 and 186 policies across NSW.

4.1 Baseline uptake of MPCI across NSW

	Share of specialist cropping farms		No of farms	
	2016-17	2020-21	2016-17	2020-21
	%	%	no	no
Low $14/ha	3.0	8.2	67	186
Medium $22/ha	3.0	6.3	67	144
High $30/ha	3.0	4.5	67	102

Source: The CIE estimates.

5 Options to reduce the price of MPCI to farm businesses

The focus of this chapter is on measures 3 and 4 that reduce the price of MPCI products and so directly improve the incentives for uptake by farm businesses. The chapter discusses the two measures (a waiver on stamp duty and a direct subsidy for MPCI), considers interactions with other forms of insurance for farmers and presents insights from the consultation undertaken for the study.

Overview of measures that reduce the price of MPCI

Stamp duty waiver for MPCI

Stamp duty has been shown to be one of the least efficient forms of revenue collection by governments. This finding is based on the highly price responsive nature of insurance products, where small price increases have been found to have a more than proportional effect on total coverage levels.

Crop and livestock insurance currently attracts a 2.5 per cent stamp duty in NSW.[13] For an insurance premium of $26 000 per farm, total stamp duty would be approximately $650. The benefits of this measure would be:

- a reduction in price and hence increase in consumer surplus for farmers who have already purchased MPCI; and
- an incentive for businesses to upgrade to MPCI from traditional insurance products to MCPI which has been incorporated into the CBA.

In line with the discussion of the baseline in the previous chapter, additional uptake of MPCI as a result of the waiver is likely to be confined to the group of first-movers or those close to BPM in specialist cropping businesses.

- This increase in demand would be limited because of the small size of the price change and the fact that businesses likely to respond to this measure are expected to be relatively unresponsive to the price change.
- This is in contrast with the case for the majority of stamp duties, including those on traditional crop insurance products, where we would expect demand to be more price-sensitive.

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13 NSW Office of State Revenue 2016, *Insurance Duty*, available at http://www.osr.nsw.gov.au/taxes/insurance, accessed on 13/05/16

Given the limited additional uptake compared to the baseline, and that these businesses would be at, or close to, BMP, there would be no or limited productivity gains.

Reduction in upfront cost of MPCI

The Terms of Reference requires IPART, in consultation with the Department of Primary Industries, to design a measure to reduce the upfront cost of MPCI premiums. IPART has instructed the CIE to assess a short-term subsidy arrangement, phased out over five years as follows:

- 50 per cent of the premium for the first 2 years up to the value of $30 000 per farm
- 25 per cent of the premium up to the value of $15 000 per farm for next three years.

The scheme is assumed to commence in 2016-17 and that following the five year period, no further subsidy arrangements would be available.

To enable the quantification of this measure, three indicative price points for MCPI were identified as low, medium and high (table 5.1), representing what can be expected in the market. The way the subsidy is structured:

5.1 Impact of proposed arrangements on MCPI premiums

Year	Low $14/ha	Medium $22/ha	High $30/ha
	$/ha	$/ha	$/ha
Unsubsidised MPCI premium	14.00	22	30
Premium paid by farmers with subsidies			
—Year 1	7.00	11.00	15.00
—Year 2	7.00	11.00	15.00
—Year 3	10.50	16.50	22.50
—Year 4	10.50	16.50	22.50
—Year 5	10.50	16.50	22.50
Average premium over 5 years	9.10	14.30	19.50
Average subsidy paid over 5 years	4.90	7.70	10.50
— % reduction in premium from subsidy over 5 years	-35%	-35%	-35%

Source: IPART; CIE calculations.

- the subsidy required averages $4.90, $7.70 and $10.50 per hectare over the 5 years for each of the scenarios where the producer is eligible; and
- results in an average premium reduction of 35 per cent for the first 5 years across all scenarios.

In practice, there are a number of product attributes along a spectrum providing insurers and businesses the ability to come to terms. Businesses across a district or region would agree with insurers on different premiums according to a range of product attributes including:

- individual circumstances in terms of location, weather-related risks and business performance

- different levels of coverage (defined as a percentage of the total crop value insured)
- insurance of certain crops or paddocks (usually high value or high productivity)
- the use and size of excesses (currently widely used in named insurance products to reduce costs); and
- other policy conditions.

The other conditions could include a staged approach to the offered product, leading into the planting season. Depending on seasonal conditions and soil moisture levels, there could be three possible outcomes:

- no insurance is offered (in the case of a seasonal that looks catastrophic)
- 40 per cent coverage is offered (covering input costs)
- coverage increases to 70 per cent and higher in the case of a good season.

Such a staged approach and other conditions allow insurers to manage their exposure during poor/catastrophic seasons and reduce their loss ratios over time. The enables them to offer price points that are below premiums currently observed in the market.

In regard to how these premium levels compare to previous estimates, Appendix C provides a review of current premium estimates and previous Australian estimates of MPCI premiums. These are significantly above those identified in the scenarios above. Conventional experience from MPCI policies in Australia suggests premiums that are at least $30 and more likely to be above $40 per hectare.

- This highlights the difficulty in comparing products, because products can be differentiated along a spectrum of attributes, in addition to price, on the basis of coverage level, the use of an excess and other policy conditions.

It is also important to note that insurers may recommend MPCI in *addition* to hail or other insurance especially if that hail insurance is on a paddock-by-paddock basis.

- MPCI is more suited to systemic losses across a farm rather than the paddock-by-paddock basis.
- This outcome is more likely to be the case at the low price point, where there will be 'room' in farm profitability to pay for both insurance types.
- As a result of the early stages of product development and recognising the limited roll-out of MPCI to high-risk hail districts, no account of this outcome has been made of this in the development of this CBA.

Interactions between MPCI and other insurance mechanisms

The degree of uptake of MPCI in NSW will necessarily rely on the degree of complementarity and substitutability between MPCI and existing options for risk management and access to government assistance for farmers.

- Complementarity — refers to the potential for MPCI to work in concert with existing risk management programs and government assistance measures to further enhance the level of protection afforded to farmers against climate, weather and other production risks

- Substitutability — refers to the potential for MPCI to crowd out, or replace, private on-farm risk management or drought response actions by farmers.

Chart 5.2 presents a highly simplified conceptual impact pathway that guides the cost benefit analysis. The upper pane shows the quantum of risk management activities that are undertaken by crop farms in the baseline scenario. These activities are made up of private, on farm risk management activities, complemented by traditional, named peril insurance policies that are currently available in Australia.

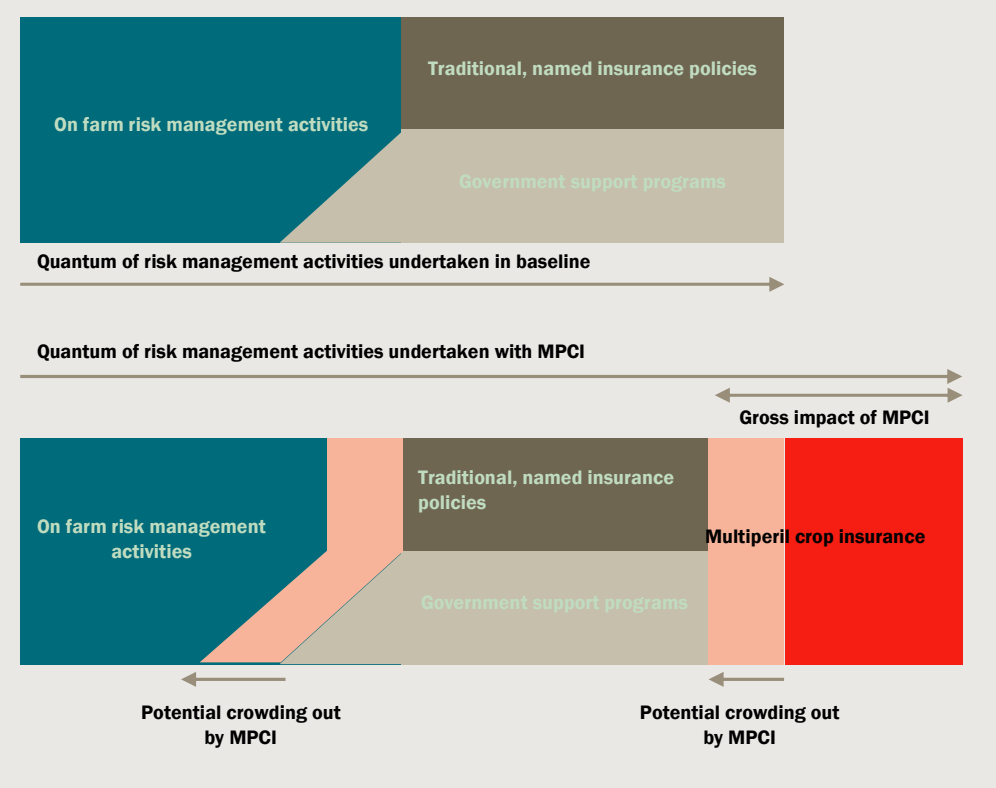
Current government programs are characterised as being both complements and substitutes for private on farm risk management activities.[14]

The lower pane considers the potential impact that provision of MPCI could have on the quantum of risk management activities that are undertaken.

Potentially, MPCI could substitute for:

- the use of traditional named peril insurance policies

5.2 Conceptualised impact pathway — substitutability issues



Data source: The CIE.

- government support programs, which we have noted above as not being likely
- private on farm risk management activities.

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14 ACIL Allen Consulting 2016, *Farm Innovation Fund Review Final Report*, Prepared for the NSW Rural Aujustment Authroity.

Private on-farm risk management decisions

There are a wide range of activities that farmers may undertake to mitigate their production risks over time. Indeed, Australian producers have traditionally tended towards a range of self-insurance, risk mitigation and diversification activities over insurance products, even when they have been offered in the market. Hatt et al (2012) finds that in general, the appetite for insurance products by Australian farmers is quite low.[15]

Examples of risk mitigation activities that may be utilised include:

- savings
- diversification into lower volatility ventures such as mixed enterprises
- capital investment in infrastructure such as dams and silos
- adoption of on-farm and marketing practices that mitigate the impact of seasonal variability.

Appendix B of this report highlights that there is already a high level of awareness of these practices.

The private decision of farmers to substitute MPCI for other risk management strategies is a private optimisation strategy for individual farmers. To the extent that the decision to manage risk via MPCI or alternate risk management activities is private and privately funded, there is no economic efficiency concern with the choice.

Economic efficiency concerns are introduced when there is the potential for privately funded on-farm risk management activities to be crowded out, or substituted against, MPCI that is publicly supported.

Previous reviews of other government farm support mechanisms have noted such issues.

Insights from the consultation

Consultations with industry representatives across the NSW cropping sector and the insurance market covered a range of topics to support the development of a quantitative model and an understanding of the baseline. A structured set of consultation questions was used to guide the discussions that covered:

- current level of uptake of traditional insurance products and the reasons behind the use of such insurance products
- the cost of insurance products generally accepted across the sector, and method used to reduce upfront costs
- the types of crops covered by traditional insurance products
- the assumed mechanisms that could potentially drive uptake of MPCI

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15 Hatt M, Heyhoe E and Whittle L 2012, *Options for insuring Australian agriculture*, ABARES report to client prepared for the Department of Agriculture, Fisheries and Forestry, Canberra, September, p1

- the potential scale of productivity benefits that could be achieved through BMP adoption
- the ability of MPCI to drive productivity improvements through BMP.

Discussions also took place with stakeholders from a range of organisations and with a range of experience including:

- MPCI providers
- general insurance providers
- NSW government agricultural advisors and industry consultants.

How market outcomes could play out

A range of insights were provided by industry representatives on the potential for a MPCI market to evolve in NSW, including:

- NSW crop farmers are expected to be highly price sensitive to MPCI policy costs, and policy coverage is expected to be a first target for cost cutting at any time
  - Indications are that the maximum amount currently paid for traditional insurance is around $16-$20 per hectare especially for higher value crops such as canola.
  - For MPCI, consultants expected that a reasonable maximum willingness to pay would be between $30 and $40 per hectare, depending on how the product is structured.
- most likely, MPCI could be utilised strategically to mitigate risks as they arise — regardless of the performance of the business in terms of being a below BMP property
  - Most businesses would take a wait-and-see approach both in terms of how the product evolve but also the benefits for first-movers.
  - Crop consultants are still in the process of developing recommendations for their clients on if and how the new products should be purchased.
- industry representatives did not consider it likely that insurance premiums could be offered at a low enough price point to be a viable instrument to mitigate longer term or more general risks.

Industry consultants have noted that they would most likely recommend a MPCI-type insurance product under the following conditions:

- expected poor yield in the coming season
- in the case of the acquisition of new debt, for example the expansion of operations through the purchase of additional land, as an insurance mechanism to cover finance repayments in the short term
- where MPCI is a lower cost mechanism for the transfer of risk than other methods accessed.

