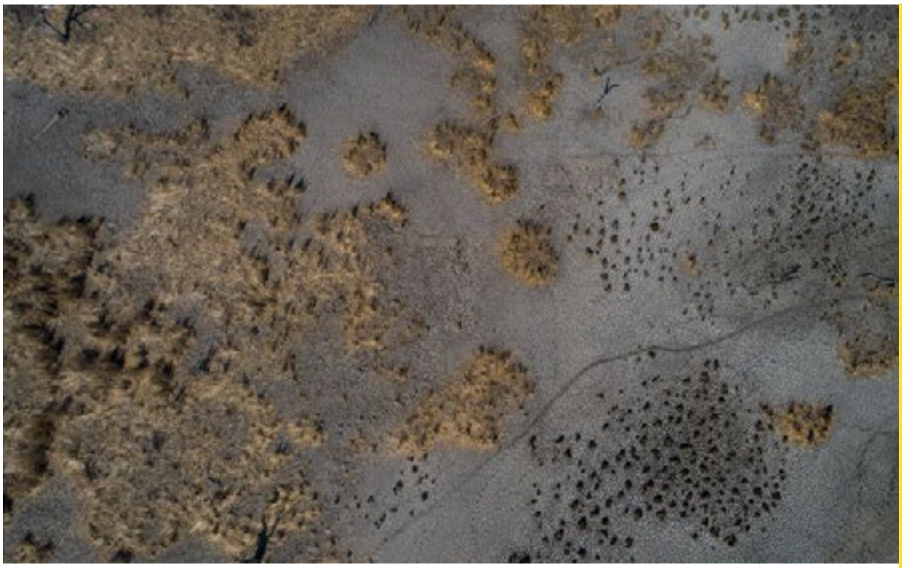

Innovative Risk Transfer Pty Limited

Climate Risk Financing

An Alternative Approach to Drought Risk Transfer

for

Productivity Commission

Enquiries regarding this document should be directed to:

David Blackett

www.risktransfer.com.au

Executive Summary

The purpose of this submission is to introduce an alternative approach to providing financial resilience for family Farmers to drought and other climate risks. The crux of the proposal is to take the existing Farm Management Deposit scheme and make it more fit for this purpose. This would be achieved by:

- Expanding the scheme to allow all majority family-owned farming enterprises to make **climate risk provisions** from pre-tax profits;
- Allowing these climate risk provisions to be **invested in a range of approved investments** rather than a low yielding bank account;
- Limiting the amount of the provision to the **audited fixed costs** of the individual farming enterprise;
- Allowing provisioning for fixed cost for the **duration of expected droughts** for the specific region farmed;
- Encouraging private sector insurers to provide **climate risk insurance** for fixed costs that exceed the provisioning of the farming enterprise; and
- Establishing a **government reinsurance pool** for droughts of a catastrophic duration that will exceed the efficient use of private sector insurer risk capital.

This evolutionary approach seeks to:

- Limit the budgetary effects to the foregone tax from profitable farming enterprises;
- Make majority family-owned farming enterprises self-sufficient by funding their own economic resilience;
- Draw in private sector risk capital to cover a family farming enterprises fixed costs that exceed these provisions to the extent that this is an efficient use of private sector risk capital; and
- Limit government support to catastrophic climate events through a reinsurance pool that insurers draw on.

In this submission, insurance underwriting expertise has been used to detail how private sector insurer risk capital can be utilized to provide climate risk insurance with minimal government assistance. The focus is on drought as it will have the greatest duration and therefore financial impact, all weather perils would be covered.

The experience in other countries has shown that premium subsidies are bad policy and should not be adopted in Australia.

The adoption of the suggested climate risk provisioning and insurance would represent the most efficient use of farmer, insurer and taxpayer resources to achieve financial resilience for an innovative and profitable agricultural sector.

David Blackett
March 3rd, 2023

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Introduction

Over ten thousand years ago, our ancestors stopped being nomads and became settled farmers. This one decision made possible a food surplus that allowed some in the community to specialize in activities other than food production. This shift underpins everything we now take for granted in our modern world.

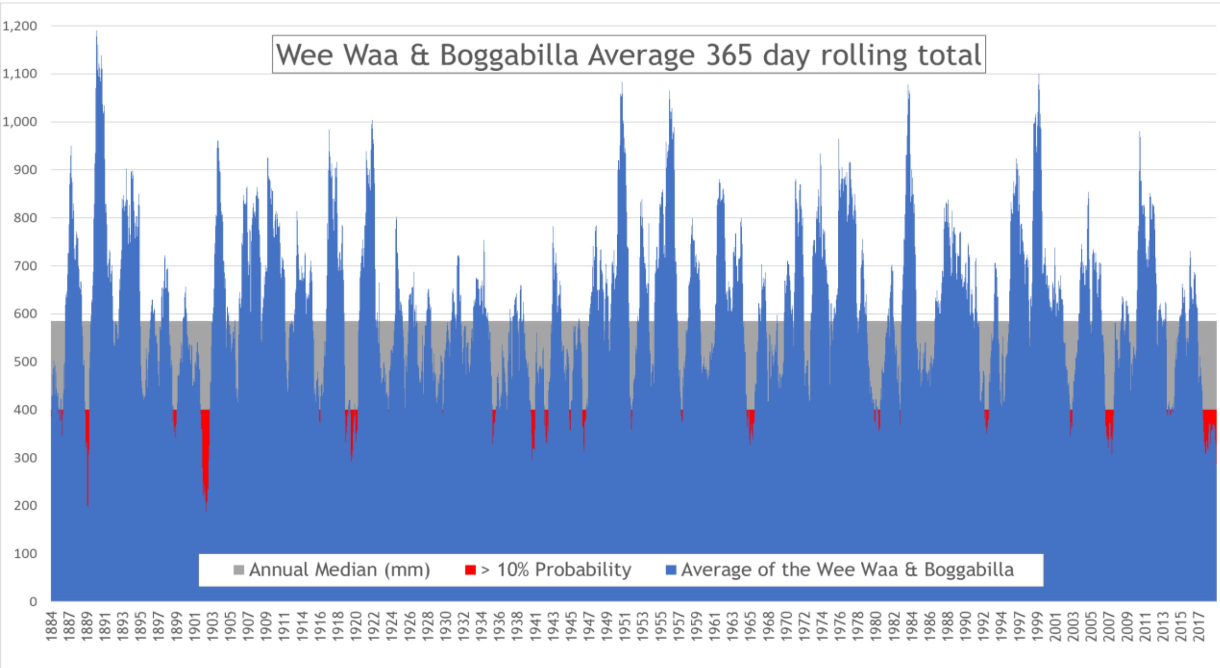
Today, the only real difference is that our farmers have become vastly more efficient. Now over 80% of the world's population specialize in something other than food production—in Australia its over 97%[1]. In Australia this dependence on less than 3% of the population has not been considered a risk. But if our farmers were forced out of business, then this dependence could expose our modern way of life to extreme risk—MI5's maxim is that society is "four meals away from anarchy".

If there was an adverse increase in rainfall variability, this dependency would represent a real and present danger to the food security of the 97%. The extent of the current drought gives cause for concern that something is happening with the climate. With food security potentially becoming a real issue for the 97%, it might be a good time to consider renegotiating the social contract with the 3%. Trading some taxpayer funds to strengthen food security in return for a way to provide farmers with financial resilience sounds like a bargain worth making.

But isn't this alarmist talk, isn't drought an ever-present risk that our farmers have adapted too?

How bad is this drought?

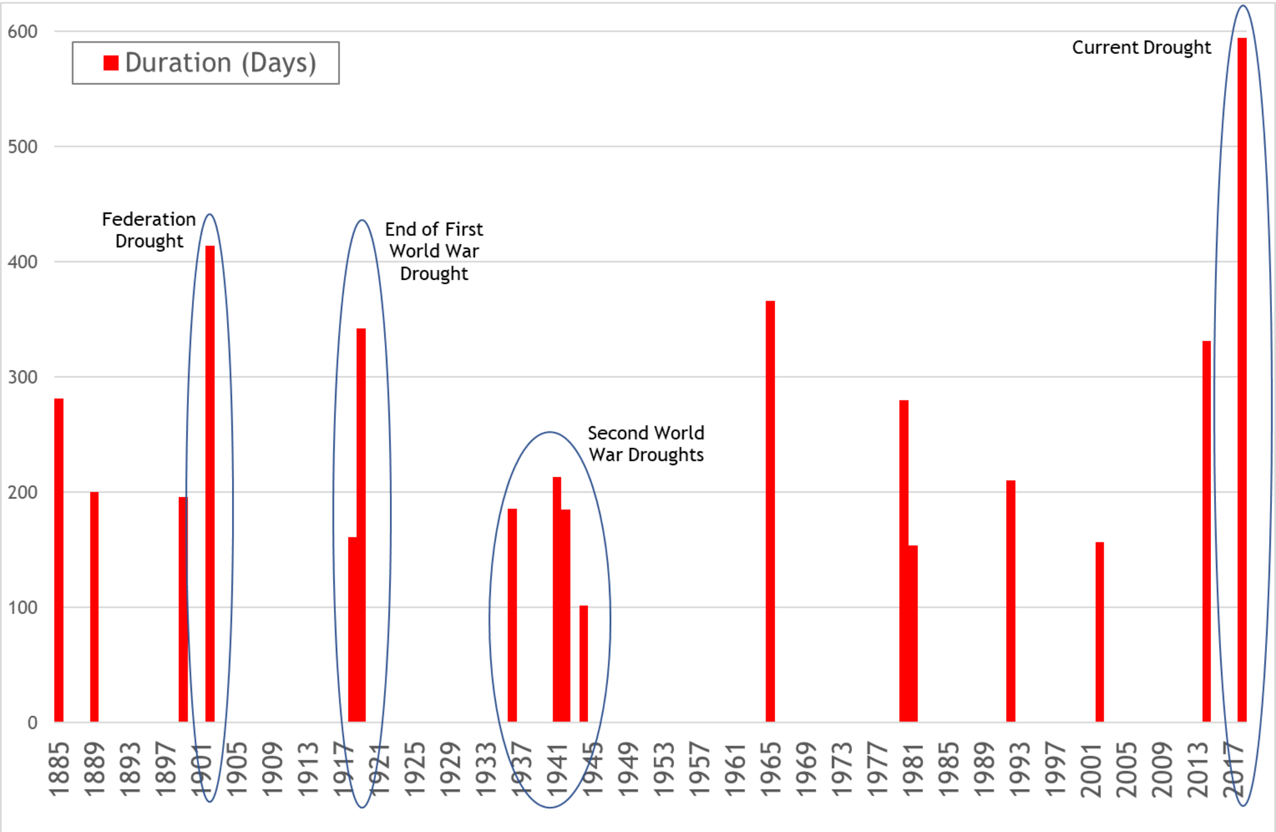
An objective evaluation of the resent drought is the first step in determining if a better social contract needs to be negotiated. A historical contextual analysis can be done by using the historical rainfall data from Bureau of Meteorology. Using the Northwestern New South Wales region as an example, the historical rainfall data averaged across Wee Waa and Boggabilla has been used to compare the recent drought with previous droughts—see graph below.