Insurance sector representatives noted that for a MPCI market to be financially viable, a sufficient degree of geographic scope would also be required to diversify the risk held by insurance providers. It was considered that any scheme that could not operate at a national level would not provide a sufficient level of risk diversification and would pose

too great a level of systemic risk for an insurer. Indeed, there have already been some significant payouts. [16]

- MPCI providers have noted that they would not be likely to offer policies in poor weather circumstances, or would require a 'no plant' clause in the policy triggered by poor seasonal prospects. This is the logic behind the price scenarios above.
- MPCI policies would also only be offered to well managed operations that have passed a detailed risk assessment process
- Even with a nationally diversified scheme, insurance sector representatives noted that there is likely to remain a requirement for external assistance in underwriting or reinsuring 20 per cent of the risk in extreme events. This is referred to as a 'stop-loss' provision.

16 http://www.abc.net.au/news/2015-01-14/multi-peril-crop-insurance-payout/6015664

6 Quantifying the impact of options to reduce the price of MPCI

This chapter focuses on the impact of the two measures to reduce the price of MPCI — a waiver on stamp duty and direct subsidisation of MPCI.

Stamp duty waiver

The evaluation of this measure involves the elimination of stamp duty on the number of business that uptake MPCI in the baseline without additional measures to reduce price.

- The elimination of 2.5 per cent stamp duty will reduce the cost to business by 2.44 per cent.

Table 6.1 shows that the estimated uptake, relative to the baseline, from this measure is modest. As noted, this is due to the small size of the price change and that businesses that would respond to this measure are likely to be close to best practice. The primary benefit of the measure is the reduction in cost for existing holders of MPCI. Therefore, this additional uptake is not associated with any productivity improvements.

6.1 Additional uptake of MPCI in response in the stamp duty waiver[a]

	Total over 5 years	2016-17	2017-18	2018-19	2019-20	2020-21
	no	no	no	no	no	no
Low ($14/ha)	12	1	2	2	3	4
Medium ($22/ha)b	6	1	1	1	2	2
High ($30/ha)	5	1	1	1	1	1

[a] Relative to the baseline. [b] Numbers may not add due to rounding.

Source: The CIE.

Table 6.2 shows the state stamp duty revenue foregone for the 5 year period 2016-17 to 2020-21 as being between $0.3 and $0.42 million. Due to the low uptake in the baseline, the total expenditure by farms on MPCI over the 5 years is estimated to be between $12.1 and $17.4 million.

6.2 Total stamp duty revenue foregone[a]

Scenario	Total over 5 years	2016-17	2017-18	2018-19	2019-20	2020-21
	$m	$m	$m	$m	$m	$m
Low ($14/ha)	0.296	0.031	0.045	0.059	0.073	0.088
Medium ($22/ha)	0.388	0.049	0.063	0.077	0.092	0.107
High ($30/ha)	0.423	0.066	0.075	0.085	0.094	0.103

[a] In 2015-16 dollars, *undiscounted.*

Source: The CIE.

Table 6.3 shows the equivalent benefits in terms of gains to farms purchasing MPCI.

6.3 Total increase in consumer surplus[a]

Scenario	Total over 5 years	2016-17	2017-18	2018-19	2019-20	2020-21
	$m	$m	$m	$m	$m	$m
Low ($14/ha)	0.303	0.032	0.046	0.060	0.075	0.090
Medium ($22/ha)	0.391	0.049	0.063	0.078	0.093	0.108
High ($30/ha)	0.428	0.067	0.076	0.085	0.095	0.104

[a] In 2015-16 dollars, *undiscounted.*

Source: The CIE.

The calculated gains in consumer surplus are only marginally higher than the value of the stamp duty. This reflects the facts that the stamp duty revenue is very small in the baseline and that sector–specific models typically underestimate the size of the distortion caused by the tax (as noted before).

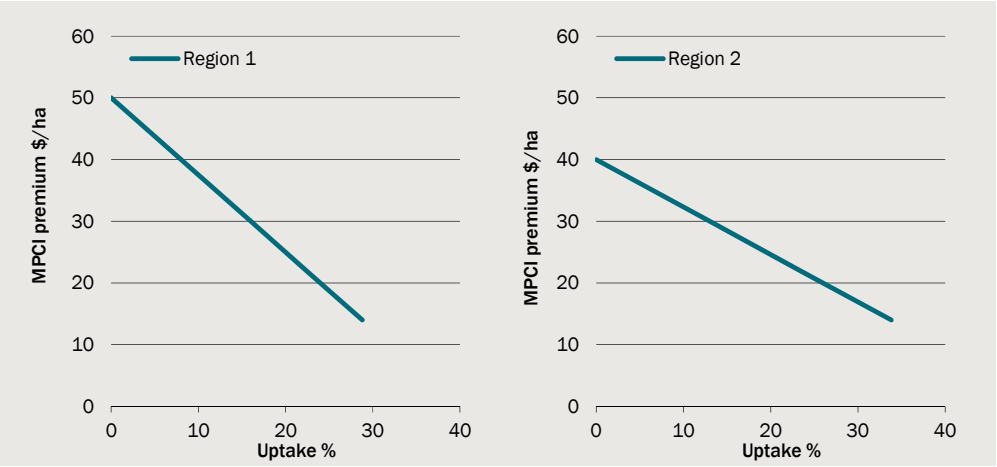
Reducing the upfront cost of MPCI

This measure requires the development of a scenario on how the market could evolve over a 5 year period of subsidised premiums at the three price point scenarios identified.

Uptake of MPCI at different price points

The objective of the consultation was to establish what the demand curve for MPCI looks like for each region as illustrated in chart 6.4.

6.4 Illustration of demand for MPCI by region



Data source: The CIE.

Each region should have a different demand curve for MPCI reflecting the composition of, and the decisions made by, individual farm businesses. Of particular interest was the

likely elasticity of demand at each of the price points identified earlier. In this example, there are a number of key differences across the two regions:

- Region 2 has a higher price elasticity of demand for MPCI than Region 1
  - This indicates that any movement in premium prices would result in greater change in coverage in region 2 than in region 1
  - Drawing on insights from the literature, this could imply that farmers within region 1 know that they face a higher degree of yield variability and are likely to be higher risk operations, and therefore, have a pre-disposition to hold on to their insurance coverage in the face of price changes
  - in contrast, farmers in Region 2 recognise that they have other strategies available to them to cover their risk exposures and the choice between MPCI and alternative risk management strategies are a highly price sensitive element of their profit maximisation equation
- Some producers within Region 1 exhibit a higher demand for MPCI premiums than any producer in Region 2
  - This could be because MPCI presents a more attractive option for risk management than other available or currently utilised instruments.

Generally, those contacted were reluctant to speculate about characteristics of demand because of the complexity of the overall product MPCI and the possible (unexpected) interaction with productivity.

Another source of information is from overseas as summarised in appendix D. The experience from the United States is mixed but indicates that overall demand for MPCI is relatively inelastic in relation to price and subsidies. One conclusion was that subsidies did not appear to attract a greater area of coverage (more production or land), rather a higher level of coverage (a higher proportion of value covered from already insured farms).

- There were also questions as to whether the crop insurance is so heavily subsidised in the United States that the influence of risk preferences are overshadowed by the subsidy-price effects.
- Indeed, significant levels of subsidies on the crop itself, via ethanol mandates and other programs, could also be driving the findings.

Pathways of productivity improvements

Industry consultants, engaged by cropping enterprises to advise on business and operational strategies and performance, noted that their client base tended to be highly aware of best management practice, have access to good levels of operational technology and generally utilised best management practices such as conservation farming techniques. They were also aware of the financial instruments available to mitigate price risks.

When asked about the drivers of key differences in relative farm performance, two factors were identified:

- the conservative use of inputs most particularly fertiliser, often significantly below recommended levels. This practice is consistent with advice provided to industry since

the 2007-08 drought. While that approach may be of benefit in below average seasons, there is a missed opportunity in average or better seasons to use more fertiliser and get a yield response;

- the skill of the owner or manager to correctly anticipate the timing of operations such as planting and weed spraying to further maximise yields and profits.
  - Despite high levels of awareness of what constitutes best practice (see data in appendix B), management capability in terms of timing of, and sequencing of planting and spraying operations, and rotations could be improved.

It was felt that operators did not have significant scope for achieving increased productivity through better access to finance. Despite perceptions, across the sector there is a substantial proportion of enterprises that have the financial capacity to self-insure against risks, and have done so, based on their equity position.

Industry representatives were asked about the ability of MPCI and the audit process to improve these factors.

- There was scepticism of the ability of MPCI to drive changes in management practices through incentive clauses that were included in (relatively) short-term policies and that most businesses would take a wait-and-see approach by observation of early adopters.
- It was also noted that likely resistance of individuals to the audit process and other compliance required by the policy conditions such as the submission of crop plans.
- **There was recognition of a potential linkage between MPCI and more neutral decision-making on farm. MPCI could bring forward changes in practices that would have occurred otherwise.**

Potential for productivity improvements

The starting point from the international literature, particularly the United States, is that there is no evidence of a link between MPCI and productivity. It has also been identified that it is difficult to extrapolate between countries.

For NSW, the general view was that the difference in productivity, on a simple yield basis, between the best and worse practice businesses in a district was considerable — between 30 per cent and at the maximum of 50 per cent. This is not the potential benefit for three reasons:

- the yield improvement is likely to be offset by higher input (fertiliser) costs;
- the average improvement across a district or region depends on which businesses uptake it and how far they can be moved toward those at best practice; and
- it may not be possible to pick up all the potential gains because of environmental differences, especially soil quality between districts.

In addition, there was also scope to increase returns by adoption of improved marketing strategies such as forward selling. The difference between best and worst practice could be as much as 10 per cent in terms of average returns across their winter crops.

Uptake and productivity pathways

The potential for productivity improvements were confined to winter cereals to make the analysis tractable. While it is noted that taking a farming systems approach to the analysis could also consider the potential for productivity spillovers to other activities (crops such as lucerne and livestock enterprises), this would add significantly to the complexity of quantifying potential benefits. Further, the additional productivity benefits are likely to be small in magnitude compared to those achievable with winter cereals.

In light of the consultation, three key pathways between MPCI and productivity have been included for farmers who are currently not at BMP:

- providing farms with the confidence to use key inputs at optimum, or close to optimum levels
- improvement of timing of, and sequencing of planting and spraying operations, and rotations
- higher average returns from an improved marketing strategy.

All of these issues could be addressed through the submission of crop plans or other documentation to the insurer under a MPCI policy. The potential gains are 'unexpected' in the sense they were not envisaged when the product was purchased and are realised after feedback from the insurance company.

The potential for differential productivity improvements to be achieved across the spectrum of enterprises taking up MPCI, is therefore considered as follows:

- first movers would be at or close to BMP, the benefits for these businesses will be transfer of risk
- as uptake increases, the scope for productivity increases at a faster rate as you engage those further away from best practice.

The 'unexpected' nature of these gains could be from simply bringing forward the move to better practice in time that would have happened anyway (with change in management, for instance). That is, the purpose of the subsidy would be to induce businesses to act rather than 'wait-and-see'.

- **The link between MPCI and productivity improvement is a key issue for this analysis with productivity gains achievable independent of MPCI uptake. One consultant suggested that farmers should directly trade-off expenditure between MPCI and purchasing more inputs.**

Quantitative analysis of measure 4

The quantitative analysis is comprised of:

- the potential for uptake of MPCI starting from a baseline where businesses purchase traditional crop insurance; and
- the potential productivity benefit implied by scenario.

Uptake of MPCI by scenario

Table 6.5 shows the key assumptions by scenario for the uptake of traditional insurance and MPCI by focusing on the three major production regions identified earlier.

- Our assessment is that an average of 80 per cent of businesses hold traditional crop insurance policies across the three major production regions.
- At a state level, this implies that a minimum of 67 per cent of grain farms hold traditional crop insurance policies.
  - Uptake is significantly higher for specialist farms than for mixed grains/livestock farms. Over 90 per cent of specialist cropping businesses already hold traditional or MPCI insurance products across the three regions analysed. These policies insure the key crops (in order of importance by value): wheat, canola and barley primarily for hail, fire and post-harvest losses.

To assess potential uptake of MPCI, in response to the subsidy arrangements over uptake levels in the baseline, we obtained judgements from industry on the level of uptake during the first 5 years of the proposed arrangements as a percentage of all businesses that already hold traditional products. [17] The key findings are that across the scenarios:

- between 9 and 21 per cent of all grain farms will purchase MPCI including those in the baselines that those that purchase MPCI in response to the subsidy period (see the highlighted numbers in table 6.5).
- the response is significantly stronger for specialist cropping than for mixed grains/livestock properties with a range of 14 to 33 per cent of farms that already purchase traditional crop insurance upgrading in to MPCI.

After the end of the subsidy period, it would be expected that some businesses would choose not to renew MPCI policies when they pay the market price. The assessment of this response was based on estimates of demand elasticities for MPCI. [18]

- Prior to uptake, the derived demand elasticities for MPCI were assessed to be -0.8 for wheat and other cropping and -1.0 for mixed grains livestock farms. [19]
- Following trialling during the subsidy period, it is likely that with wider uptake, that the derived demand elasticity for MPCI would fall: to -0.5 for wheat and other cropping and -0.7 for mixed grains livestock farms.

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17 The international literature has highlighted that those enterprises that already have traditional insurance coverage are more likely to take out MPCI than those that do not. By implication, we assumed that those who do not hold traditional insurance, will not purchase MPCI.

18 Another possibility is that businesses could alter their coverage in response to the loss of the subsidy.

19 These elasticities are around twice those identified in the literature for the United States (see appendix D), the rationale being that the Australian trading environment results in farmers being significantly more cost-sensitive to a product they are unfamiliar with.