[1] World Bank – World Development Indicators 14th October 2016. For the world farming employment accounted for 19.8% in 2010 and for Australia 2.6% in 2013

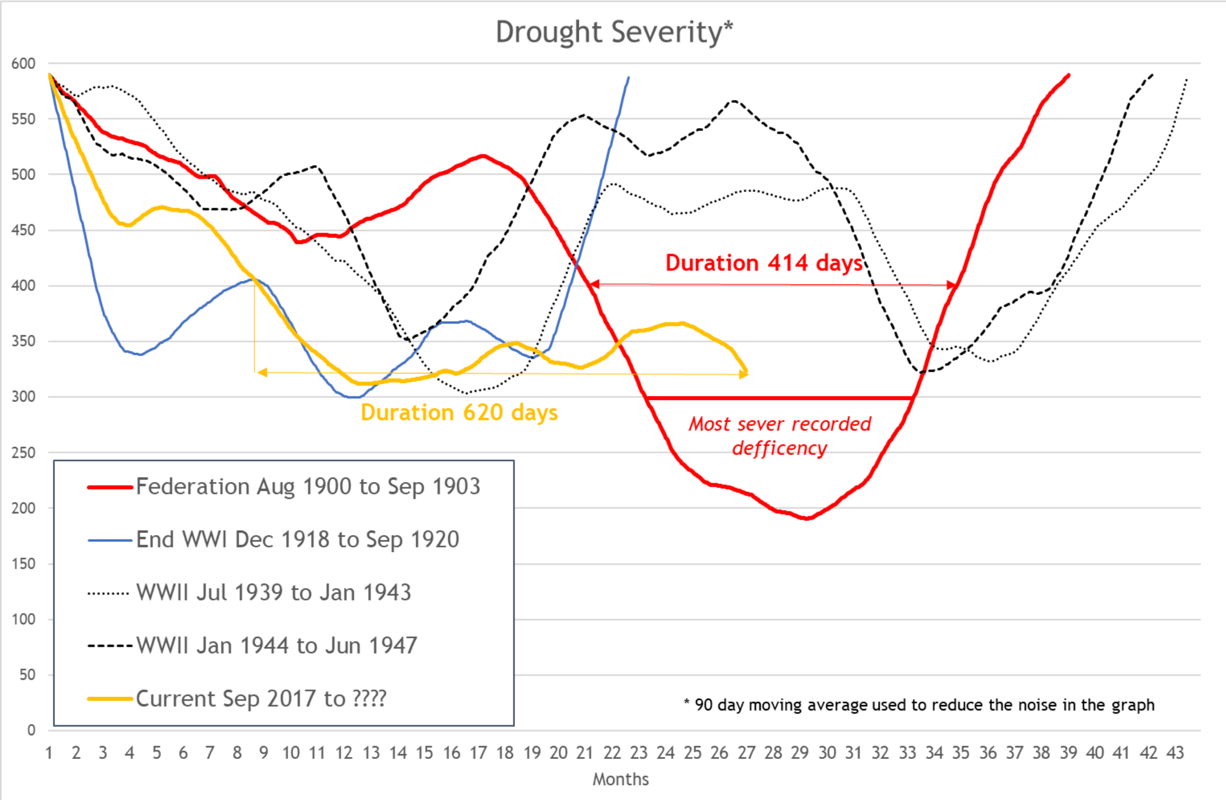
The red areas on the graph represent rainfall deficiency, defined for this region as rainfall less than 400 mm during the preceding 365 day, averaged across the two sites. The 400 mm level is estimated to represent an annual rainfall probability of less than 10%. Severity can be measured in terms of the duration of this level of deficiency.

During the one hundred and thirty-five years of recordings from 1884 to 2019, there were seventeen periods of more than ninety days where total rainfall for the preceding 365 days was below the 400 mm level as shown in the graph below—on average a drought every eight years. On this simple measure, at 620 days as at the beginning of December 2019, the resent drought has exceeded the Federation drought of 414 days. So, it does look like the resent drought is the most severe recorded drought as it has lasted about a third longer in this region—see graph below.



This measure of drought is likely to be too simplistic as the Federation drought was preceded by a period of dryer than normal conditions as was the resent drought (refer graph on page 3). These dry conditions would have had a detrimental effect on soil moisture and the ability to grow crops. In addition, both the end of the First World War and the succession of droughts through the Second World War period are worthy of further consideration.

Using the starting point as the last day the annual rainfall was above the median annual rainfall of 585 mm, the durations for these five periods are shown in the graph on the next page. Unsurprisingly, this shows that no two droughts are the same. The Second World War droughts do represent an unusual period of sustained below median rainfall with double dip severe droughts. However, cropping opportunities occurred with a rainfall period above 400 mm at the eighteen to twenty-four-month mark. After considering overall rainfall deficiency and duration in this way, the two longest droughts are the Federation drought and the resent drought. The resent drought has remained below the 400 mm threshold for over a third longer than the Federation drought.



So, the answer to the question is, that, yes this is a very bad drought, the resent drought is the longest recorded period of rainfall deficiency in this region. The Federation drought didn't last as long but was the most sever rainfall deficiency in this region

A fresh approach

For the period May 1902 through to April 1903, rainfall in the Federation drought dropped below 300 mm, lower than it has during the current drought. Without modern transport, refrigeration, air-conditioning or communications, it's hard to imagine what life would have been like during this severity of drought.

But one thing hasn't changed. Farmers are still frustrated by the fact that they are not able to access risk financing tools that provide financial resilience for their families through droughts. Although transport, electricity, communications and the financial services sectors would be unrecognizable to farmers from a hundred and twenty-years ago, the frustration faced by today's farmers from the inability to assess risk financing tools would be immediately recognizable.

For Australian farmers, successive governments at the state and federal levels have resisted calls for a formal risk financing solution that would provide financial resilience, preferring ad hoc farm relief in times of drought. This position has been driven by the legitimate desire to avoid any open-ended funding commitments and a need to be seen not to be providing farm subsidies while calling for the removal of subsidies from other countries during trade negotiation.

Prior to this unprecedented duration of drought in the major cropping region of Northwestern New South Wales, this was a tenable position. With an apparent increase in rainfall variability and in the face of this unprecedented drought, this approach should now be challenged.

This is not to suggest that the government and taxpayers should be drawn into open-ended commitments to farmers. As this submission will argue, there are alternative risk financing solutions for the government to consider that would allow farmers to become financially resilient and which do not amount to open-ended commitments to subsidies. This alternative approach would retain the current government objectives while providing financial resilience for farmers.

This submission will also suggest that Australian agriculture is at a crossroad. One option is to go down the premium subsidy road that much of the world has taken, while the other is to go down a different road of our own making that will create financially resilient family farming enterprises. This submission will set out the reasons against going down the premium subsidy road and what going down the financial resilience road would look like.

The premium subsidy road

Farmers in many countries have access to risk financing tools such as Multi-peril Crop Insurance (**MPCI**). This is because their governments have been prepared to provide premium subsidies for insurers to offer a heavily subsidized insurance product. These MPCI products have evolved in countries with strong farmer representation, farmers who are only cropping and that experience lower levels of rainfall variability. Recent attempts to introduce MPCI in Australia without premium subsidies have failed. The higher pressure applied on other countries' governments for premium subsidies, by farming enterprises that are solely dependent on cropping, and the lower variability in rainfall have allowed these products to survive where they have not in Australia.

The cost to an Australian Government to subsidies MPCI, in the driest arable continent on earth, would be proportionally greater than in the countries where it was developed. The greater variability in rainfall results will mean greater levels of variability in insurance results, and thus drive the need for higher levels of government premium subsidies. Australian governments have been prudent to avoid premium subsidies and would be wise to continue to do so. Due to the greater variability in rainfall, Australia needs to develop a set of unique risk financing solutions.

Arguments against the premium subsidy road

Partly because Australian governments have resisted the calls for premium subsidies for MPCI, Australian farmers have had to become the most efficient and adaptable farmers on earth. The incentive to continue to adapt to increased rainfall variability and any adverse change in rainfall patterns for our farmers should be maintained. This imperative to adapt has driven the innovation in agronomic practices and will be needed to drive adaptation to any future adverse change in rainfall patterns. This imperative to adapt creates a competitive environment that provides the conditions that allow more efficient farmers to grow.

Premium subsidies weaken adaptation by artificially supporting poor agronomic practices and distorting property values. A guarantee of an insured yield and price under MPCI policies encourages farmers in marginal areas or seasons to plant crops that they would otherwise not be planted. The incentive to alter planting intentions is driven by the reality that the farmer receives income whether the crop fails or not. This minimal risk environment does not encourage innovation as the consequences of crop failure are limited.

In addition, subsidizing MPCI effectively provides farmers with two sources of income—a crop income and a MPCI income. This is due the fact that governments are topping up the premium that farmers pay through a subsidy. In some cases, government premium subsidies are multiples of the premium farmers pay. In these situations, farmers are getting back far more in claims than they pay in premium. This additional income source increases the returns from owning farmland. This inflates the value of farmland, making farm consolidation and economies of scale more difficult to achieve for efficient farmers thus reducing the efficiency of the farming sector overall.

Australian taxpayers should not be asked to support premium subsidies that reduce farming efficiency. An Australian plan for financial resilience must maintain the financial imperative to adapt while providing support to viable farming enterprises.

The need for an financial resilience road

The regional analysis of the historical rainfall in the Northwestern New South Wales region puts the variability of rainfall into context but how should this variability be viewed? **It is the blue peaks not the red troughs that are the key to resilience!**

It can be argued that early European settlers looked at the rainfall variability the wrong way. It's not so much the ability to survive drought that should be the focus but rather the ability of the farming enterprise to capitalize on rainfall events that holds the key to financial resilience.