6.5 Total uptake of MPCI by farm businesses by scenario[a]

	Baseline	Low — $14 per hectare			Medium — $22 per hectare			High — $30 per hectare		
	Farms with traditional insurance[b]	% uptake of MPCI of all grain farms[c]	Drop-out rate at program end[d]	Uptake after subsidy period[e]	% uptake of MPCI of all grain farms[c]	Drop-out rate at program end[d]	Uptake after subsidy period[e]	% uptake of MPCI of all grain farms[c]	Drop-out rate at program end[d]	Uptake after subsidy period[e]
	%	%	%	%	%	%	%	%	%	%
NW slopes and plains										
Wheat and other crop	90	29	8	21	23	6	17	14	4	10
Mixed grains/livestock	70	16	6	10	12	5	8	6	2	4
Total grain farms	78	21	7	14	17	5	11	10	3	7
Central West										
Wheat and other crop	90	29	8	21	23	6	17	14	3	12
Mixed grains/livestock	75	17	6	11	13	5	8	7	2	5
Total grain farms	78	20	7	13	15	5	10	9	2	7
Riverina										
Wheat and other crop	95	40	11	29	29	8	21	15	3	12
Mixed grains/livestock	70	16	6	10	12	5	8	6	2	5
Total grain farms	81	27	8	19	20	6	14	10	2	8
State – outcomes[f]										
Wheat and other crop	85	33	9	24	24	7	18	14	3	11
Mixed grains/livestock	58	14	5	9	11	4	7	6	2	4
Total grain farms	**67**	**21**	7	***14***	**16**	5	11	**9**	2	***7***

[a] Total uptake of MPCI includes farms holding MPIC in the baseline. [b] Percentage of all grain producing farms holding traditional insurance. [c] Percentage of all grain farms that purchase MPCI in the last year of the subsidy period including farms holding MPIC in the baseline. [d] Percentage of all grain farms that opt out of MPCI after the subsidy period. [e] Percentage of all grain farms that hold MPCI policies after the subsidy period. [f] Includes grain farms outside of the three major production regions which were excluded from the analysis. *Source:* The CIE and industry consultation.

Table 6.5 shows that across the three scenarios, the drop-out rate would range from 2 per cent in the low scenario to 7 per cent in the high scenario of traditional policy holders who takeup MPCI during the subsidy period.

Following the end of the subsidy period, the total number of grain farms that maintain MPCI premiums, including those in the baseline, could be between 8 and 14 per cent (see emboldened numbers in table 6.5).

Estimated impact on uptake

The implications in terms of number of farms taking up MPCI in 2020-21 (the last year of the subsidy period) is shown in table 6.6. The baseline for the total number of grains farms and the average area cropped for winter cereals is shown in table B.3. By 2020-21 (the last year of the subsidy), the average area cropped for winter cereals state-wide was:

- 1 275 hectares for specialist cropping
- 493 hectares for mixed grain/livestock farms.

As a point of reference, in the baseline for 2020-21, 4 750 farms were estimated to purchase traditional crop insurance in the baseline, out of a total population of 6 600 businesses in the grains industry. Of these, 145 farms would have purchased MPCI without any subsidy arrangements.

In addition, to the farms that already have purchased MPCI in the baseline, it is estimated that between 470 and 1 220 *additional* farms would upgrade to MPCI for each of the price points, in response to the reduction in the upfront cost under measure 4.

- For the low scenario, the 1 220 farms represents a market penetration of 17 per cent of traditional crop policy holders.
- The region with the highest market penetration is expected to be the Riverina followed by the Central West.
- Mixed grains/livestock farms comprise half of the new policies written for each of the price point scenarios despite the lower uptake levels, primarily because these farms represent the majority of grain producers (around 64 per cent state wide).
- For specialist producers who already have adopted, the subsidy is a transfer with no real effects.

Table 6.6 also calculates the average premium paid per farm, which is a widely used as metric of the capacity to pay (relative to farm income).

- One benchmark identified during the consultation was a ceiling of $30 000 for an average farm, this threshold is crossed for the medium and high scenarios for specialist producers (recognising that these farms had significantly larger cropping areas than the average).
  - Because of smaller cropping areas, average expenditure by mixed grains and livestock farms is 40 per cent of that for specialists.

6.6 Additional uptake of MPCI in terms of number of farms and expenditure per farm[a]

	Baseline 2020-21			*Uptake in 2020-21*			Baseline 2020-21		*Average premiums paid :2020-21*[b]		
	Farm businesses	Traditional polices	MPCI policies	Low $14/ha	Medium $22/ha	High $30/ha	Traditional polices	MPCI policies	Low $14/ha	Medium $22/ha	High $30/ha
	no	no	no	no	no	no	$/farm	$/farm	$/farm	$/farm	$/farm
NW slopes and plains											
Wheat and other crop	449	400	25	90	70	40	26 840	49 681	23 710	37 260	50 810
Mixed grains/livestock	629	440	0	100	80	40	7 500	0	8 520	13 390	18 250
Total grain farms	1 078	840	25	200	150	80	16 760	49 681	15 910	25 210	35 310
Central West											
Wheat and other crop	474	430	26	100	80	50	23 800	35 746	17 060	26 810	36 560
Mixed grains/livestock	1 540	1 160	0	260	200	110	7 120	0	6 130	9 630	13 130
Total grain farms	2 015	1 580	26	360	280	150	11 620	35 746	9 150	14 500	20 330
Riverina											
Wheat and other crop	1 350	1 280	74	430	310	140	20 590	22 407	10 620	16 690	22 760
Mixed grains/livestock	1 487	1 040	0	240	180	90	5 450	0	3 820	6 000	8 180
Total grain farms	2 838	2 320	74	660	490	240	13 810	22 407	8 190	12 740	16 950
State – outcomes											
Wheat and other crop	2 484	2 110	145	620	460	230	22 440	30 695	13 660	21 750	**30 790**
Mixed grains/livestock	4 160	2 640	0	600	460	240	6 530		5 610	8 820	**12 030**
Total grain farms	6 644	4 750	145	**1 220**	920	**470**	13 610	30 695	9 710	15 320	**21 290**

[a] Estimates include uptake that is *additional* to the baseline MPCI uptake. In 2015-16 dollars. [b] Premium paid includes subsidy paid by the State.

Source: The CIE.

- At the $30 per hectare price point, the total additional costs for the average farm at state level, above traditional insurance, would be $21 290 which would vary significantly between specialist farms ($30 790 per farm) and mixed grains/livestock farms ($12 000 per farm).
- The differentials at regional level are largely the result of average areas of winter cereals cropped by region in the baseline. In the case of North West Slopes and Plains, the large per farm estimate for specialist cropping is driven by average cropping areas that are larger than the state average.

Productivity improvements

Productivity improvements reflect the extent of adoption and the gap to best practice for those adopting. These are in turn influenced by the average price of an MPCI policy and the level of the subsidy. We consider there are three scenarios for productivity improvements.

- Case 1: there are no resulting productivity gains, that is, all the benefits relate to a transfer in risk to the market and are no 'expected' gains by farmers who purchase polices
- Case 2: productivity gains that would have occurred anyway are brought forward in time (for example, brought forward by the length of the scheme by 5 years)
- Case 3: productivity gains would not have been achieved by other means.
  - That is, the productivity gains achieved would be enduring with a one-off and permanent shift in the supply curve.

The productivity benefits on a per farm basis are based on assumptions that link each of the scenarios. For the high $30 per hectare scenario, 50 per cent of specialist cropping businesses adopting MPCI in the high scenario (over those in the baseline) are at, or close to, best practice and so will receive minimal/no benefit.

- For these farms the benefit is simply a transfer of risk to the market, which is part of the demand curve for the product.
- For mixed farms, those businesses close to best practice are assumed to comprise 30 per cent of farms that uptake MPCI in the high scenario.

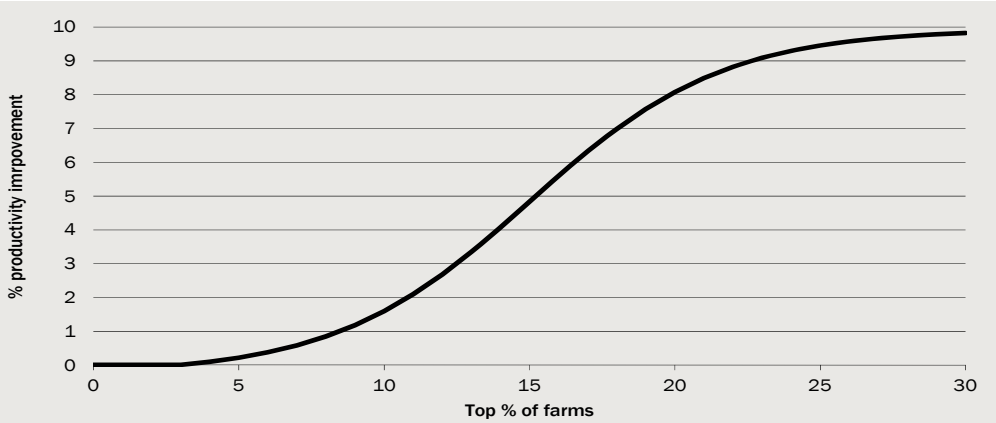
Higher levels of uptake at lower price points are associated with a net productivity improvement that is represented by an improvement in yield equivalent.

- That is, based on the productivity pathway above, MPCI is likely to provide incentives to use more inputs, and achieve higher yields, resulting in an improvement in gross margins.
- In addition, this improvement in practice could also be attributed to improved marketing strategies that result in higher average returns.

The level of productivity benefit is a function of uptake levels. The greater the uptake, the higher the probability of including businesses that are further away from best practice. Given the maximum uptake under the low scenario, based on discussions with industry, a *maximum* 10 per cent net productivity improvement could be possible for those who uptake MPCI and are furthest away from BMP.

This is demonstrated in chart 6.7 which shows the relationship between the top 30 per cent of farms and their potential net productivity improvements, relative to BMP.

6.7 Relationship between uptake of MPCI and productivity



Source: The CIE and industry consultation.

A *maximum* increase in net productivity of 10 per cent associated with those that are in the top 30 per cent of farms (the most likely to uptake MPCI), but furthest away from BMP. The first 5 per cent of the uptake (who are already at BMP) do not receive any or minimal (unexpected) benefits.

In practice, the only opportunity to verify the shape of this relationship is though farm-by-farm results at a district level.

Table 6.8 shows the average increases in productivity that could be possible based around a maximum 10 per cent increase in net productivity (increased output and value less increased costs) across those businesses that uptake MPCI.

For the low price scenario, the 10 per cent productivity improvement translates to a 3.3 per cent average net productivity improvement across all those who uptake MPCI.

6.8 Average productivity benefits by NSW region as a result of uptake of MPCI[a]

Region and sector	Low $14/ha	Medium $22/ha	High $30/ha
	%	%	%
NW slopes and plains			
Wheat and other crop	2.9	1.4	0.1
Mixed grains/livestock	3.2	1.7	0.2
Total grain farms	3.0	1.5	0.1
Central West			
Wheat and other crop	2.9	1.4	0.1
Mixed grains/livestock	3.2	1.7	0.2
Total grain farms	3.0	1.6	0.2

Region and sector	Low $14/ha	Medium $22/ha	High $30/ha
	%	%	%
Riverina			
Wheat and other crop	3.6	1.8	0.1
Mixed grains/livestock	3.2	1.7	0.2
Total grain farms	3.5	1.8	0.1
State — outcomes			
Wheat and other crop	3.3	1.7	0.1
Mixed grains/livestock	3.2	1.7	0.2
Total grain farms	3.3	1.7	0.2

[a] Net improvement in equivalent gross margin (total receipts less variable costs) weighted across adopting farms to achieve an average productivity benefit by for a region and sector y 2020-21.

Source: The CIE and industry consultation.

It is assumed that the maximum impact of this productivity increase occurs in 2020-21 at the end of the subsidy arrangements.

- **For cases 2 and 3: producers who uptake MPCI and subsequently opt out after the subsidy period will retain the productivity benefit associated with MPCI uptake.**

Total benefits are calculated by multiplying through the net productivity benefits by uptake across farms multiplied by the baseline revenue from winter cereals by region, as shown in table 6.9.

6.9 Potential productivity benefits from adoption of MPCI[a]

	Total benefits all farms: 2020-21			*Average benefits per farm: 2020-21*		
	Low $14/ha	Medium $22/ha	High $30/ha	Low $14/ha	Medium $22/ha	High $30/ha
	$m	$m	$m	$/farm	$/farm	$/farm
NW slopes and plains						
Wheat and other crop	2.91	1.15	0.06	30 700	15 460	1 460
Mixed grains/livestock	1.24	0.49	0.03	12 340	6 420	730
Total grain farms	4.15	1.64	0.09	21 270	10 900	1 110
Central West						
Wheat and other crop	2.43	0.96	0.05	24 210	12 190	1 150
Mixed grains/livestock	2.56	1.01	0.06	9 730	5 070	580
Total grain farms	4.99	1.97	0.11	13 730	7 080	750
Riverina						
Wheat and other crop	11.84	4.36	0.15	27 730	14 210	1 050
Mixed grains/livestock	2.11	0.83	0.05	8 890	4 630	530
Total grain farms	13.95	5.20	0.20	21 000	10 670	840
State – outcomes						

	Total benefits all farms: 2020-21			Average benefits per farm: 2020-21		
	Low $14/ha	Medium $22/ha	High $30/ha	Low $14/ha	Medium $22/ha	High $30/ha
	$m	$m	$m	$/farm	$/farm	$/farm
Wheat and other crop	17.19	6.48	0.27	27 610	14 070	1 150
Mixed grains/livestock	5.90	2.33	0.14	9 840	5 120	580
Total grain farms	23.09	8.81	0.41	18 890	9 620	860

[a] In 2015-16 dollars.

Source: The CIE and industry consultation.

It is important to note that from the perspective of individual businesses, that the benefits on a per farm basis cannot be compared back to the additional premiums paid, because productivity benefit are 'unexpected'. The farm-level decision would be made on the benefit from the transfer of risk, relative to the cost of the premium.

In terms of total payoffs to regions and to farm types:

- the Riverina captures the most benefits (60 per cent of the state total) because there is the greater potential for uptake and flow-on productivity gains and it accounts for around 45 per cent of the value of total winter cereal production
- specialist cropping captures the majority of the benefit in the low and medium scenarios (over 70 per cent), because of higher rates of uptake and the scope for productivity improvements.

Table 6.10 shows how these benefits are expected to vary over time in line with the adoption of improved practices that are phased-in over the 5 year period to 2020-21.

6.10 Potential productivity benefits from adoption of MPCI statewide[a]

Scenario and sector	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
	$m	$m	$m	$m	$m	$m
Low $14/ha						
Wheat and other crop	4.1	7.8	11.3	14.4	17.2	17.2
Mixed livestock	1.2	2.4	3.5	4.7	5.9	5.9
Total grain farms	5.3	10.2	14.8	19.1	23.1	23.1
Medium $22/ha						
Wheat and other crop	1.5	2.9	4.2	5.4	6.5	6.5
Mixed livestock	0.5	0.9	1.4	1.9	2.3	2.3
Total grain farms	2.0	3.8	5.6	7.3	8.8	8.8
High $30/ha						
Wheat and other crop	0.1	0.1	0.2	0.2	0.3	0.3
Mixed livestock	0.0	0.1	0.1	0.1	0.1	0.1
Total grain farms	0.1	0.2	0.3	0.3	0.4	0.4

[a] In 2015-16 dollars.

Source: The CIE.

Implications for business costs and government subsidy

Table 6.11 shows the size of additional costs incurred by farms buying MPCI after the subsidy. Compared to the baseline, these costs represent between 12 and 16 per cent of the total baseline value of traditional insurance purchased. This is relatively low, because of much smaller uptake of MPCI compared to traditional insurance.

6.11 Cost of increased MPCI premiums to farm businesses[a]

Scenario	Total over 5 years	2016-17	2017-18	2018-19	2019-20	2020-21
	$m	$m	$m	$m	$m	$m
Low ($14/ha)	54.0	8.8	8.6	12.6	12.2	11.9
Medium ($22/ha)	63.3	10.2	10.0	14.7	14.4	14.0
High ($30/ha)	45.0	7.1	7.0	10.5	10.3	10.1

[a] In 2015-16 dollars.

Source: The CIE.

It is important to note that these additional costs to farm businesses have not been included in the BCA. The rationale is that voluntary uptake of MPCI would involve an assessment that the benefits of holding MPCI or anticpaited, in terms of transfer of risk, and would be equal to or exceed the costs of purchasing the policy.

Table 6.12 shows that the over the 5 years of the scheme, the total subsidy required to be paid by the state ranges between $14.8 and $45.1 million , with around 60 per cent of this cost occuring in the first 2 years of the scheme.

6.12 Total cost of the upfront subsidy to state government[a]

Scenario	Total over 5 years	2016-17	2017-18	2018-19	2019-20	2020-21
	$m	$m	$m	$m	$m	$m
Low ($14/ha)	29.6	8.8	8.6	4.2	4.1	4.0
Medium ($22/ha)	34.6	10.2	10.0	4.9	4.8	4.7
High ($30/ha)	24.4	7.1	7.0	3.5	3.4	3.4

[a] In 2015-16 dollars.

Source: The CIE.

In relation to the total cost of the subsidy to the state economy, using the marginal excess burden of payroll tax identified in chapter 2 of $0.35 for every dollar raised, the deadweight loss of raising that revenue required is up to $12 million over the 5 years of implementation.

7 *Quantifying the impact of supporting measures for drought assistance*

This chapter outlines more detail on the first three measures that are not directly related to MPCI. These measures are based on the rationale that addressing information asymmetries to those who participate in markets will improve the efficiency and effectiveness of those markets.

The Commonwealth Treasury recommended that government action to address information asymmetries in insurance markets is one option that could be pursued to address the noted level of non and underinsurance in the Australian economy in general.[20]

The intent of the supporting measures is to be complementary with the wider uptake of MPCI by improving access to information and knowledge. That is to provide:

- farm businesses with better decision-making and enable increased resilience through enhanced skills and better weather forecasts over the long term
- decision makers in government and industry with complementary information on the profile of risk across agricultural regions and sectors.

In this chapter, we have quantified these benefits independently of MPCI uptake for two reasons:

- measures 1 and 2a can be accessed by all sectors across agriculture, horticulture and the intensive animal industries with no specific focus on the grains industry
  - Linking these benefits back to the grains sector would require knowledge of the profile of businesses that use that information and how it changes their practise. That is, how it increases the probability they take up MPCI and then make subsequent improvements to their practices.
- benefits from measure 2b are also widely applicable across all sectors, and unlikely to influence MPCI uptake or practice change.

Farm business skills professional development program

As part of the NSW Government's Drought Strategy. $45 million over 5 years has been put aside for Farm Business Skills Professional Development (FBSD) Program. The

20 Australian Government Treasury (2014) Submission to Productivity Commission Inquiry: Natural Disaster Funding Arrangements, p13

objective of the FBSD Program is to 'support farm businesses in all conditions, but particularly in relation to preparing for and responding to drought'. [21]

Three priority areas of the program have been outlined as:

- management of risk
- financial and business management
- farm business planning and/or drought preparedness.

The FBSD Program allows for the reimbursement of up to 50 per cent of the costs of an approved course or activity. There is a $5 000 limit per farmer and a $9 000 limit per farm business under the FBSD Program.

Recent advice from RAA indicates that the upfront cost of audit, associated with the application for MPCI, is not reimbursable through the FBSD program.

- However, the Commonwealth Government Managing Farm Risk Program provides a direct reimbursement of half of the costs incurred by eligible farm businesses, up to $2 500 for assistance in 'preparing and applying for a new insurance policy that assists with the management of drought and other production and market risks' — namely MPCI. [22]
- Therefore the link to MPCI will be through skill development, it has been assumed that benefits associated with this measure are independent of the uptake of MPCI.

Current demand for the FBSD programs

The FBSD program was launched on 2 November 2015, and as of 3 June 2016, approximately $53 000 has been disbursed to 54 applicants following completion of training activities. [23]

In addition, 30 providers have received approval to provide training services. In total, 2 775 training places across 84 training activities have been approved with an expected cost of $3.68 million. This is effect the 'supply' of places.

There is a total budget for the FBSD program of $9 million for the 2015-16 financial year, however, as the details of the program were announced in November, it is not expected that this budget will be fully utilised. There have been no applications for reimbursement of fees to collate financial records in preparation for a MPCI risk assessment audit.

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21 Rural Assistance Authority (2015) Farm Business Skills Development Program, available at http://www.raa.nsw.gov.au/assistance/professional-development-program, accessed on 11/05/2016

22 Department of Agriculture and Water Resources (2016) Managing Farm Risk Programme, available at http://www.agriculture.gov.au/ag-farm-food/drought/assistance/mfrp, accessed on 11/05/2016

23 At an average cost approximately of $1 960 per training place.

Complementarity and substitutability with other training programs

There have been no evaluations undertaken on the relative costs and benefits of providing the FBSD program to NSW farmers. The rationale behind the program is that increased business skills and understanding, or increased access to professionals that are able to provide these services is likely to provide additional benefits to the sector through for example:

- increased financial stability and flexibility
- improved understanding of financial risks of the farm business
- an ability to identify and act on business opportunities.

However, there are also a range of business skills activities that are provided by research and development corporations, and farm business groups that do not necessarily incur a contribution by the participant. These business skills resources, such as the GRDC Farming the Business Manual, Farm Business Gross Margin Guide, Farm Decision Making, as well as Agricultural Training Awards are all targeted at similar outcomes to the FBSD program.

Quantification of potential uptake and costs

The size of the budget available for this measure is substantial: at a maximum cost of $5 000, there would be funding for 9 000 places which is half the number of NSW farms alone.

Another metric for uptake is by those who have already have a high level of awareness of support programs administered by the NSW RAA. Over the past 8 years, a maximum of 14 000 applications were received for all forms of assistance in any one year (that was in 2007-08). After accounting for multiple applications, the total population that would be likely to apply for the training course could be in the order of 8 000 businesses.

- Assuming (conservatively) the potential uptake rate was 50 per cent from the available population of 8 000 businesses, over the 5 years, potential participation could be in the order of 4 000 businesses.
- After the slow start in 2015-16, uptake is assumed to be uniform until the end of the program (see table 7.1).

7.1 Estimated uptake and cost FBSD programs[a]

	Total uptake	Total cost
	no	$m
2015-16	54	0.1
2016-17	986	2.5
2017–18	986	2.5
2018-19	986	2.5
2019-20	988	2.5
Total	4 000	10.0

[a] In 2015-16 dollars, undiscounted.

Source: CIE.

- The total estimated expenditure is $10 million of which 50 per cent is reimbursed by the NSW government.
- **It is recognised that at this uptake, and average course cost, only 11 per cent of the allocated budget would be expended.**

Quantification of benefits

Investment in training and extension is typically not evaluated within an economic framework across Australian agriculture. An evaluation would require the following metrics:

- the number of participants that implement practice change
- the additional value of that practice change to that business.

The usual method of gathering this data is follow-up interviews with participants. This should be undertaken as the program progresses.

There are a number of equivalent studies that can used to benchmark what can be expected from this program. For example, the Evergraze program was a significant investment undertaken Australian Wool Innovation, Meat and Livestock, the CRC for Plant based Management of Dryland Salinity and regional catchment management agencies. The objective was to improve grazing practices, strategies and performance generally and in response to periods of climate variability. The total investment was substantial: in the order of $33 million over the period 2005 to 2013 through a program of demonstration sites, producer engagement in workshops and supporting research. The ex-post evaluation of this program achieved a headline BCR of 5.4:1 using a 5 per cent discount rate.[24]

Another significant program that involved the grains industry was the Grain and Graze program. The objective of the investment was to assist mixed farming businesses across Australia by helping farmers to understand complex systems, adapt to market risks and seasonal changes, and to make informed decisions to optimise grain yield and livestock productivity while protecting the environment. The overall investment in the program was in the order of $31.1 million in 2007-08 terms with an estimated BCR of 1.48:1 using a 7 per cent discount rate.[25]

More recently, in the Meat Industry Strategic Plan, CIE (2015) calculated that an extensive extension program across the industry costing $100 million a year would have an expected BCR of 1.6:1. However, tightly restricting the program and focusing on producers with the highest benefit could increase the payoff to 6.0:1 using a 5 per cent discount rate.[26]

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24 Agtrans Research 2012, *Economic Evaluation of Investment in EverGraze*, Prepared for Meat and Livestock Australia, Project Code B.GSM.0002, September.

25 Viv Read and Associates and Petersen E 2008, *Program Evaluation for Grain and Graze, Summary Report*, Prepared by the Grain and Graze program, October.

26 CIE 2015, *Meat Industry Strategic Plan 2015-20:Quantifying the payoffs from collaborative investments by the red meat industry*, Prepared for the Red Meat Advisory Council, September.

Therefore, payoffs for investments of this type would be expected to range from 2:1 to 6:1 in Australian agriculture.

- **Given the scale of this investment and the similarity of programs already in place, it is likely that the expected payoff would be in the order of 2:1.**
- **Once the cost of raising government funds are factored into the analysis, this benefit-cost ratio falls to 1.5:1.**

Additional rain gauges and weather stations

The Commonwealth Treasury recommended that government action to improve information availability on natural hazards in Australia is one option that could be pursued to address the noted level of non and underinsurance in the Australian economy in general.

> Government can have a role in collecting evidence and providing information to assist consumers and businesses to understand and manage their risks. With access to a greater quantity and quality of data, consumers can make more informed insurance purchase decisions and insurers could be more certain about the extent of risk they are taking on and could price more appropriately (and extensively, by covering areas previously redlined), thereby ensuring consumers are charged premiums which are commensurate with the risk they face. [27]

An allocation of $2.5 million was made through the Drought Strategy to work with the Bureau of Meteorology to improve the NSW weather station network.

To date, the installation and maintenance of 28 additional weather stations has been planned (20 tipping buckets and eight automatic weather stations). The locations of these additional weather stations were chosen based on their ability to address geographical gaps in the weather station network. All stations are anticipated to be operating by June 2017.