Our flora speaks to this. The flora of this country is very different from that of other countries because our flora has had to evolve drought tolerance not because it is a periodic event but rather it is the natural state of varying durations that are ended by rainfall events. This is not Europe or North America where flora has evolved with more reliable annual rainfall. Australian flora survives because it can make it to the next rainfall event and farmers financial resilience will be achieved by assisting farming enterprises to do the same.

Yet the expectation of regular annual rainfall was the mindset that early European settlers brought with them to this country and that they have successfully unlearnt. The problem that Australian farmers now face is, that city based financial professionals, once removed from the physical Australian environment, still provide financial approaches and solutions developed in Europe.

It's time for the Australian financial sector to also unlearn the experience from Europe.

Financial resilience tools need to be fit for purpose

Annual financial products like insurance and annual profit determinations make sense in European countries with reliable annual rainfall but not in large parts of this country. The main determinant of profitability for Australian farmers is surely the farmers ability to capitalize on drought breaking rainfall events that are not annual. Any risk financing tool that is meant to provide Australian farmers with financial resilience, that is fit for purpose, must straddle these rainfall events and these will be several years apart for many farming enterprises. Any sensible measure of a farmer's financial viability can only be made by amortizing the profit in rainfall years over the subsequent loss-making drought years.

Part of any financial resilience plan should include an ability for farmers to provision for future drought. This should involve the introduction of drought or climate risk provisioning. This is not a radical approach as a limited form of provisioning already exists in the form of Farm Management Deposits. In addition, insurers benefit from establishing provisions from current premiums for claims that will be paid in future and banks establish provisions for future loan defaults, why can't farmers establish provisions for future droughts? Why aren't farmers able to set up provisions for fixed operating costs that will be paid to maintain the farm between rainfall events and thus provide them with financial resilience?

Like insurers and banks, farmers could be required to maintain funds in approved assets classes. These climate risk provisions should replace the Farm Management Deposits and be more flexible and farmer-controlled rather than bank-controlled. They could be managed under similar rules as those applying to self-managed superannuation funds.

These climate risk provisions should be able to be invested in approved asset classes to increase the investment returns, thus increasing the funds available to cover drought losses and provide financial resilience. Adopting this approach would make climate risk provisioning attractive for farmers as they would control their financial planning and resilience to survive their unique level of drought exposure.

Over time this approach is tax neutral. Initially there will be a loss of taxation revenue for the government, but this is only a timing issue as farmers eventually claim tax deductions for losses carried forward from loss making drought years. What is being proposed, is that farmers draw this deduction forward after the drought breaks and provide for the next drought. It is a timing effect for the individual farming enterprise.

The budgetary effect will not occur in one financial period. A separate timing effect exists, as not all farmers will be provisioning at the same time. Not all regions were recently in drought so those farmers not in drought could start provisioning now, while farmers in other regions in drought or suffering from flooding would not be able to provision this financial year.

This provisioning would also be less distortionary than the current taxation rules. In profitable years, farmers look to minimize their tax liability and often overcapitalize in farm machinery to reduce their tax. If there was another avenue to reduce their tax liability through climate risk provisioning, more rational capital equipment choices would be made.

It is also envisaged that such a farmer climate risk provision would become a primary risk financing mechanism with a secondary multi-year climate risk insurance product that would be provided after this is exhausted, providing additional financial resilience to the climate risk provisions the farmer has set aside. Farmers would control their own risk financing by prudently provisioning for the individual enterprises fixed costs of operating for an expected drought duration, with the ability to choose to purchase insurance to cover unexpectedly long drought events.

If this secondary insurance protection was exhausted, then a tertiary Government reinsurance pool should be available to be called on to cover catastrophically long droughts. Under this proposal, the Government would be providing a risk capital subsidy only in years of prolonged drought rather than premium subsidy every year. A capital subsidy would only be called upon in catastrophically long droughts and only after the private sector insurance markets risk capital had been utilized. This layering of the risk would be the most efficient use of capital for farmers, insurers, reinsurers, and taxpayers.

The climate risk insurance product would be a consequential loss-based product that covers the fixed costs of maintaining the farming enterprise for up to five years. It should cover all the farming enterprises activities. Australian dryland farmers have already diversified their risk through cropping and grazing, with many diversifying further into off farm income activities. To reduce the variability, insurers should view the enterprise risk rather than just the cropping risk.

This highlights one of the reasons MPCI is not fit for purpose. As it singles out crop losses for coverage. This increases the risk for insurers as they do not have the advantage of the risk diversification that grazing offers—a failed cereal crop still has value as it can be grazed or cut for hay. Another reason MPCI is not fit for purpose is that it fails to remove the need for government drought assistance—in NSW, over 80% of government drought assistance went to livestock farmers[2].

As the driest arable continent on earth, Australia is different. Applying the European farming approaches has been shown not to be the best approach for Australian conditions. Expecting risk financing solutions for farmers that have been developed in other countries to work in Australia is an exercise in trusting hope over experience.

Rather than going down the premium subsidy road with its agronomic and market distorting twists and solutions not fit for purpose turns, this submission will argue for taking a more direct road to Australian farming financial resilience.

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[2] IPART Review of multi-peril crop insurance incentive measures – page 5.

The Road to Financial Resilience

Australian agriculture is at the financial resilience crossroads. Do we follow down the road that much of the world has taken with insurance premium subsidies in the hope that it will also work in the driest continent on earth with farmers that have diversified their farming activities or is there a better road we can follow? This submission sets out the case for taking a different road to financial resilience for family farming.

Other countries' solutions to climate variability have involved governments subsidizing premiums for MPCI. This effectively provides farmers with an additional source of income that adversely influences their agronomic practices and inflates property values that retards efficient farmers growth. This impedes adaptation which will be essential if the current generation of farmers are to adapt to any increase in rainfall variability.

The best way to reward innovative and profitable farm enterprises that adapt to climate variability would be to allow them the ability to provide for their own financial resilience through climate risk provisioning. Developing primary financing of climate variability from retained earnings before tax, would allow for the development of a secondary climate risk insurance product designed to be triggered after these primary climate risk provisions have been exhausted. Insurers and reinsurers would require less capital to protect farming enterprises if they are covering the risk of these provisions being exhausted by an unexpectedly long drought rather than from the first dollar of loss from a minor drought or other minor adverse weather event.

This would reduce the cost to farmers as it is the most efficient use of private sector risk capital. The most efficient way for the government to assist farmers would be to prove a catastrophic tertiary climate risk reinsurance pool that responded when the farmers provisioning and private insurance sectors cost efficient risk capital has been exhausted.

This approach aims to allow:

- viable farming enterprises to develop their own financial resilience plan based on their individual risk tolerance and risk exposure;
- insurers to enter the market on an "excess of loss" basis rather than a "ground up" basis reducing underwriting risks such as moral hazard, morale risk and adverse selection;
- insurers to efficiently utilize their risk capital to insure low frequency high severity climate events that exhaust the individual enterprises climate risk provisions; and
- the government to participate at the catastrophic level when the use of private risk capital becomes inefficient.

This approach differs from the premium subsidy approach by positioning the governments involvement at the point that the private capital prices itself out of the market.

Individual climate risk provisioning

Each individual farming enterprise should be able to assess their individual risk tolerance and risk exposure. No two farming enterprises will have the same risk tolerance and this risk tolerance will change over time. The individual farming enterprise is best positioned to assess their tolerance to risk. Risk tolerance will vary for several reasons. These include:

- level of savings;
- amount of debt;
- off farm income; and

- diversity of farm income.

As with risk tolerance, risk exposure will vary from farming enterprise to enterprise. Different farming activities will be exposed to risk differently. The individual farming enterprise is best positioned to assess their exposure to risk. Risk exposure will also vary for several reasons. These include:

- regional climate variability;
- agronomic adaption strategies employed; and
- level of fixed costs.

The complexities of the interaction of these factors makes it difficult to externally set the level of a climate risk provision. It is envisaged that the individual farming enterprises would determine their own level of climate risk provisioning needed. However, this should not be open-ended.

Limiting the amount of the provision

As a first step, farming enterprises should determine their individual climate risk provisioning. Under this proposal, viable farmers would build up provisions during good seasons from before tax earnings to cover their fixed costs during climate events of an expected duration. The amount of any climate risk provision should be limited by the:

- fixed costs of the farming enterprise net of any off farm income;
- expected duration of drought in the region based on historical records; and
- cost of climate risk insurance.

Climate risk insurance premiums would be paid annually to provide protection for unexpectedly long climate events so should be included in the ongoing fixed costs of the farming enterprise.

An external audit of the farming enterprises proposed climate risk provision limit should be required to limit any abuse of provisioning. The farming enterprises accountants could verify the fixed costs as being consistent with current expenditure adjusted for future inflation. Off-farm income could also be verified based on previous income used to support the enterprise.

The Bureau of Meteorology could provide guidance on the expected duration of drought of an agreed severity in the enterprise's region. National guidelines on the frequency and severity of climate risk that would need provisioning would need to be developed. Using the Northwestern New South Wales region as an example, the graphs on page 3, would suggest that droughts that exceed two years have a frequency of about one in twenty-five years. A climate risk provision limited to the two years of audited net fixed costs seems a prudent limit.

As provisioning would occur annually, any change in the tolerance and exposure to risk could be used to adjust the limit if needed.

Accessing provisioning

Provisioning will not provide financial resilience for all farming enterprises. Only the profitable sections of the agricultural sector will be able to provision. For the purposes of discussing climate risk provisioning, farming enterprises could be categorized into four groups:

1. Hobby or lifestyle;
2. Non-viable;
3. Over-extended; and
4. Profitable.

Provisioning from profit will only provide financial resilience to the profitable farmers as the provisioning will be made from profits.

Hobby or Lifestyle

Hobby or lifestyle farming enterprises do not make profits and would not be able to provision for climate risk from non-existent profits. If it was felt necessary, climate risk provisioning could be limited to enterprises that have paid tax during the preceding five years.

Non-viable

Enterprises that are non-viable may have paid tax in the last five years but were struggling before the recent drought. Non-viability can occur for many reasons, some of them beyond the control of the enterprise. The decision to allow a dignified exit from farming or not is beyond the scope of this submission but it should be recognized that the proposed climate risk provisioning will not help this category of enterprise.

Over-extended

The recent unprecedented drought has exposed some otherwise profitable enterprises as being over-extended by debt. In the medium term, climate risk provisioning will not be able to help these enterprises, but it is not in the 97%'s interest to have these farmers forced out of the agricultural sector. Many of these enterprises will be victims of their own success. They should be supported through by other forms of government assistance—more debt as is being offered is not the answer.

Profitable

Profitable enterprises will be able to take advantage of climate risk provisioning and strengthen their financial resilience. The issue for the most prudent of these enterprises will be that they have already provided for climate risk through off-farm investments from after tax earnings in the past. In a way, providing climate risk provisioning for these enterprises after they have made prudent after-tax provisioning, is punishing them. An equitable formula for them to be able to quarantine off-farm income from reducing their fixed cost to zero and thus excluding them from participating in climate risk provisioning should be determined.

Finally, climate risk provisions could be open to abuse and should only be available to certain farming enterprises. It is proposed that the ability to set up climate risk provisions should initially be limited to family farming enterprises. These could be defined as sole traders, partnerships or limited liability companies that are majority owned by members of a family by birth or marriage.

How would provisioning work?

It is not the intention of this submission to be exhaustive in determining who and how profitable farmers should accesses this climate risk financial plan, but rather to outline how such a plan could operate. To this end, three hypothetical case studies are presented below that show how this new climate risk ecosystem would operate.

Case Study One—Small Climate Event

Wal Smith operates a family farming enterprise in Northwestern New South Wales. Wal currently has just enough off-farm income to survive this financial year but needs the drought to break soon. Fortunately for Wal, March sees good rain and Wal feels confident enough to plant a winter cereal crop.

In year one of his ability to contribute to a climate risk provision, Wal makes a before-tax profit of $200,000 and he decides to place $150,000 in his climate risk provision account. He determines that he needs to retain $50,000 before tax to fund future variable costs. He approaches his accountant and produces invoices for all his fixed costs including a market salary for himself. The accountant verifies these and provides Wal with an interim climate risk certificate that confirms his fixed costs as $225,000. He takes this to his bank to set up a cash account, like he has for his self-managed superannuation, that can be used to transfer funds to and from his chosen investments.

Wal also approaches insurers to enquire about climate risk insurance products being offered. At the time there are only three insurers offering these covers and two of them send out representative to discuss their covers and provide Wal with a quotation. Wal choses the best deal and agrees to pay the first year's premium of $25,000 in four instalments during the next year.

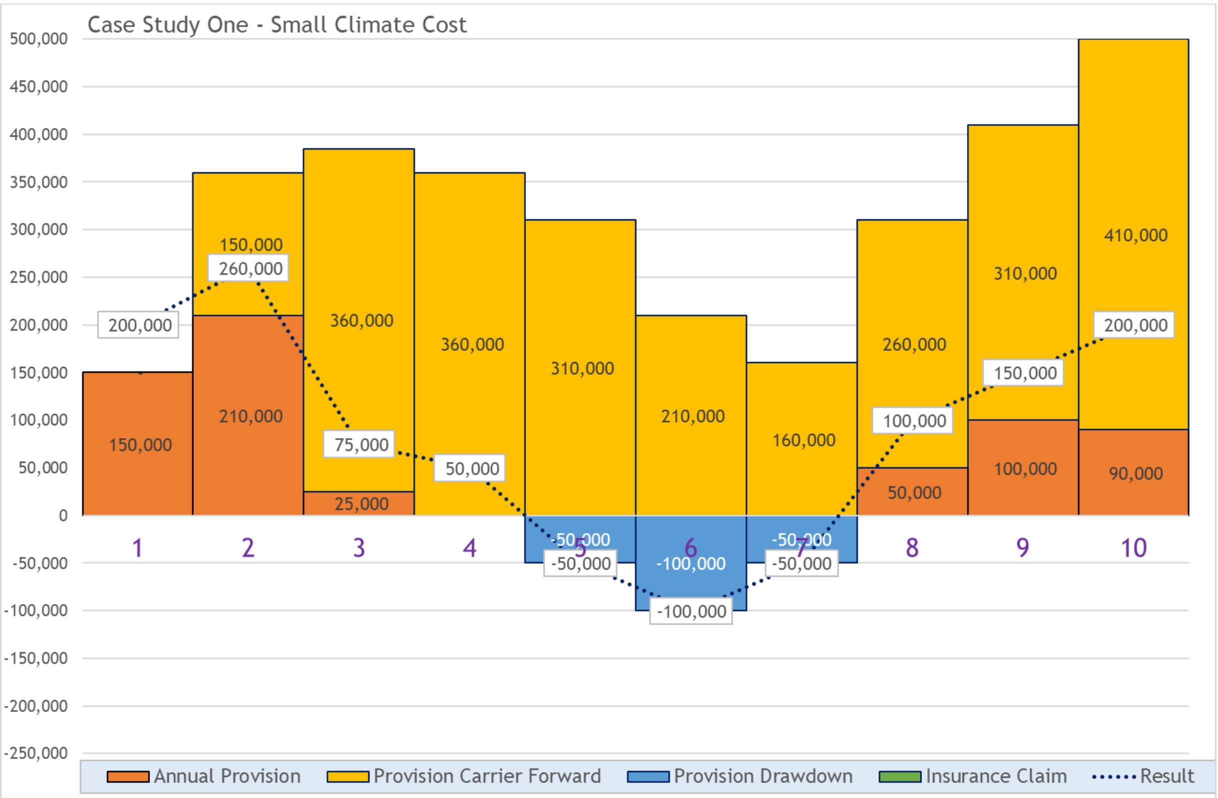
Wal takes this invoice back to his accountant to add the amount to his fixed costs for the next year, bringing the revised annual fixed cost figure to $250,000. His accountant has also referred to the Department of Agriculture and found that the region where Wal is farming has a provisioning limit equivalent to two years of fixed costs. The limit for his climate risk provision is set at $500,000.

In year two Wal has an even better year and makes a profit before tax of $260,000. He puts $210,000 of this into his climate risk provision, which increases his provision to $360,000. Wal's climate risk provision is now 144% of his fixed costs. The reduction in his premium is offset by other increase in costs so his fixed costs remain at $250,000.

Year three sees more difficult conditions and he only makes a before tax profit of $75,000. He puts all this into his climate risk provision.

Year four sees the continuation of the difficult seasonal conditions and he makes a before tax profit of $50,000. Wal decides not to add to his climate risk provision.

Year five sees a return of dry conditions and Wal makes his first loss in five years of $50,000. Wal draws down $50,000 from his climate risk provision to make up the short fall. He advises his insurer that he has made a drawdown from his climate risk provision. As Wal has made a drawdown, his insurers trigger the five-year policy period limit. This case study is shown graphically below.



Year six sees further deterioration in conditions and Wal has a second loss of $100,000. Wal again draws down $100,000 from his climate risk provision to make up the short fall to cover his costs.

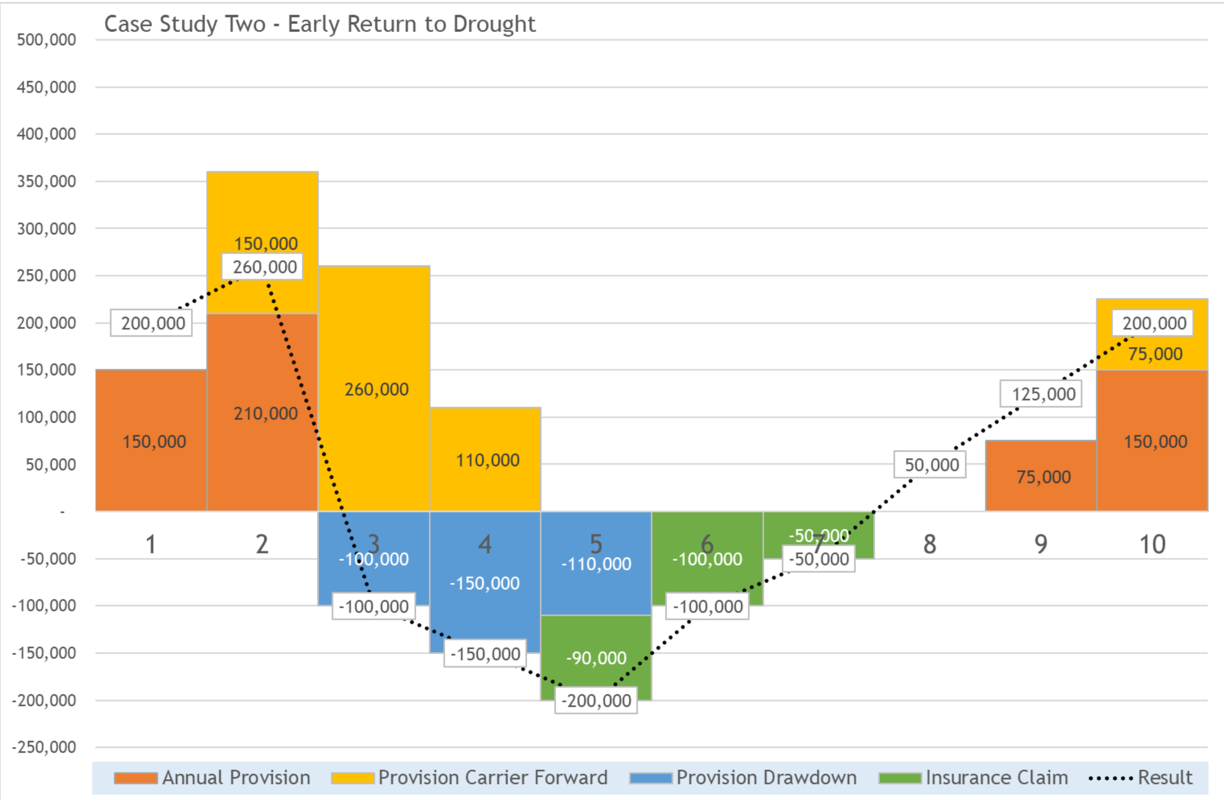
Year seven does see a small improvement in conditions but Wal still makes a loss of $50,000. Wal again draws down $50,000 from his climate risk provision to make up the short fall to cover his costs.

Years eight, nine and ten are all profit years with profits of $100,000, $150,000 and $200,000 respectively so Wal returns to adding provisions to his climate risk provision until year ten when he can only put in $90,000 of his $200,000 profit because his fund has hit the climate risk provisioning limit of two times his fixed costs or $500,000. Insurers lift the five-year policy limit in year eight as Wal has started provisioning again.