A further $900 000 is still to be allocated, with DPI reported to be attempting to identify opportunities that do not overlap with Commonwealth funding and responsibilities. [28]

Rationale for the measure

The reliance of Australia's agricultural sector on the weather is self-evident. Further, increased accuracy of weather forecasts driven amongst other things by access to increased granularity of rainfall data has been shown to be highly valuable to the agriculture sector.

Box A.5 summarises the key determinants of the value of seasonal weather forecasts in agriculture. These findings were supported by a quantitative analysis that found that

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[27] Australian Government Treasury (2014) Submission to Productivity Commission Inquiry: Natural Disaster Funding Arrangements, p13

[28] Pers Comm (email, 2016) from the Rural Assistance Authority

improved seasonal weather forecasts in Australian agriculture could have significant value to the Australian economy:

- using a detailed methodology that incorporated the uncertain nature of improved seasonal climate forecasts and the cost of responding to forecasts, the value of improved seasonal climate forecasts that could be realised through optimising fertiliser application in wheat enterprises in Western Australia was estimated at between $418 million and $780 million per year
- assuming the same parameters hold for all cropping across Australia, improved seasonal forecasts may have a value of between $800 million and $1 491 million each year.[29]

In the short term, increased geographic coverage of rainfall data would be useful to support the MPCI through identification of regions that have been affected by altered rainfall patterns, allowing insurers to gather additional information to limit the risk of moral hazard in managing policies. However, it has been reported that MPCI providers already require farms to purchase and install rain gauges as a condition of coverage, so the placement of additional, government-funded rain gauges would provide little additional information to insurers on farms already insured.

7.2 Value of forecasts

- Forecasts are likely to be of greatest value in areas of high climate variability and Australia has one of the most variable climates (Hennessy et al. 2008).
- The value of a climate forecast is less than the extent of climate sensitivity.
  - Not all impacts of weather on sectoral output can be eliminated with a climate forecast, no matter how skilful
  - Any mitigation actions that are adopted must be cost effective.
  - Mitigation actions are not costless and therefore the value of a climate forecast is diminished by the cost of acting on it.
  - Climate forecasts are not perfectly accurate and there are costs associated with incorrect forecasts.
- The value of improved seasonal forecasts for the agriculture sector depends on a wide range of complex and interrelated factors:
  - forecast accuracy
  - including accuracy at relevant spatial resolution and with appropriate lead times
  - forecast adoption rates
  - risk attitudes
  - seasonal conditions experienced.

Source: CIE (2014) Analysis of the benefits of improved seasonal climate forecasting for agriculture. Prepared for the Managing Climate Variability Program

[29] CIE 2014) Analysis of the benefits of improved seasonal climate forecasting for agriculture. Prepared for the Managing Climate Variability Program.

In the medium to longer term, increased geographic coverage of rainfall data could provide impacts through:

- providing additional geographic information for insurers to identify regional rainfall patterns and probabilities, feeding into premium calculations, reducing the level of uncertainty included in these calculations; and
- improving localised weather forecasts for farmers, assisting on a year-to-year basis the prediction of rainfall, crop yields and therefore the need for insurance at the farm level.

Quantification of potential benefits

A 2013 economic evaluation prepared for GRDC quantified the expected benefits from GRDC's and the Sugar Research Development Corporation's investment in the Managing Climate Variability Program. This evaluation focussed on the economic benefits associated with the following program outputs:

- more rapid development of the Predictive Ocean Atmospheric Model for Australia (POAMA) to replace current statistical forecasts which are likely to be less useful as a result of climate change;
- accelerating the use of POAMA to provide a new forecast at a multi-week timescale and a new forecast of the monsoon onset, and
- the launch of CliMate, a free mobile application with a web version forthcoming, that can be used to readily access and interrogate recent weather and likely climate probabilities for a location, and which has had 3 000 downloads in the first six weeks.

Overall, it was concluded that the $15 million investment in increased predictive power of seasonal forecasting models, and increased accessibility to forecasting information delivered economic benefits of approximately $95 million —a 6.15:1 benefit cost ratio.

Notably, these program outputs are focussed on increasing the predictive power of forecasting models. In contrast, the majority of the NSW Government's investment in weather forecasting ($1.6 million) is associated with increased data collection and not increased processing power. There are no economic impact evaluations comparing the relative benefits associated with increased data granularity against increased computing power. There are likely to be confounding effects on the relative costs and benefits associated with these elements including:

- maintaining a static underlying modelling capacity that is structured around increased data collection would continue any existing computational discrepancies and biases within the model;
- improved data quality is likely to improve the accuracy of modelling results; and
- increased input data without a commensurate increase in computing power will slow down the processing time — although the limited number of additional weather stations is unlikely to have a discernible impact on processing time.

While these results are not directly transferable to an evaluation of the additional weather stations being funded by the NSW government, they provide a clear indication that

improved weather forecasts, supported by increased data and information on rainfall patterns across Australia do hold value for the NSW cropping sector.

- **Given the role additional weather stations play in overall weather forecasting, it would be expected that the payoff would be lower than for previous investments in improving weather information. Therefore the payoffs from this measure are included at a benefit cost ratio of 3:1 based on expenditures in 2015-16 terms.**
- **Once the cost of raising government funds are factored into the analysis, this benefit-cost ratio falls to 1.9:1**

Sharing of NSW Rural Assistance Authority Information

A further information sharing program that is being implemented by the NSW government, is sharing data, information and reports held by the NSW Rural Assistance Authority. These information sources include:

- 10 years of exceptional circumstances data
- a focus on the subset of the agricultural sector likely to seek government assistance
- farm level financial information.

The RAA also publishes publicly available reports such as Seasonal Conditions Reports and Local Land Services Reports.

Rationale for this measure

The outcome of this measure is transforming information, previously paper-based, into a more accessible format for distribution. To date, the RAA has assembled the assistance data for the period 2010-11 to 2014-15 by

- assistance program
- Local Land Services (LLS) region (Central Tablelands, Central West, Greater Sydney, Hunter, Murray, North Coast, North West, Northern Tablelands, Riverina, South East, Western
- ABS farm type (Sheep/Beef, Dairy/Milk, Poultry/Eggs, Pigs/Goats, Wheat/Coarse Grains, Rice, Mixed Farming, Fruit, Citrus, Grapes, Dried Vine Fruit, Sugar, Vegetables, Cotton, Fodder Crops, Oysters, Nursery (Wholesale), Nuts, Bees/Honey.

Quantification of costs

The scale of the costs for this initiative will be modest, especially if they are part of the RAA's business-as-usual activities. In the context of the other measures, the expected costs should be relatively modest if the transfer of data from paper to an electronic form is one off, and then the database is maintained in the required electronic form on an ongoing basis.

Quantification of the benefits

This information has a potential audience across two primary groups: decision makers in government and industry including insurers. In terms of decision makers in State and Commonwealth government, such as the NSW DPI, this information potentially has value in the refinement and improved targeting of drought assistance and better understanding the profiles of businesses and regions that are at risk.

Industry and insurers already maintain their own datasets based on their clients and district level information including a historical time series of premiums paid and losses. Some also independently collect their own data on district-level yields. The RAA provides the opportunity to provide a complementary picture of risks by region and farm type.

There are a number of identified limitations to the data held by the RAA including:

- financial information only collected from applicants to the exceptional circumstances scheme, not for other government assistance programs and would be subject to confidentiality restrictions; and
- data is limited to a proportion of farms that apply for assistance, with limited ability to scale this data to a total population that has been impacted by drought or other circumstances.

The majority of these limitations are overcome to a certain extent in publicly available data sets such as those held by the ABS and ABARES.

- **Given the complementary nature of the information made available by this measure, there is likely to be a net benefit, largely because the costs of providing the information will be very low.**

8 Cost benefit analysis results

In this chapter, the benefits and costs of the 5 measures listed in table 1.1 are formally quantified.

Stamp duty waiver

Table 8.1 sets out the benefits and costs for the measure that waives stamp duty on MPCI premiums. There are three baselines for this analysis for each price point scenario which involve different levels of uptake of MPCI without any additional incentives that would mitigate the full cost.

8.1 Summary of benefits and costs for measure 3[a]

Price scenario	MPCI related[b]	Other benefits	Total benefits	Costs[c]	Benefit cost ratio
	$m	$m	$m	$m	
Low ($14/ha)	0.3	0.0	0.3	0.3	1.0
Medium ($22/ha)	0.4	0.0	0.4	0.4	1.0
High ($30/ha)	0.5	0.0	0.5	0.5	1.0

[a] Net present of benefits and cost in 2014-15 terms over 20 years, 2016-17 to 3035-36 using a real discount rate of 7 per cent. [b]Total benefits are calculated by the a marginal excess burden of 1.35.[c] Total expenditure by government multiplied by a marginal excess burden of 1.35.

Source: CIE calculations.

As noted in chapter 2, it has been assumed that the stamp duty revenue foregone will be raised from payroll tax with a marginal excess burden of 0.35. As noted in chapter 6, the estimated benefits from the model are close to the estimated costs (tables 6.2 and 6.3), reflecting the small base of the stamp duty and unresponsive demand of those farms likely to respond to the measure.

Therefore, the benefits and costs for each of the scenarios are foundto be 1:1.

Reduce the upfront cost of MPCI

The key premise on which this analysis is based is the link between the uptake of MPCI and two key benefits:

- the transfer of risk from a range of other instruments and practices to insurers — these benefits have not been quantified

- improvements in total factor productivity that result from the link between MPCI uptake and higher yields as a result of less conservative use of key inputs — which have been quantified.

Table 8.2 brings together the benefits and costs for the three cases under which the link between MPCI and improved productivity:

- Case 1: no productivity 'unexpected' flow-on (benefits are all in terms of transfer of risk)
- Case 2: the productivity gains would have occurred anyway, and the incentive to uptake MPIC has brought forward this gain by 5 years
- Case 3: the productivity gain wouldn't have happened without the upfront reduction in the cost of premium.

There are some clear implications from the results:

- without productivity gains, the measure is not worth pursuing
- in the case where productivity gains[30] would not occurred without the scheme the benefits exceed the costs for all price scenarios, except for the $30 per hectare price point

8.2 Summary of benefits and costs for measure 4[a]

Case and price scenario	MPCI related[b]	Other benefits	Total benefits	Costs[c]	Benefit cost ratio
	$m	$m	$m	$m	
Case 1: no productivity gains					
Low ($14/ha)	19.1	0.0	19.1	40.0	0.5
Medium ($22/ha)	21.0	0.0	21.0	46.7	0.5
High ($30/ha)	15.3	0.0	15.3	32.9	0.5
Case 2: Productivity gains brought forward by 5 years					
Low ($14/ha)	105.0	0.0	105.0	40.0	2.6
Medium ($22/ha)	53.6	0.0	53.6	46.7	1.1
High ($30/ha)	16.8	0.0	16.8	32.9	0.5
Case 3: Productivity gains would not have occurred without MPCI					
Low ($14/ha)	220.1	0.0	220.1	40.0	5.5
Medium ($22/ha)	97.5	0.0	97.5	46.7	2.1
High ($30/ha)	18.9	0.0	18.9	32.9	0.6

[a] Net present of benefits and cost in 2014-15 terms over 20 years, 2016-17 to 3035-36m using a real discount rate of 7 per cent. [b] Includes benefits from increases in consumer surplus as a result of the subsidy to both existing and new policy holders [c] Total expenditure by government multiplied by a marginal excess burden of 1.35.

Source: CIE calculations.

30 That is, a maximum increase of 10 per cent in net productivity is experienced by the marginal producer taking up furthest away from BMP.

- where productivity gains are brought forward, the potential benefits are between 48 and 55 per cent lower for the $14 and $22 per hectare scenarios, compared for case 3, but still result in BCRs over 1
  - for the $30 per hectare scenario, there is a negligible difference between cases 2 and 3, because low levels of uptake confined to producers close to BMP will restrict the scope for any productivity benefits.

The key insight from the analysis, is that higher levels of uptake are required to achieve the 'unexpected' productivity gains required to 'pay' for the likely costs of the upfront subsidy.

Breakeven analysis

To evaluate the sensitivity of the analysis, the headline analysis was modified to establish the size of the productivity benefit required for the measure to break even. Given the $30 per hectare scenario is already below breakeven for case 3 in table 8.2, the focus of the analysis was the low and medium price scenarios:

- compared to the assumed 10 per cent maximum increase in net productivity, the medium or $22 per hectare scenario requires a maximum 3.4 per cent net increase in productivity to breakeven
- for the low or $14 per hectare scenario, this requirement falls to a 1.0 per cent increase in net productivity.

Supporting measures for drought assistance

Table 8.3 provides a summary of the supporting measures as based on the benefits and costs discussed in the chapter 3. The bene

The costs include:

- payments by both course participants and government for the FBSPD (on a 50:50 basis); and
- investment by government in the case of rain gauges and weather stations and the cost of making RAA data more accessible.

8.3 Summary of benefits and costs across supporting measures 1, 2a and 2b[a]

	MPCI related	Other benefits	Total benefits	Costs[b]	Benefit cost ratio
	$m	$m	$m	$m	
1. Farm Business Skills Professional Development	0.0	17.0	17.0	11.5	1.5
2a. Rain gauges and weather stations	0.0	6.3	6.3	3.4	1.9
2b. Sharing NSW RAA data	0.0	0.0	0.0	0.0	>1
Total across supporting measures	0.0	23.2	23.2	14.8	>1.6

[a] Net present of benefits and cost in 2014-15 terms over 20 years, 2016-17 to 3035-36m using a real discount rate of 7 per cent. [b] Total expenditure by government multiplied by a marginal excess burden of 1.35.