Case Study Two—Early Return to Drought

In this case study, Wal takes the same steps he did in years one and two. In year three, the region returns to drought. In this year Wal makes a drawdown of $100,000 to make up the shortfall in his costs and insurers trigger the five-year cover limit. In year four conditions deteriorate further and he makes a loss $150,000 and he draws this amount down from his climate risk provision to make up the shortfall to cover his costs.

In year five, Wal makes a $200,000 loss and draws down all his remaining climate risk provision of $110,000 leaving a shortfall of $90,000 which he claims from his insurance. Year five turns out to be his worst year with year six recording a loss of only $100,000 which he again recovers from insurers. Year seven is also a loss-making year but with a reduced loss of only $50,000 which he again recovers from his insurers. In years five, six and seven Wal is unable to plant any crops so incurred no variable costs.

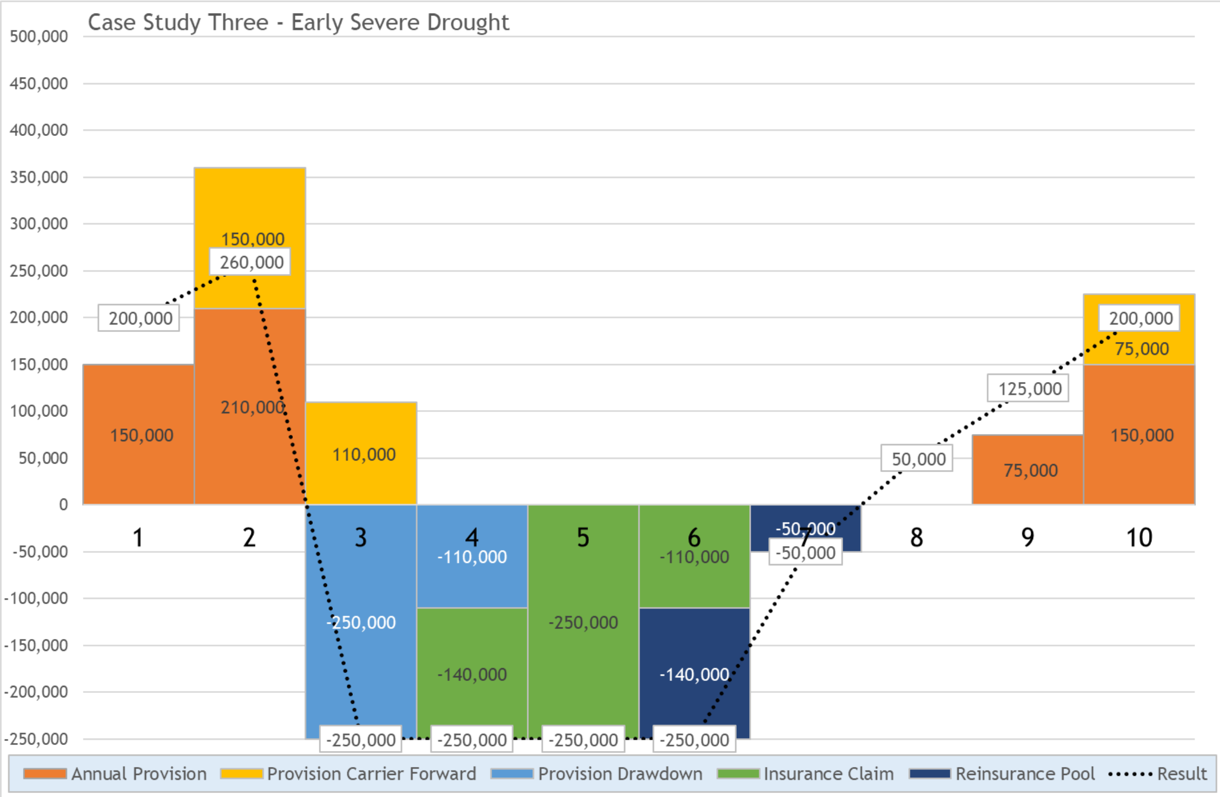


Years eight, nine and ten see Wal return to profit with profits of $50,000, $125,000 and $200,000 respectively. The return to profit sees him rebuilding his climate risk provision. Unlike in case study one, as Wal has drawn down more from his climate risk provision, he does not reach his provisioning limit in year ten, so he contributes $150,000 of his profit to the provision instead of being limited to being limited to $100,000. He finishes year ten with $225,000 a climate risk provision. This case study is shown graphically on the previous page.

Case Study Three—Early Catastrophic Drought

In this case study, Wal again takes the same steps he did in years one and two in the previous case studies, but the region experiences a catastrophic drought with four years when Wal can earn no on-farm income. In year three, Wal makes a drawdown of $250,000 to cover his fixed costs. This triggers the insurers five-year policy period limit.

In year four he again makes no on-farm income and draws down the remaining $110,000 of his climate risk provision to make up the shortfall and needs to claim $140,000 from insurers to cover his fixed costs. In this case, Wal incurs no variable cost in year's four, five, six or seven as crops can not be planted.



In year five, with no climate risk provisions left, he needs to claim his full fixed costs from insurers. When Wal took out the insurance, he agreed to a policy limit equal to his climate risk provision limit, so he is limited to making claims equal to his climate risk provision limit of $500,000. By the end of year five, he has claimed $390,000 so only has $110,000 of his sum insured remaining.

In year six he is once again unable to make any on-farm income and exhausts the remaining sum insured of $110,000. His insurers notify the government climate risk reinsurance pool and claim $140,000 on his behalf. Having insured, Wal become eligible to claim from the government climate risk reinsurance pool.

Although Wal can make some on-farm income in the seventh year, his efforts still result in a $50,000 loss which his insurers claim from the government climate risk reinsurance pool. As in the case two study, years eight, nine and ten are profit years for Wal and he re-builds his climate risk provision.

In this example, insurers exhaust their cover during year six. This is only four years into their five-year policy period. The coverage offered by insurers would have the dual limitation of five-years *or* the limit of liability under the policy of $500,000, whichever occurs first. The government reinsurance pool would be triggered if either of these limitations were reached.

Climate risk ecosystem

The three case studies are meant to provide a simplified view of the climate risk ecosystem and its three participates interaction: the farming enterprise through climate risk provisioning; the insurer through the provision of climate risk insurance; and the government through the provision of a climate risk reinsurance pool. These simplified case studies ignore inflation and investment income. In a real-world operation, the provisions value and investment returns will alter the balance of the climate risk provision held by the farming enterprise from year to year. An assessment of the risk associated with the investment strategy of the farming enterprise would be included as part of the process of costing of the insurance.

Again for simplicity, these case studies assume the losses claimed from insurers are for fixed costs only. The farmers drawdowns will include both fixed and variable costs not covered by income. The insurance product will cover fixed cost only. As with business interruption insurance, the determination of insured loss will differ from the accounting loss. Variable costs would be removed from the determination of the insured loss. Any such variable costs would have to have been funded by the farmer from retained income or borrowings.

Also as with business interruption insurance, the farmer may agree with the insurer to insure additional increased costs of working. For example, the farmer may take out cover for agistment costs for their livestock to maintain the herds viability through a drought. Insurers may in turn identify agistment sites in advance to reduce their costs. If individual farmers risks are aggregated through insurance, cost minimization strategies can cost effectively be developed.

These case studies show that the insurers are not providing "ground-up" cover but sitting over the farming enterprise's climate risk provisions. This significantly alters the underwriting risk as will be shown next. As the final case study shows, the government is only asked to respond when the farming enterprises' provisions are exhausted and insurer risk capital becomes inefficient—an explanation of this is also provided below.

Climate risk insurance

Profitable farmers will need to have access to an insurance product that will respond if their climate risk provisions are exhausted by an extended set of adverse weather events such as an extended drought as shown in case study two and three. such an insurance product does not currently exist. There is no reason why such a product should not exist. This section of the submission set out to demonstrate the feasibility of a climate risk insurance product.

This would not be the insurers first choice

Underwriting agricultural crop and livestock risks is challenging. The insurance industry has used this to argue that the only way for them to be involved in drought insurance would be if the government provided premium subsidies. This would be the insurers first choice but as set out in the introduction on page 5 and 6, this would not be good public policy as it weakens adaptation by supporting poor agronomic practices and distorts property values. It also obscures the reasons for the high cost of agricultural risk insurance.

Premium subsidies effectively turn the insurer into a cost-plus supplier that ceases to utilize private sector risk capital and instead relies on government support. This provides little to no incentive for insures to manage costs. It is indicative of the historical failure of the private insurance market to insure adverse weather events, that instead of providing their risk capital to absorb losses—their core competency, they seek to use taxpayer funds for this purpose.

Providing climate risk insurance, as outlined in the previous section, would require the private sector insurers to confront the challenges of underwriting agricultural crop and livestock risks and expose their risk capital to loss. An experience of underwriting agricultural risks leads to the belief that these existing perceived challenges can be remediated, and a financially viable climate risk insurance product developed.

Remediating the challenges

The proposed climate risk provisions provide a basis for the insurance sector to engage with insuring climate risk that is less challenging because it operates above a known level of risk that is self-funded by the farming enterprise. The consequence of this one change is that the underwriting risk is significantly reduced through a combination of limiting cover to audited fixed costs and providing cover that will be triggered several years into the future after self-funding is exhausted.

What follows is an agricultural underwriter's perspective on the challenges that were faced by MPCI products and how climate risk provisioning remediates many of these challenges.

Asymmetry of information

Farmers have a better understanding of their exposure to risks for the season ahead. This comes from decades, if not generations, of local experience. Insurance underwriters have lacked the ability to achieve an equal level and quality of information so are at a disadvantage when trying to price a risk transfer product such as MPCI for farmers.

This asymmetry of information is insurmountable when trying to determine the risk of drought on a cereal crop that has already been planted, which is what some underwriters were doing with the attempt at MPCI products in Australia. Without detailed planting information, soil moisture profiles, field fallow history and a detailed rainfall outlook, the chances of an underwriter, sitting in an office in a capital city, to accurately price the exposure to risk are vanishingly small. Even if it was possible, the effort involved would likely price the product out of the market.

With the passage of enough time, this information asymmetry diminishes. The further into the future the evaluation of risk occurs, the less predictable an outcome becomes so there is a diminishing asymmetry of information with an extension of the forecasting horizon. The risk of drought in 2025 is unknowable by both parties to a drought insurance policy today.

Under the proposed climate risk insurance product, the farming enterprise is establishing a provision from the current year's profits to the end of the financial year in June. By this point in the year, the next season's winter crop will be planted, and the climate risk provision will have been established that represents a proportion of the fixed costs that need to be available to pay the fixed costs in the next financial year. In effect, at worst, the climate risk insurance will only be called on to cover the difference between the fixed costs and the climate risk provision in following financial year and the farmer is committed to five years of premium.

The nature of weather events through to over five years time is unknowable so farmers will not have an asymmetry of information. This extended forecasting horizon will also remediate adverse selection.

Adverse selection

Adverse selection is said to exist when only worse than average risks insure, thus undermining the underwriters' pricing. In agricultural insurance, the individual farmer often has a better understanding of the exposure to risk than the underwriter.

For ease of pricing, underwriters' premiums are often based on aggregate data that produces a community rate that will underprice higher than average risk farmers. Farmers are in a good position to judge the value of the community rate compared to their assessment of their individual exposure to risk.

With a better understanding of the risk, a higher proportion of higher risk farmers and a lower proportion of lower risk farmers will insure. The premium set by the underwriter based on averages will be inadequate to pay the losses. Over time, this creates a death spiral and the ultimate effect of this is a non-viable product.

For climate risk insurance, several factors remediate the issue of adverse selection. These are:

- Individual rating will be needed as each farming enterprise will have a different risk profile.
- All weather perils will be covered so it is more difficult for the farmer to accurately determine their exposure to all risks.
- Farming enterprises will have established a climate risk provision that will cover a a likely loss in the first year.
- New cover will only be available in favorable seasons and unavailable in unfavorable seasons for the same reason new home insurance is not available during a bushfire.
- Covers will be for a rolling multi-year period so it will not be possible for farming enterprises to pick and choose when they want to be insured.

Farmers are very astute, and it would be unwise for an agricultural underwriter to underestimate their ability to "game" any insurance product, but the very design and operation of the climate risk provisioning and insurance makes the risk of gaming the system small.

Systemic risk

A systemic risk is one where there is a strongly positive correlation in loss events. This is the case with drought risk. The basis of insurance is to spread the premiums of the many amongst the losses of a few. Generally, systemic risks cannot be insured as the losses are highly correlated so most policyholders will suffer a loss at the same time—the losses of the many exhaust the premiums of the many.

For a systemic risk such as drought, insurance solutions must be found to remediate the exposure to loss by spreading the losses over more policyholders' premiums. There are two methods for dealing with the systemic risk of drought.

- The first, is to *spread the risk geographically*. In Australia, this would aggregate several climate zones into the portfolio of insured farmers so the probability that most farmers are affected by drought at the same time is reduced. Although Australia is prone to drought, the size of the country means that there are several different climate zones which are negatively correlated for drought.
- The second, is to *spread the risk temporally*. This can be achieved by spreading the risk across multiple seasons. Drought is a cyclical systemic risk that spans one or more seasons. If a policy period is long enough, then the good seasons premium can pay for the bad season losses.

Both these methods will be needed to remediate the systemic risk of drought if it is to be insurable.

Systemic risks have traditionally been dealt with by matching the duration of the risk with the duration of cover. An example would be mortgage insurance where the duration of the policy matches the duration of the loan. Pooling risk from many loans over many years provides an adequate premium pool to fund systemic default periods.

Climate risk products should be for a duration of at least five years, and ideally seven. Enquiries made with the international reinsurance market indicate that the current maximum policy period is five years. Periods longer than this have regulatory considerations—mortgage insurance policies have traditionally had additional reserving and capitalization requirements to protect policyholders.

Before a multi-year climate risk product is offered to Australian farmers, the Australian Prudential Regulation Authority (**APRA**) will need to develop provisioning regulations for the product. This is needed to limit the recognition of insurer's profit, so the appropriate level of premium is retained to pay future claims as this is still a systemic risk and will be subject to high variability in annual underwriting results.

Moral hazard

A moral hazard is said to exist if an insured takes out cover with the intention of claiming non-fortuitous or fraudulent losses. Underwriters' risk assessment must be robust enough to prevent farmers who represent a moral hazard from becoming part of their portfolio. Underwriters' products must also have adequate protections to prevent farmers who have already experienced a loss or know they are almost certain to suffer a loss from taking out insurance and becoming part of the insurer's portfolio.

Under our definition, moral hazard relates to the insurability of the individual farmer. An indicator of poor moral hazard farmers would be a history of fraudulent claims. Moral hazard minimization is a proactive pre-coverage attachment issue for underwriters that focuses on the individual farmer seeking cover. Under the proposed climate risk provisioning, normal underwriting procedures should be enough to deal with the moral hazard.

Morale risk

Morale risk is said to exist if the existence of the insurance alters a policyholder's behavior. Underwriters must design their products in such a way as to minimize the likelihood that the existence of the insurance cover will alter the risk minimizing behavior of insured farmers.

Under our definition, morale risk is created by the existence of the insurance so is a post coverage attachment issue for underwriters that focuses on the portfolio of insured farmers. It is minimized through specific product design features that impose stipulated actions that must be undertaken under set conditions. Such conditions already exist in traditional insurance covers.

An example of a morale risk prevention mechanism would be the implied condition of all policies that the policyholder must take all reasonable steps to prevent or minimize further loss—in most policies this is only implied but in some crop policies it is written into the contract and the insurer undertakes to reimburse farmers for the reasonable costs incurred.

Limiting the sum insured to fixed costs also remediates many of the underwriting challenges that are prevalent with agricultural insurance as discussed below.

The significance of a fixed cost sum insured

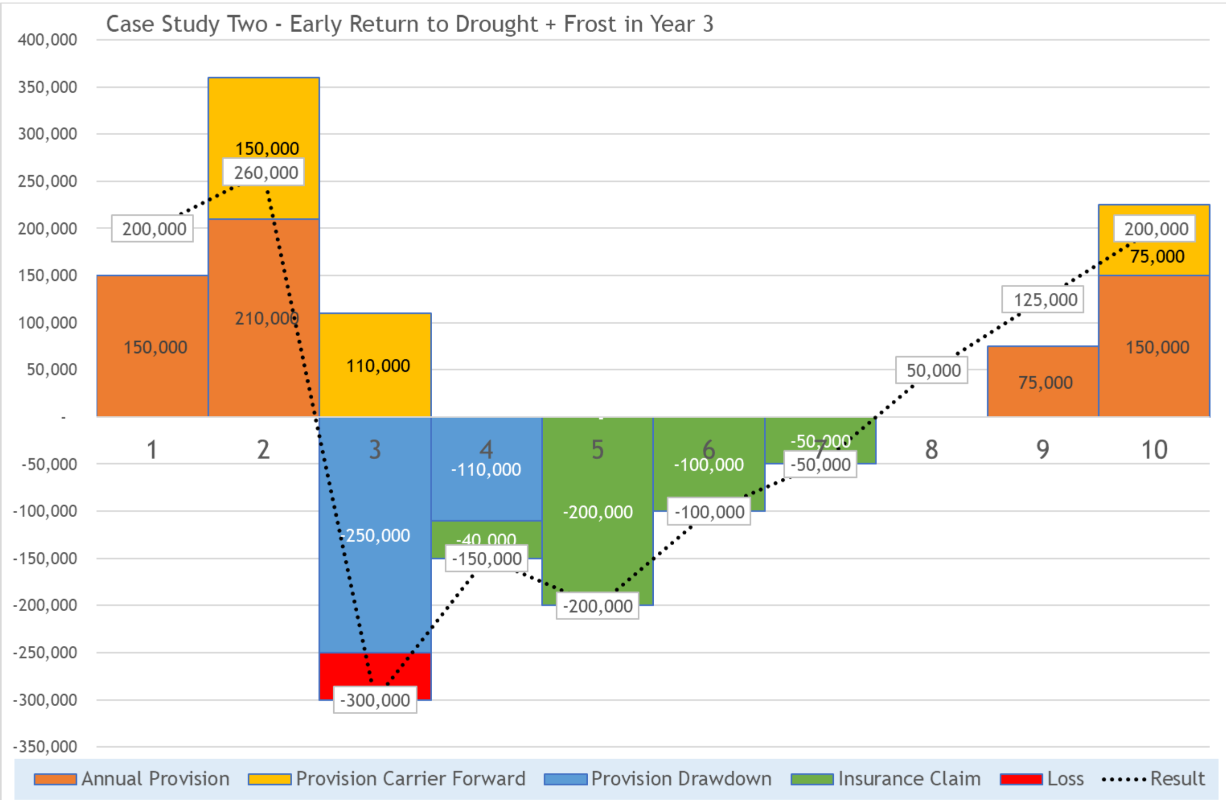
By insurers only offering to cover fixed costs, adverse selection, moral hazard and morale risk are greatly remediated. By not covering profit and variable costs, the financial incentive to adversely select against the insurer is minimized as there is no profit in it, only costs incurred will be recovered. Moral hazard is reduced for the same reason. Morale risk is also remediated.

Case Study Two—Early Return to Drought (see page 14), can be adjusted to illustrates the morale risk remediation effect. In the third year in Case Study Two, Wal makes a $100,000 loss. This is not the accounting result but rather the insured result. The difference is that an insured result is the result before accounting adjustments such as depreciation—it's the cash position. For the purposes of determining the insured loss, only two figures need to be determined. They are the insured result and the fixed costs, with the latter being subtracted from the former and a negative difference being the definition of a loss.

With the fixed costs of $250,000, for Wal to only make a loss of $100,000, he would have engaged in some cropping and grazing activities that covered their own cost and generated a surplus of $150,000. Variable costs incurred by Wal are not recoverable from climate risk insurance. Any loss greater than the fixed costs would need to come from retained profits in the business or borrowings. The incentive for Wal to continue to manage the agronomic risks associated with whatever cropping and grazing activities he undertakes remains unchanged by the existence of the climate risk insurance as they are not covered.

To reframe Case Study Two to illustrate this, let's assume that Wal's cropping activates were significantly affected by frost in year three and he had no costs or income from any other activity.

To grow the crop, his variable costs for were $300,000 and his revenue was only $250,000, so on these activities he lost $50,000. He still had fixed costs of $250,000 so his combined loss is now $300,000 as shown in the graph below.