Source: CIE calculations.

Note that the BCRs for these measures will be lower than those identified in chapter 7, as a result of the adjustment of the cost base, for each measure, for the marginal excess burden of 1.35 (for consistency with the evaluation of other measures).

In total, after consideration of the small but positive benefits for measure 2b, the expected benefit cost ratio for the supporting measures is greater than 1.6:1

Verification of productivity impacts of MPCI

The focus of this report has been the quantification of measure 4 to reduce the upfront cost of MPCI. The potential improvement in productivity identified in this report, is conservative and plausible given advice from industry in NSW. There is significant uncertainty about its realisation, however, given the lack of empirical support in jurisdictions such as the US. Large and systematic analysis in other jurisdictions have failed to deliver a clear link between MPCI and productivity. However, the operational environment is very different in Australia.

In agriculture, the pathways between key economic and environmental drivers and change in practice or technologies, particularly of BMP and off-the-shelf R&D, are not transparent.

- Observed improvements in yield equivalent and productivity could be equally attributable to other factors that drive adoption of BMP including declines in terms of trade and consolidation of farm businesses.

Comparison between each of the three scenarios, and the key insight that first adopters will be at or close to best practice, leads to the conclusion that measures that lead to greater uptake are *more likely* to result in middle-tier businesses adopting better practices.

Given the extent of the uncertainties, policy-makers should consider a trial or staged approach to implementation of a subsidy arrangement.

- This is especially the case when insurers are seeking to manage their exposure by recruiting businesses across jurisdictions and by varying the terms and conditions of the polices.
- A trial, for example, would provide insights on takeup levels and more importantly, follow-up evaluations could quantify movement toward best practice. The Orana region has a high level of adoption of traditional crop insurance products and a mix of farm types and could be a good region for a trial.

A More details on government assistance measures

Tables A.1 to A.6 provide more detail on the types of payments that were administered by RAA and provided to livestock, mixed farming and cropping specialists in NSW, aggregated over the 2010-11 to 2014-15 financial years.

As can be seen, over the time period, NSW cropping specialists received a total of:

- $36.4 million in drought related assistance, representing 9.6 per cent of total drought related RAA administered payments over this period
  - $23.8 million of this figure was paid as Exceptional Circumstances payments by the Commonwealth government in the two 2010-11 ($21.3 million) and 2011-12 financial years ($2.1 million)
- Excluding the two Commonwealth government programs of Exceptional Circumstances and Concessional Loans, there was a total of $88 million in drought related assistance provided to NSW farms, and $44 million of non-drought related assistance provided
  - NSW wheat and coarse grains enterprises accounted for 2.6 per cent of total drought related assistance payments, and 14.3 per cent of non-drought related payments

A.1 RAA administered Special Conservation Fund payments — 2010-11 to 2014-15

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	78	6.0	7	0.3
Wheat/coarse grains	16	1.0	0	0.0
Mixed farming	67	5.6	7	0.4
Other	31	2.5	3	0.2
Total	192	15.1	17	0.9

Source: RAA provided data

A.2 RAA administered Farm Innovation Fund Loans — 2013-14 to 2014-15

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	82	7.9	126	16.8
Wheat/coarse grains	6	0.7	36	6.5
Mixed farming	35	4.0	90	14.7
Other	5	0.5	26	4.2
Total	128	13.0	278	42.2

Source :RAA provided data

A.3 RAA administered Transport Assistance — 2012-13 to 2014-15

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	5 924	14.4	523	1.2
Wheat/coarse grains	93	0.3	1	0.0
Mixed farming	723	3.0	35	0.2
Other	190	0.7	189	0.5
Total	6 930	18.4	748	1.9

Source: RAA provided data

A.4 RAA administered Emergency Water Rebate — 2013-14 to 2014-15

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	4188	37.8	0	0.0
Wheat/coarse grains	36	0.4	0	0.0
Mixed farming	269	2.6	0	0.0
Other	81	0.8	0	0.0
Total	4574	41.5	0	0.0

Source: RAA provided data

A.5 RAA administered Concessional Loans — 2013-14 to 2014-15

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	117	60.0	0	0.0
Wheat/coarse grains	15	10.2	0	0.0
Mixed farming	50	29.4	0	0.0
Other	16	7.8	0	0.0
Total	198	107.4	0	0.0

Source: RAA provided data

A.6 RAA administered Exceptional Circumstances payments — 2010-11 to 2011-12

	Drought related		Non-drought related	
	# approved	$m approved	# approved	$m approved
Sheep/beef	1 160	43.9	0	0.0
Wheat/coarse grains	441	23.8	0	0.0
Mixed farming	1 451	69.3	0	0.0
Other	1 078	44.9	0	0.0
Total	4 130	181.9	0	0.0

Source: RAA provided data

B NSW cropping industry and baseline

Categorisation for farm types by region

The analysis is centred around the ABARES farm survey data, based on the three key regions that are at the heart of the wheat-sheep and pastoral zones (see table B.1). The ABARES survey data is critical not only because it records off farm revenues and costs but also overall financial performance in terms of farm income and return on debt. However, while this data is the best available, its deficiencies must be recognised including modest sample size and self-selector bias. [31]

B.1 ABARES NSW zones

ABARES regions	Major centres
Major broadacre crop zone	
121: North West Slopes and Plains	Tamworth, Moree, Narrabri, Coonamble, Walgett
122: Central West	Dubbo, Cowra ,Forbes, Wellington, West Wyalong
123: Riverina	Wagga Wagga, Albury, Griffith, Leeton, Deniliquin, Cootamundra
Other zones	
111: Far West	Broken Hill, Cobar, Bourke, Wentworth Brewarrina, Wilcannia
131: Tablelands	Canberra, Orange, Bathurst, Goulburn, Armidale, Singleton, Cooma, Yass, Glen Innes
132: Coastal	Sydney, Newcastle, Wollongong, Coffs Harbour, Port Macquarie, Nowra, Taree, Murwillumbah, Bega

Source: ABARES Farms survey.

Table B.2 shows that out of an estimated population of around 18 000 farms in 2014:

- 7 000 businesses carried on substantive cropping activities
- 11 500 were located farms in the three regions of interest including livestock specialists.

B.2 Estimated ABARES farm population and average farm size 2014

	Businesses	Average farm size
	no	ha
All farm businesses	17 974	2 170
Farm type		
Specialist cropping	2 431	2 377

31 That is, better businesses will have the incentive to provide information based on their records and above average performance.

	Businesses	Average farm size
	no	ha
Mixed grains livestock	4 612	1 520
Region		
North West Slopes and Plains	3 004	2 004
Central West	3 975	1 337
Riverina	4 486	1 439
Other regions	6 509	3 259

Source: ABARES Farms survey.

What follows provides an overview of the differences between regions that the analysis is attempting to capture and how businesses will respond to the four MPCI measures.

North West Slopes and Plains

Cropping is generally located on fertile soils with little or no slope or on sloping country with contour banks with both summer and winter crops grown. The most significant difference between farms in this region from the point of view of the approach is between dryland and irrigated cropping. Cotton is the principal irrigated (summer) crop while on irrigated land, wheat is used as break crops in rotations. In dryland farming, there is a mix of specialist cropping and mixed grains/livestock farms.

On dryland farms, wheat has been the most widely grown winter crop, with sorghum the predominant summer crop (grown more in the south and east). Other crops (for example, canola and chickpeas) have been increasingly adopted in crop rotations to address pest and disease issues. Livestock are also an important part of the region, but are often run on a separate part of the property where cropping is not practiced, especially on the plains. In the slope areas, were cultivation takes place between contour banks, cropping and livestock are generally rotated.

Central West

The majority of the agricultural land in the region is used for dryland mixed grains and livestock farms while irrigation is restricted to river flat country for intensive crops such as lucerne hay production and vegetables. Common broadacre cropping enterprises in the Central West include wheat, barley, oats, canola, triticale and pulse crops such as lupins and field peas. Because it is a winter rainfall area, few dryland summer crops are grown in the region.

Wheat and canola are the primary crops grown following a pasture phase, usually in a long fallow. Over the past 10 years, the intensity of cropping has increased with increased use of successive crops (wheat, barley and canola) made possible by the greater use of fertiliser and chemical inputs (substituting for pasture rotation) and the need to increase capacity utilisation of machinery. Common livestock enterprises include sheep for wool production, merino ewes and wethers, first-cross lambs, and cattle for yearling beef production.

Although farms may adopt similar enterprises, performance varies between farms depending on the proportion of arable and non-arable land but also management skills. The combination of enterprises adopted is influenced not only by their profitability but also by farmers' skills, their preferences, attitude to risk, culture (family influence).

Riverina

The Riverina is predominantly a winter rainfall area where the differentiation between irrigated and dryland farms is critical. The Murrumbidgee Irrigation Area produces a variety of cropping and horticultural products from rice through to vegetables.

Rice in summer (land planted now is heavily dependent on available water allocations) and wheat in the winter are the most important crops on broadacre farms, however, canola has emerged as a significant and high value crop over the past 5 years in response to strong prices. While livestock numbers, particularly sheep, have decreased significantly over the past 20 years, lamb and cattle remain important in the mixed enterprise farms.

There has been widespread adoption of conservation farming practices in the dryland sector of this region that has also corresponded to a steady increase in farm size.

Baseline estimates of farms and cropping areas

The analysis in this report required the development of a baseline for NSW grain farms. The estimates in table B.3 are based on the ABARES Farm survey making the following assumptions:

- to ensure consistent with the analysis, total and average cropping areas are for winter cereals only (excluding rice, cotton, sorghum and other summer crops and fodder crops)
- historical trends in number of farms and average cropping area between 2005 and 2015 are expected to persist
- over the next 6 years, there will be ongoing consolidation in average areas cropped for winter cereals for both specialist and mix grains/livestock farms.

B.3 Baseline number of grain farms and average cropping areas

		2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Number of NSW grain farms								
Wheat and other crop	no	2 447	2 455	2 462	2 469	2 477	2 484	2 492
Mixed livestock	no	4 287	4 261	4 236	4 210	4 185	4 160	4 135
Grain farms	no	6 734	6 716	6 698	6 680	6 662	6 644	6 627
Total cropping area for winter cereals								
Wheat and other crop	000 ha	3 013	3 043	3 073	3 104	3 135	3 166	3 198
Mixed livestock	000 ha	2 067	2 064	2 060	2 057	2 054	2 051	2 048
Grain farms	000 ha	5 080	5 106	5 134	5 161	5 189	5 217	5 246

		2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Average winter cereals cropping area per farm								
Wheat and other crop	ha	1 231	1 240	1 248	1 257	1 266	1 275	1 283
Mixed livestock	ha	482	484	486	489	491	493	495
Grain farms	ha	754	760	766	773	779	785	792

Source: ABARES Farm survey and CIE estimates.

Economic profile and productivity in NSW grains

Currently there are two major macro drivers for the NSW grains industry and indeed broadacre agriculture:

- move to a hotter, drier climate. Yields since 2000 were flat and more variable compared to the 1980s. Between 80 and 90 per cent of the variability in wheat yields were attributable to changes in available soil moisture.
- ssructural change. The higher profitability and lower labour intensity of cropping enterprises over sheep and wool, resulted in the transfer of land into cropping.
  - The average size of cropping farms has doubled since 2000.

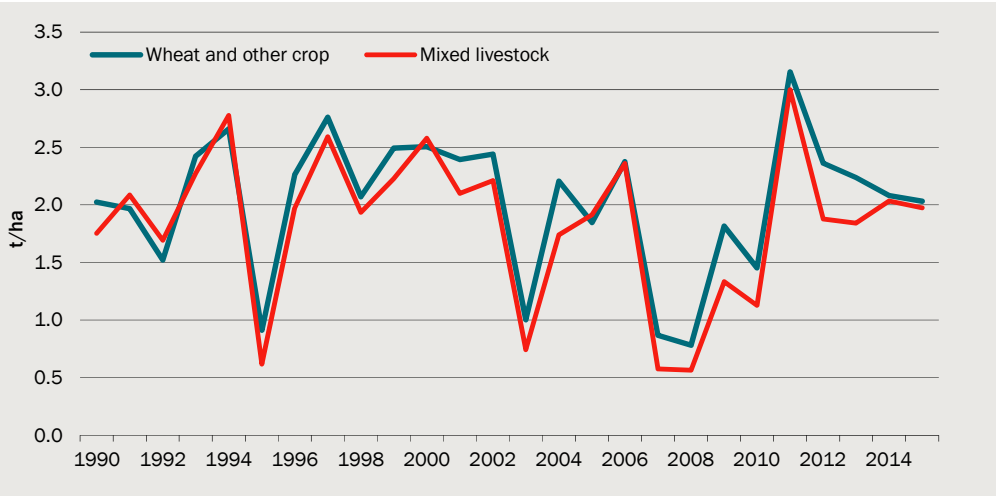
Total factor productivity trends

The key performance indicators within the grains industry include yields, operational costs and total factor productivity.