The purpose of the climate risk provision and climate risk insurance is to ensure Wal's financial resilience. It is not its purpose to underwrite his agronomic decisions. In year three, Wal can draw down a maximum of his annual fixed costs for the year of $250,000, so he must fund the $50,000 variable costs loss from cropping. As this risk is not covered, through either the provision or insurance, a morale risk is not created.

For an insurer, this is significant, as they do not need to be involved in the agronomic management of the farming enterprise as they are not exposed directly to the loss. The farmer still has a significant incentive to make responsible agronomic decisions.

The outcome in Case Study Two was altered in two ways.

- A loss from the cropping activities due to frost, increased Wal's drawdown in year three. This had the knock-on effect of increasing the insurance claim in subsequent years from a total of $240,000 to $390,000 or an increased claims cost to the insurer of $150,000 over the five years of loss making by Wal. This was a consequence of an additional weather event so not a flaw in the insurance product structure.
- Most farmers live to farm and find it challenging to decide to do nothing when nothing is the financially sensible thing to do. When the financial imperative to pay for the enterprises fixed costs is also present, then the agronomic decision making is made under financial duress. By having the fixed cost covered, better agronomic decisions are likely to be made as this financial duress is reduced through knowing the fixed costs will be recovered.

Insurers will only enter a climate risk insurance market if they can make a return on their risk capital. An analysis of the results for the insurer for the case studies would determine if this was possible.

Insurer results

In Case Study One the insure paid no claim. Let's consider the premium income the insurer would have received over the ten years of the case study. The premium rate Wal accepted was 10% of his fixed costs. It would have been locked at this level during the five-year policy period that the insurers would have triggered in year three, the first loss year. At the end of this five-year policy period, the premium rate would have been renegotiated so lets assume it was increased to 12.5%.

Year	Fixed Costs	Rate	Premium	Cumulative Premium	Claims	Cumulative Claims	Gross Loss Ratio
1	250,000	10.0%	25,000	25,000			0%
2	250,000	10.0%	25,000	50,000			0%
3	250,000	10.0%	25,000	75,000			0%
4	250,000	10.0%	25,000	100,000			0%
5	250,000	10.0%	25,000	125,000	90,000	90,000	72%
6	250,000	10.0%	25,000	150,000	100,000	190,000	127%
7	250,000	10.0%	25,000	175,000	50,000	240,000	137%
8	250,000	12.5%	31,250	206,250		240,000	116%
9	250,000	12.5%	31,250	237,500		240,000	101%
10	250,000	12.5%	31,250	268,750		240,000	89%

The total premium paid under these assumptions would have been $268,750 as shown in the table on the previous page showing the results for Case Study Two. The early return to drought would have been unwelcome for insurers but not financial disastrous. The gross loss ratio for this one farmer in one region that experienced an early return to drought was 89%.

The result for Case Study Three based on the same assumptions is shown in the table below. The gross loss ratio for this one farmer in one region, which experienced an early return to drought was 186%. Again, not desirable but by no means terminal for an inherently high-risk insurance product that could be remediated by a higher rate increase.

Year	Fixed Costs	Rate	Premium	Cumulative Premium	Claims	Cumulative Claims	Gross Loss Ratio
1	250,000	10.0%	25,000	25,000			0%
2	250,000	10.0%	25,000	50,000			0%
3	250,000	10.0%	25,000	75,000		-	0%
4	250,000	10.0%	25,000	100,000	140,000	140,000	140%
5	250,000	10.0%	25,000	125,000	250,000	390,000	312%
6	250,000	10.0%	25,000	150,000	110,000	500,000	333%
7	250,000	10.0%	25,000	175,000		500,000	286%
8	250,000	12.5%	31,250	206,250		500,000	242%
9	250,000	12.5%	31,250	237,500		500,000	211%
10	250,000	12.5%	31,250	268,750		500,000	186%

If the results of these three case studies was aggregated, the combined loss ratio would have been 92%. As will be discussed below, this Gross Loss Ratio does not represent a profitable result. But, these three case studies do not represent a likely portfolio of insured farmers as they were constructed to show how the proposed ecosystem would interact in the event of a drought.

For the sake of discussion, if it were assumed that a *hypothetical portfolio* consisted of two Cases Study Ones plus Case Studies Two and Three then the aggregate loss ratio would have been 69%. It is reasonable to assume that a portfolio of Climate Risk Insurance policies would be expected to have 50% of policies claiming within a ten-year period.

The point being made is, that only providing insurance cover once the farmers provisioning is exhausted, limiting cover to fixed costs and spreading the risk temporally over five years makes insurance feasible. Add to this the fact that adverse selection, moral hazard and morale risk are remediated by the provisioning structure, then it is reasonable to assume that insurers familiar with agricultural risks would be willing to develop a climate risk insurance product.

A balanced approach

Farmers and underwriters are at opposite ends of the risk tolerance spectrum—their career choices have led them there. Farmers are optimistic when assessing the chances of growing a crop while underwriters would only see uncertainty and risk. If underwriters were farmers, we would most likely all starve.

For this reason, underwriters should not get involved in agronomic decisions. If variable costs and profit were to be insured, then underwriters would want to place restrictions on when farmers could and couldn't plant crops or require mandatory destocking if seasonal climate conditions deteriorated. Not only are underwriters' temperaments not suited to this task, their physical remoteness from the individual agronomic conditions on the ground plus the costs and time delays in determining the appropriate decision would make any insurance product that covered more than fixed costs difficult to implement.

Relieved of the financial duress-inducing problem of finding the funds to cover their fixed costs, farmers are likely to make more balanced decisions about sitting out a poor season and not increasing their financial difficulties. Not only does this provisioning structure make family farming enterprises more financially resilient but also in a better position at the start of challenging climate conditions to make the right agronomic decisions.

Insurance Pricing

The financial attractiveness of any insurance product for farmers will depend on the cost. If the cost of risk transfer through the mechanism of insurance was frictionless then this would be easy as all the premium would be available to pay claims. But the provision of insurance is not frictionless.

The Gross Loss Ratios shown in the tables above are not the net result for the insurer. A Gross Loss Ratio is calculated by dividing the gross premium by the claims. The gross premium includes expenses. The net premium available to pay claims will be less than the gross premium by the amount of the expenses.

Expenses

For a climate risk insurance product to be financially attractive to farmers, the expenses need to be as low as possible. The major expenses for agricultural insurers are the cost to distribute the insurance to remote farmers, adjust losses and pricing and administrating the policies.

Distributing

The remoteness of farmers from the underwriting offices of insurers makes distributing expensive. Most agricultural insurers rely on insurance intermediaries to distribute their products in regional areas. This is primarily through insurance brokers. They are paid by commission. For products like crop insurance, commissions of between 10% and 20% are paid depending on the crop and the influence of the broker.

To keep the premium acceptable to farmers, they are going to expect a reasonable return on their premium dollar. Having up to 20¢ in the dollar going to distribution will make this challenging. Keeping distribution costs to 5% will be necessary for farmers to see value.

Adjusting losses

Loss adjusting costs for crop losses are typically around 2.5% to 7.5% depending on the crop and type of damage. This is because an agronomist is needed to inspect the damage and assess the loss, for some crops this will involve multiple farm visits. One of the benefits of only covering fixed costs is that the need for crop inspections will be minimal for most claims as the adjusting process will focus on the cash flows of the enterprise not the level of crop damage.

Much of the loss adjusting should be able to be carried out by the enterprises accountants and be ancillary to their normal task of preparing financial statements for existing purposes. Basic physical inspections of crops and stock will likely be necessary for some claims but loss adjusting costs should be able to be limited to 5%.

Administrating

Insurers incur costs to underwrite, administer policies and claims, manage the business, and comply with prudential and consumer regulations. With the complexities of the risk assessment, underwriting will require specialist underwriters that will be required to spend time assessing the agronomic risk profile, the provisioning amount available and investment risk for each individual farming enterprise to determine the price required.

The other costs of administration will be standard. It would be expected that the administration costs for this product would be able to be kept under 10%.

Being able to bring expense in at under 20% will be necessary to make this insurance financially attractive to farmers. If combined expenses for the *hypothetical portfolio*—two Case Study Ones plus Case Study Two and Three, were 20% then the Net Loss Ratios the four Case Studies would have been 0%, 0%, 112% and 233% of a combined result of 86% compared to the Gross Loss Ratio of 69%. With expenses of 20%, insurers would have paid out 86¢ in claims and expenses for every $1.00 of premium. But would this have been profitable for insurers?

To determine if any product is profitable, the cost of capital needs to be considered. The Net Loss Ratio does not consider the cost of the risk capital that insurers expose to loss when they issue insurance policies. Depending on the cost of risk capital, insurers could still be making a loss on the *hypothetical portfolio* with a Net Loss Ratio of 89%.

Costs of capital

For insurers, the cost of the risk capital must be covered by the premium over time. For a climate risk insurance product to be financially attractive to farmers then the cost of risk capital also needs to be contained. For climate risk insurance, this could be achieved through the adoption of a multi-year policy period and utilizing risk capital efficiently.

Insurance is a capital-intensive business. For the purposes of this discussion, it is assumed that the Pure Risk Premium for a mature portfolio would be based on the average historical losses. If this were the case, for one season in two, losses would exceed the premium collected. In these seasons' risk capital will be needed to make up the short fall between premiums and claims.