- Declining or flat yields**.** Increased seasonal variability resulted in trend yields that were declining in the wheat-sheep zone through to the late 2000s when there was a distinct improvement.
- Reductions in operating costs. Changes in the input mix and on-farm production technology and increases in farm scale resulted in trend declines in per hectare operating costs, primarily for specialist producers.
- Increase in total factor productivity through lower input use rather than increased outputs. TFP analysis confirms the reduction in operational costs as the driver of improved on-farm profitability.

Chart B.4 shows the increased variability of yields during the 2000s, especially around the two major droughts, which have improved and stabilised from 2011 onwards. It is also interesting to note that yields from mixed grains/livestock farms tracks yields of specialist growers, have been consistently lower (by an average of 14 per cent over the past 7 years).

B.4 Winter grain and oilseeds yield for NSW farms[a]



[a] Includes wheat, barley and canola.

Data source: ABARES farm survey.

Over the period 2000-2015, increases in all costs, especially fertiliser and hired labour, were offset to some extent by the reduction in overhead costs as the average size of a cropping enterprise increased.

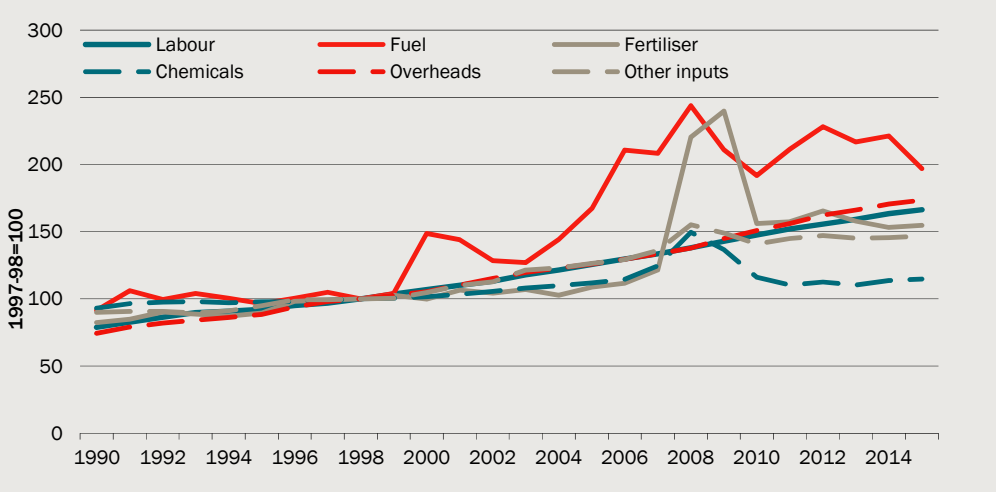
Over this period average prices paid by all grain producers increased at an average annual rate of 2.5 per cent each year, in line with costs throughout the economy, but as chart B.5 shows, fuel prices increased faster than other inputs from 2000 onwards and during the GFC, fertiliser prices spiked. [32]

In response to climate variability and downward pressure on terms of trade, there has been a move to increased average farm sizes, use of conservation agriculture and also more conservative use of key inputs, particularly fertiliser. Since 2000, chart B.6 shows the long term use of major input groups on a quantity index per hectare basis. While reduction in per hectare labour and overhead costs is consistent with mechanisation and larger farm sizes, the use of fertiliser has declined substantially since the period from the early 2000s onward.

- **Given further erosion of the farmer's terms of trade and continued threat of climate variability, there will be further downward pressure on costs and for continued structural change.**

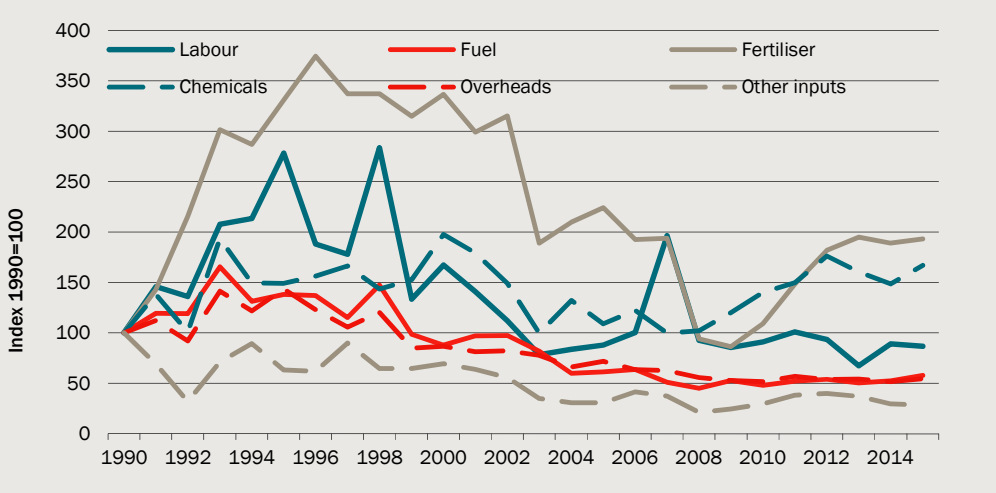
32 This was particularly the case for nitrogen-based fertilisers. The increase in oil prices and energy costs more widely made all nitrogen-based fertilisers substantially more expensive than for the phosphates.

B.5 National cost indices for broadacre agriculture



Data source: ABARES.

B.6 Quantity of inputs used per hectare by NSW cropping specialists



Data source: ABARES and CIE calculations.

Private on-farm risk mitigation practices in Australia

Given the underlying variability of the operating environment, in terms of both climate and markets, grain growers already take a number of approaches to mitigate their risks. These approaches need to be accounted for before consideration is made as to what a MPCI market could potentially contribute. Examples of utilised risk mitigation instruments include:

- traditional or named peril crop insurance products
- adoption of on-farm practices that improve productivity, both in terms maximising water use efficiency and achieving economies of scale

- the use of financial instruments to smooth income across periods of reduced production and profitability
- accessing other forms of government assistant, especially in the context of drought relief.

Adoption of traditional insurance

An obvious starting point for the analysis, and part of the baseline for the BCA, is the number of farm businesses that already purchase named or traditional crop insurance products. Currently, there are more than 10 companies that offer crop insurance products. Typically, each of these companies have different polices for coverage across crops, events and regions. For example, typical coverage of events by so-called 'combined products' includes:

- hail and fire
- damage from livestock and crop overspray
- post-harvest losses in storage and transport.

In terms of crops, the level of coverage offered also varies between insurers which is a function of their assessment of their own exposure to risk.

- Insurers specialise in high value activities such as cotton and winter crops (wheat and canola). As a general rule, summer crops (sorghum) are not insured because the market is too thin relative to the risks.
- Insurers also have broad internal procedures that consider the physical location of policy-holders, with regional exclusions due to:
  - risk of drought, hail and cyclones [33]
  - thin markets — the limited number of potential clients and the cost of maintaining assessors that are sufficiently familiar with a particular region.

The uptake of MPCI depends critically on the price points at which individual businesses will adopt insurance, and how these price points vary with coverage (that is, which crops or what percentage of crops are covered). As noted previously, if MPCI is required in addition to named (hail) products will also be an important factor.

The degree of penetration of existing insurance products should provide insights into the degree of uptake of MPCI. For example, businesses who are already insured for hail etc would be more likely to adopt MPCI, compared to those who are currently uninsured or self-insured as they have already shown a pre-disposition towards financial risk management instruments.

Determining the number of businesses already purchasing crop insurance is a significant challenge given that this information has not been made available by the insurance industry for this study. However, a brief consultation with the industry indicates that:

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[33] For example, some insurers have a blanket exclusion policy for Queensland due to the probability of droughts and cyclones.

- the vast majority of grain producers hold crop insurance in some form either through choice or in compliance with the conditions of bank loans;
- businesses and insurers tend to agree on hectares/crop type covered, the coverage percentage of each crop and the combination of premium and excess payable
  - If uptake is motivated by compliance with banking and finance conditions, businesses will often minimise annual costs through the use of an excess.

Adoption of MPCI

The development of MPCI products is currently in its infancy with three insurers offering or trialling products to their customers across a number of states. Typically, these businesses are at or close to BMP, and so are looking for a mechanism to transfer some of their risk to the market.

- Assumptions for uptake for 2016-17 and 2020-21 is shown in table 4.1.
- Given the ongoing product development and without any additional incentives to uptake MPCI, it would be likely that uptake will be restricted to BMP businesses in the specialist cropping sector.

Adoption of conservative management practices

With respect to climate variability and drought, farmers can mitigate some of the key risks by adopting practises that maximise the use of available soil moisture and also improve the sustainability of farm practices. These are referred to as conservation farming practices, which in combination with improved business and financial practices as termed BMP.

For the cropping sector, the predominant conservation practices include:

- zero and no-tillage practices — minimising the amount of ground disturbance at the time of planting so as to, amongst other things, retain soil moisture and reduce soil erosion;
- use of precision agriculture — introducing a range of technology solutions to physical cropping and harvesting activities, as well as targeted fertiliser applications to maximise crop planting area, reduce soil compaction and maximise yields based on variable fertilisation across crops; and
- stubble management — retaining previous crop stubble in the fields to improve soil moisture retention between crops, improve soil structure and reduce soil erosion.

In many cases, conservation practices are viewed as BMP techniques that have been progressively adopted across the cropping sector in response to increasing weather variability and climate change.

In 2012, the Grains Research and Development Corporation published its second Farm Practices Survey Report that considered, amongst other things, the degree of use of conservation practices in the cropping sector. Selected results from the survey are presented in table B.7.

B.7 Use of conservation practices in NSW cropping sector

	Zero- and no-tillage		Precision agriculture – Auto steer		Stubble management – Stubble retained through to planting	
	2008	2011	2008	2011	2008	2011
	% of cropped area					
NSW Central	56.8	42.4	46.9	67.5	89.6	76.2
NSW NE/ Qld SE	66.3	59.0	53.5	57.1	96.6	90.4
NSW NW/ QLD SW	69.0	70.6	53.3	75.9	93.5	91.0
NSW/ Vic Slopes	68.2	58.7	48.3	69.4	90.7	69.8

Source: GRDC (2012) Farm Practices Survey Report.

The GRDC Farm Practices Survey presented a number of findings in relation to conservation practices in the NSW cropping sector including:

- a high and steady proportion of cropped area being managed with zero or no-till practices over the period 2008-11
- strong use, and rapid uptake of auto steer technology, particularly by larger farming operations
- a high but slightly declining rate of use of stubble retention practices.

A recent GRDC cropping sector survey — the Grower Survey, 2015 —provided some insights into the reasons why practices have changed over the past five years. In total, 70 per cent of respondents to the survey reported having changed their farming practices in the past five years, their reasons for changing practices were reported as follows:

- research and development findings in the industry, 70 per cent
- risk aversion, 70 per cent
- seasonal or weather conditions, 68 per cent
- GRDC information, supported training event, workshop, project or other specific activity, 55 per cent[34]

These conclusions were supported by discussions with farm consultants.

- **There is a high level of awareness among farmers of best practice, especially specialist grain producers.**

Increasing scale, access to technology and adoption of BMP

The overview of the broadacre sector has identified that since the early 1990s, consolidation of farms and increased farm size has been key feature. This trend is expected to continue, albeit at a slower rate than the previous 20 years.

A number of studies in the sector have examined the link between larger farms, adoption of best practice and innovation, and TFP. There have been a number of studies that have looked at particular aspects, or refined, the standard TFP approach.

34 GRDC 2015, *GRDC Organisation Performance Research – 2015 Grower Survey Report*, July, p48

Sheng et al (2011) confirmed that there had been an overall slowdown in Australian broadacre productivity based on TFP analysis. Their analysis demonstrated that there was a structural break, or turning point, around 1993-4 over a time series that spanned 1952-53 to 2006-07.

- While this study was across all broadacre farms, at a national level, it would be difficult to mount an argument why NSW farmers would be significantly different to national averages.

The paper goes on to postulate the causes of break: changing climate especially when the use of inputs was too high because of decisions made the expectations of average seasons

- The analysis suggested that of there had not been a run of poor seasons since the mid-1990s, that productivity would have kept growing at its trend rate until 2002 and that after accounting for climate, there remained a significant change in structure around 2002.
- This supports the working hypothesis that this shift was due to the 2002-03 drought.

Sheng et at (2011a) focused on the *mechanisms* of structural adjustment to test the observation that larger farms are typically more resilient, productive and profitable. The conventional explanation has been increasing returns to scale: that overhead costs on a per hectare based declined with larger farm size.

- This analysis showed that although larger farms performed better, this was due to differences in production technology rather than returns to scale and was consistent across cropping and livestock. In fact, there may be *decreasing* returns to scale where overhead costs increase with farm size.
- The implication is that larger farms are able to access technology or management resources more easily than smaller businesses via credit availability or specialisation of the manager.

This finding was the same as that by Islam et al (2011) who extended traditional TFP analysis for broadacre farm productivity and profitability in south Western Australia using panel data from 67 farms across three rainfall regions (low, medium and high) between 1998 and 2008.

The study decomposed profitability in both terms of trade and TFP components, which was further decomposed onto technical change and technical efficiency change, where:

- technical change is moving the production frontier
- technical efficiency is moving towards the frontier for the same (best practice) technology through improved input-output mixes and increased returns to farm size.

The key findings included:

- sources of profitability were dominated by TFP, with the terms of trade impact on profitability being moderated by compensating changes in TFP
- technical change was the main source of TFP growth (between 68 and 100 per cent depending on the rainfall group and the year), improved technical efficiency made a small contribution.

- **These studies confirmed the link between economies of scale and productivity through farmers' ability to adoption best practices and innovation.**

Conclusions for approach to risk mitigation

These trends have a number of confounding influences on the derived demand for commercial risk management products, either:

- possible substitution away from commercial risk management products towards investments in self-insurance activities
- encouraging uptake of commercial risk management products through increased economies of scale.

Increased economies of scale and specialisation allow for more resources to be invested in management, analysis, planning and education activities has:

- allowed operators to identify and tailor on-farm risk management strategies more cost effectively especially through the increased use of specialist consultants
- resulted in greater awareness of commercial risk-management tools
- driven more intensive cropping on marginal land that is associated with higher levels of risk.

C Estimates of crop insurance premiums

Current estimates of traditional crop insurance

Table C.1 lists estimates of traditional cost insurance based on DPI information and industry estimates. It is important to note that these are the typical premiums without an excess, which businesses may choose to reduce this cost by the use of an excess.

Of these crops, oilseeds (canola) is the highest cost crop both in terms of premiums as a percentage of total value and dollars per hectare as a result of its:

- the relatively high risk associated with the crop from weather events
- the high value of the crop.

This contrasts with barley which is typically a lower-risk, lower value crop.

C.1 Estimated cost of traditional crop insurance 2015-16[a]

NSW Region		Wheat	Barley	Oilseeds	Pulses	Total
In total crop value						
Northern	%	1.4	1.2	3.7	3.6	1.8
Central West	%	1.6	1.6	2.7	1.9	1.8
Riverina	%	2.2	2.2	3.7	2.7	2.6
Per hectare						
Northern	$/ha	13	4	22	25	14
Central West	$/ha	17	9	26	17	17
Riverina	$/ha	16	10	40	18	22

[a] Oilseeds based on canola and pulses by chickpeas to enable comparison across regions.

Source: NSW DPI gross margins and Industry information.

MPCI premiums from previous Australian studies

ABARES (2012) conducted a comprehensive analysis of MPCI premiums for Australian regions that provides important context for this report. In addition, Multi-peril Crop Insurance Taskforce in Western Australia also produced a comprehensive report on the viability of MPCI in the Australian context.

Australia's variable yield and weather conditions

The analysis by Hatt et al (2012) found that agriculture faces a high degree of production risk compared to other sectors in the economy, up to twice as variable as the next most variable sector of finance and insurance services.

The more challenging comparison is that of Australia's agricultural volatility internationally. NRAC noted studies that reported production risk in Australian wheat, barley and oilseeds to be notably higher (both nationally and at the farm level) than across other countries. This additional degree of volatility in production values, coupled with projected increases in climate variability and insufficient data at regional levels was considered to pose prohibitive hurdles for companies looking to offer MPCI in Australia in the longer term. This finding was supported by further analysis that noted the high degree of government subsidies already required to maintain MPCI in these countries with less volatile climatic conditions.

Estimated MPCI premiums in Australia

MPCI is an expensive insurance product with relatively high administration costs. The OECD estimated that administrative costs of individual yield insurance above the risk component of the premium is estimated to be approximately 30 per cent.[35] This covers the administrative costs associated with managing both adverse selection and moral hazard issues in the market. The United States government provides support to private insurance companies to offset administrative and operating costs that would otherwise be included in insurance premiums.[36] Subsidies in the United States have been observed to be as high as 67 per cent, indicating that the 30 per cent estimate provided by the OECD may be an underestimate of additional administration costs in some cases.

Tables C.2 to C.4 present the estimates of actuarially fair premiums for a compulsory MPCI scheme in NSW by Hatt et al (2012)— reported as per cent of agreed crop value insured. This analysis was based on the Australian Agricultural and Grazing Industries Survey for 31 Australian broadacre regions for the period 1989 to 2011.In essence, the calculation of 'pure risk' premiums are those required for insurance providers to break even. Alternatively, it can also be thought of as the amount that farmers would have to put aside each year to self-insure.

- Note that the assumption of a compulsory scheme was made due to the difficulties of assessing adverse selection issues associated with a non-compulsory scheme.
- A non-compulsory scheme would necessarily have higher actuarially fair premiums due to the exit of low risk farms from the insurance pool.

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35 Anton, J. et al (2012) A comparative study of risk management in agriculture under climate change. OECD Food, Agriculture and Fisheries Papers No. 58

36 DAE (2015) Scoping study on Multi-peril Insurance and its application to Agricultural industries in NSW. Prepared for the Department of Primary Industries, p22

C.2 Estimated premiums for a compulsory insurance scheme, 30 per cent loss ratio[a]

	Wheat			Canola			Lupins		
NSW region/coverage	25%	40%	60%	25%	40%	60%	25%	40%	60%
	%	%	%	%	%	%	%	%	%
Far West	8.3	19.0	37.0	na	na	na	na	na	na
North West Slopes and Plains	6.0	13.7	26.0	na	na	na	na	na	na
Central West	7.3	15.3	32.0	10.3	19.7	38.0	17.3	32.0	55.7
Riverina	7.7	14.3	28.3	13.3	20.7	38.0	10.3	21.3	47.0
Tablelands	4.0	13.0	24.0	na	na	na	na	na	na

[a] By region and coverage level, no excess. Loss ratios, defined as total insurance payouts as a share of total premiums

Source: Hatt, M., Heyhoe, E. and Whittle, L. (2012) Options for insuring Australian agriculture, ABARES report to client prepared for the Department of Agriculture, Fisheries and Forestry, Canberra, September.

C.3 Estimated premiums for a compulsory insurance scheme, 60 per cent loss ratio, 30 per cent excess[a]

	Wheat			Canola			Lupins		
NSW region/coverage	25%	40%	60%	25%	40%	60%	25%	40%	60%
	%	%	%	%	%	%	%	%	%
Far West	2.9	6.7	13.0	na	na	na	na	na	na
North West Slopes and Plains	2.1	4.8	9.1	na	na	na	na	na	na
Central West	2.6	5.4	11.2	3.6	6.9	13.3	6.1	11.2	19.5
Riverina	2.7	5.0	9.9	4.7	7.2	13.3	3.6	7.5	16.5
Tablelands	1.4	4.6	8.4	na	na	na	na	na	na

[a] By region and coverage level, 30% excess. Loss ratios, defined as total insurance payouts as a share of total premiums

Source: Hatt, M., Heyhoe, E. and Whittle, L. (2012) Options for insuring Australian agriculture, ABARES report to client prepared for the Department of Agriculture, Fisheries and Forestry, Canberra, September

C.4 Estimated premiums for a compulsory insurance scheme, 100 per cent loss ratio, 50 per cent excess[a]

	Wheat			Canola			Lupins		
NSW region/coverage	25%	40%	60%	25%	40%	60%	25%	40%	60%
	%	%	%	%	%	%	%	%	%
North West Slopes and Plains	0.9	2.1	3.9	na	na	na	na	na	na
Central West	1.1	2.3	4.8	1.6	3.0	5.7	2.6	4.8	8.4
Riverina	1.2	2.2	4.3	2.0	3.1	5.7	1.6	3.2	7.1
Tablelands	0.6	2.0	3.6	na	na	na	na	na	na

[a] By region and coverage level, 50% excess. Loss ratios, defined as total insurance payouts as a share of total premiums

Source: Hatt, M., Heyhoe, E. and Whittle, L. (2012) Options for insuring Australian agriculture, ABARES report to client prepared for the Department of Agriculture, Fisheries and Forestry, Canberra, September.

- The Multi-peril Crop Insurance Taskforce in Western Australia estimated in 2003, that adverse selection problems could add between 2 to 6 per cent to annual premium costs.[37]

37 MPCI Taskforce (2003) Final Report to the Minister for Agriculture, Forestry and Fisheries, January.

- Therefore the ABARES estimates can be considered to the *minimum* premium levels required by insurers to cover losses over the period 1989 to 2011.

This analysis demonstrates a number of key points the estimated premiums decrease in line with:

- the level of coverage
- the assumed loss ratio of insurers (an indicator of gross margins), that is, the lower the loss ratio the more profitable will be writing the policy
- the impact of the excess level in reducing premium costs.

To compare these estimates with the proposed analysis in table C.5, these premiums must be put on the same per hectare basis as shown in table C.5 using wheat as an example. Compared to these estimates, the proposed costs per hectare used in this analysis, look low.

- For example, the $22 per hectare cost for MPCI premium for 40 per cent coverage is lower than for the 'fair premiums' calculated by ABARE under the 60 per cent loss ratio and 30 per cent excess scenario.

C.5 Estimated premiums for wheat compulsory insurance scheme

	Coverage level		
NSW region/coverage	25%	40%	60%
	$/ha	$/ha	$/ha
Compulsory insurance scheme, 30 per cent loss ratio, no excess[a]			
Far West	48	109	213
North West Slopes and Plains	35	79	150
Central West	42	88	184
Riverina	44	82	163
Tablelands	23	75	138
Estimated premiums for a compulsory insurance scheme, 60 per cent loss ratio, 30 per cent excess[a]			
Far West	17	39	75
North West Slopes and Plains	12	28	52
Central West	15	31	64
Riverina	16	29	57
Tablelands	8	26	48
Estimated premiums for a compulsory insurance scheme, 100 per cent loss ratio, 50 per cent excess[a]			
Far West	na	na	na
North West Slopes and Plains	5	12	22
Central West	6	13	28
Riverina	7	13	25
Tablelands	3	12	21

[a] By region and coverage level, 50% excess. Loss ratios, defined as total insurance payouts as a share of total premiums

Source: ABARES (2012) and CIE calculations.

D Elasticity of demand for agricultural insurance

A 2014 study in the United States considered the impact that subsidies had on the value of premium purchases over the period 1997 to 2002. This period of time was chosen because of the range of policy changes and subsidy changes that were applied in the market, allowing for a reasonable data set to be developed.[38]

Overall, the study found that demand for MPCI was slightly inelastic in relation to subsidies, that is, a slightly less than proportional impact on total premiums was observed from a change in subsidies. It was further concluded that subsidies did not appear to attract a greater area of coverage (more production or land) , rather a deeper level of coverage (a higher proportion of value covered from already insured farms).

Across all study regions, a 1 per cent increase in MPCI subsidies resulted in the following increases in total premium purchases for crop insurance:

- 0.86 per cent for corn
- 0.74 per cent for soybeans
- 0.64 per cent for wheat

The area of crops covered by insurance did not have a statistically significant change, with average estimates of approximately 0.2 per cent.

However, the finding regarding insured area is not universal, with Goodwin (1993) finding a statistically significant inverse relationship between the proportion of planted area insured and premiums per area insured. The findings indicated that a 1 per cent increase in the premium per area resulted in a 0.32 per cent reduction in the proportion of area insured. This would imply a positive relationship (although not of the same scale) for an increase in premium subsidies – a reduction in price faced by farmers — and the proportion of farming land insured.[39]

A range of hypotheses on the elasticity of demand for MPCI were investigated and reported on in Goodwin (1993), as follows.

- There were empirical findings to support the theory that more adversely-selected participants have a lower price elasticity of demand for insurance.[40] That is, unobservable high risk farmers will remain in the market longer than unobservable low risk farmers.

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38 O'Donoghue, E. (2014) The effects of premium subsidies on demand for crop insurance. Economic Research Service, United States Department of Agriculture.

39 Goodwin, B. (1993) An empirical analysis of the demand for multiple peril crop insurance. American Journal of Agricultural Economics, 75(2), p431

40 Goodwin, B. (1993) An empirical analysis of the demand for multiple peril crop insurance. American Journal of Agricultural Economics, 75(2), p431

  - The implication of this finding is that insurance companies will be facing a relatively highly price responsive market when focussing on sound risk farms to insure (through upfront audit processes)
- The elasticity of planted acres was found to be lower than the elasticity of liability per planted acre, indicating that once insured, farmers are more likely to adjust their level of coverage in response to a change in premium than adjust the area of land covered by insurance
  - This finding aligns to a certain extent with the findings of O'Donoghue (2014) who found insured areas had an inelastic response to changes in premium subsidies
- Low yields in previous years were found to have a positive and significant effect on insurance purchases, which reduces over time. This indicates that events in recent history have a greater influence on a farmer's decision to insure, than longer term events
- Corporate farmers were also more likely to be covered by insurance, as were larger farm operations

These findings were supported by Shaik et al (2005) who also found:

- farmers with higher average yields were less likely to purchase insurance — with an estimated elasticity of -0.48
- there is a strong and negative correlation between prices and the decision to participate in insurance — with an estimated elasticity of -0.4.

They did find that risk aversion of farmers was not a statistically significant determinant of insurance uptake, leading the author to posit whether crop insurance is so heavily subsidised in the United States that the influence of risk preferences are overshadowed by the subsidy price effects.[41]

41 Shaik S, Colble L and Knight T 2005, *Revenue crop insurance demand*. Presented at AAEA Annual Meetings, Providence, Rhode Island, July 24-27.

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