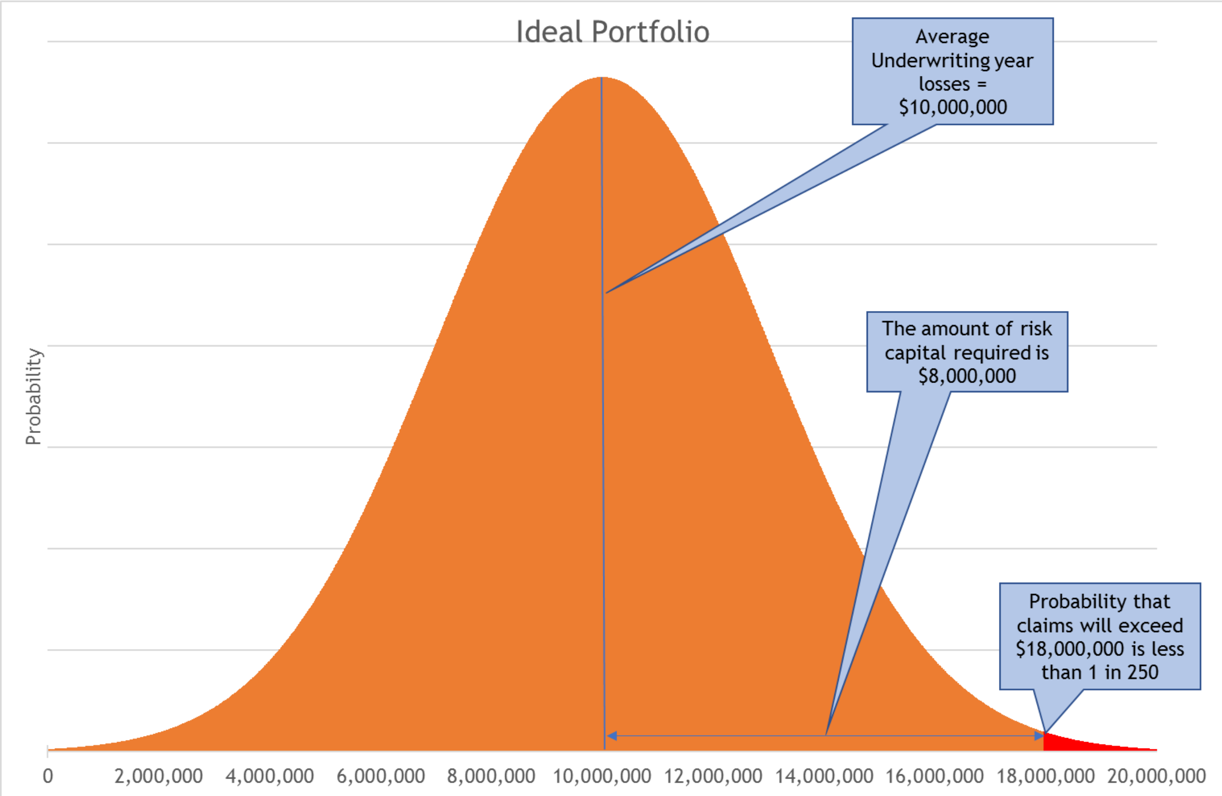
Generally, insurance risk capital providers look for a 10% rate of return. The cost of capital will be determined by applying this rate of return to the amount of risk capital required. The amount of risk capital required will be set by the variability of the portfolio of claims about the average underwriting year result. The greater the variability, the more capital that is required and therefore the more of the premium that is required to cover the return on the risk capital that is needed.

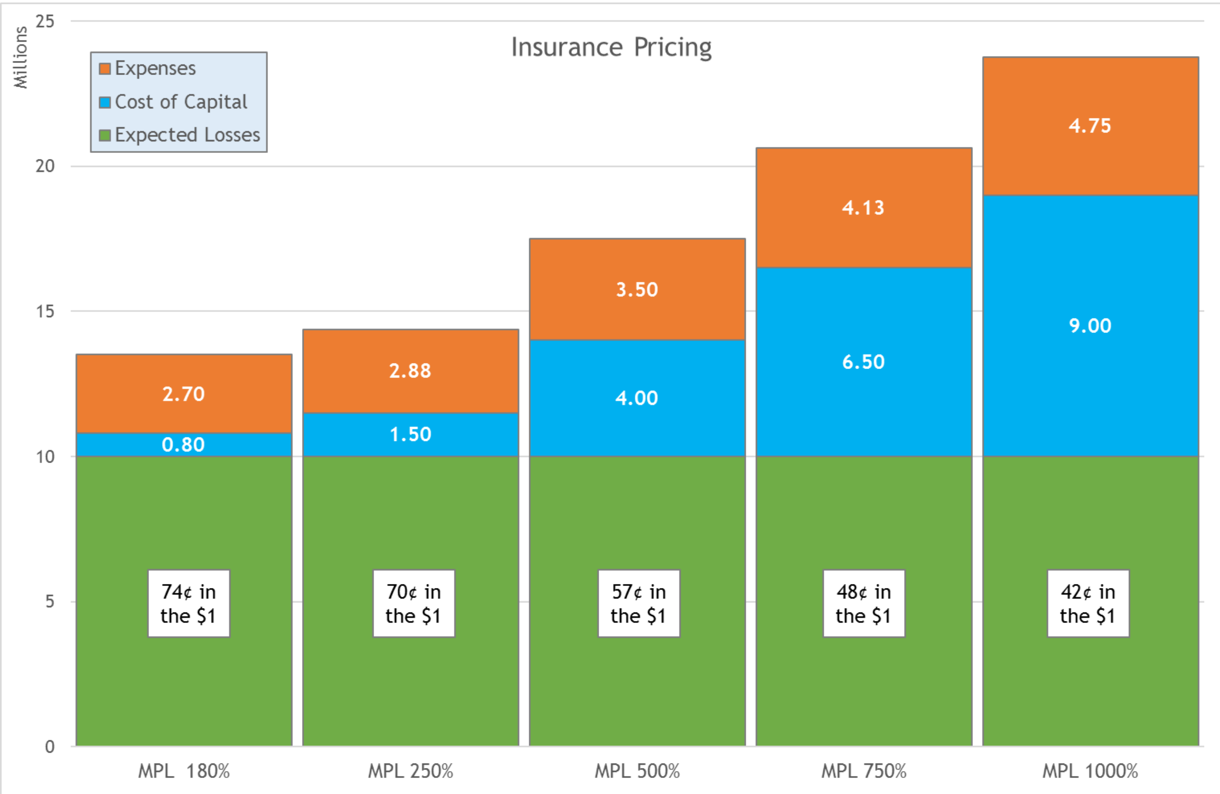
To illustrate this, consider a hypothetical *ideal portfolio*. It would be made up of reasonably homogeneous insured assets so that the portfolio is not exposed to a single large loss because all policyholders are insured for a similar value. The assets are also well spread out over Australia so there are no large concentrations of risk that are exposed to single events.

In addition to this, losses have a low correlation—a loss by one policyholder does not increase the probability that another policyholder will have a loss. Such a portfolio would be ideal for insurers as it would have a low variability in annual claims as it is only really exposed to variations in the frequency of events in the year not their disproportionate effect on the portfolio.

For this example, the distribution of annual losses is assumed to be normally distributed, with an average annual loss of $10 million and a standard deviation in losses of $3 million. The expected distribution of annual losses is shown in the graph on the next page.

For this hypothetical *ideal portfolio*, risk capital would be required as a pure risk premium of $10 million would only cover the average annual expected losses. A prudent amount of risk capital would be needed to absorb a probability of annual losses that could exceed the average. This would normally be set at a probability of one in two hundred and fifty years. Using the normal distribution, the amount of risk capital needed is determined to be $8 million or 180% of the average losses. The probability of losses over $18 million is one in two hundred and fifty. The underwriter would determine that $18 million or 180% of the premium as the Maximum Probable Loss (**MPL**), and this would be set by the insurer's management and Regulators.





Assuming the expenses are 20%, then the premium required to insure the portfolio would be $13.5 million made up of a pure risk premium of $10 million, a cost of capital of 10% of the required risk capital of $8 million or $0.8 million and an expenses cost of $2.7 million. This is shown graphically by the first column in the graph on the previous page for the column shown as MPL of 180% from the expected distribution of the *ideal portfolio*. This pricing structure returns 74¢ in the dollar to policyholders. This would be considered a cost-effective insurance risk transfer product.

As the variability increases the cost-effectiveness reduces. The variability in the ideal portfolio was relatively low by design. The variability of real portfolios is higher. Portfolios with higher variability in annual losses will need higher levels of risk capital and will require more of the premium to cover the costs of the insurers risk capital. As the graph on the previous page shows, increasing variability as measured by the MPL, incurs a higher cost of capital. Once the MPL reaches 1,000%, the pricing structure only returns 42¢ in the dollar. Farmers, who can determine the value of transferring their risk, are likely to see this as bad value and not insure.

Insurer results (revisited)

If we meld the *hypothetical portfolio* with a Gross Loss Ratio of 69% with the *ideal portfolio* loss distribution, with expenses of 20% and a 180% MPL that requires a return of $0.8 million as the cost of risk capital or 5.9% of the premium, then insurers would have paid out 69¢ in claims and 20¢ in expenses or costs before costs of capital of 89¢ for every $1.00 of premium. This would have resulted in a surplus of 11¢ that more than covered their cost of capital of 5.9¢. At this level of variability in loss distribution insurers would have made a profit of 5.1% in addition to covering their cost of capital. The total premium charged to all farmers would have been $13.5 million and they would have received 69¢ in the dollar back from insurers.

If this was the likely outcome for the climate risk insurance product, then insurers would likely participate. However, the variability in the loss distribution is likely to be much higher but farmers ability to pay would remain the same. By looking at the results for insurers at the premium level likely to be affordable by farmers we can see the fundamental problem involved in developing a climate risk insurance product.

If the MPL was 250% and the same premium was charged, then the cost of capital would have been $1.5 million or 10.4¢ and insurers total costs, including the cost of capital, would have been 99.4¢ for every $1.00 in premium. Insurers would have just covered their cost of capital. Farmers would still have received 69¢ in the doll back from insurers. The difference here is that the variability in the loss distribution has increased by just 39% from 180% to 250%. This increase has changed the premium of $13.5 million from profitable for insurers to marginal at best.

For higher levels of variability in loss distribution, the insurers are unable to recover their costs of capital at the same level of premium. The reality is that the variability in loss distribution that is likely for a climate risk insurance product is going to be much higher than the MPL of 250% in this last example.

If the MPL was 1,000% and the same premium was charged, then the risk capital required would have been $9 million and the cost of capital 67¢ for every $1.00 of premium. For the same gross loss ratio and premium, insurers total costs including the cost of capital would have been $1.57 for every $1.00 in premium. No insurer would put their capital at risk as there is no potential to recover their risk capital costs.

So, in the real world something must give, and the path of least resistance has been to make up the difference through a premium subsidy. In very simplistic terms, to make this example work for insurers the answer would be to subsidize the premium by 57¢, so farmers pay $1.00 of premium and the government pays 57¢ to insurers. Circle squared but who wins?

Who benefits from Subsidising the Premium?

Insurers and distributors. A premium subsidy is good for insurers because the premium subsidy is going to insurer shareholders for the cost of the risk capital required to support the climate risk insurance product. A premium subsidy is also good for insurers and distributors because the reasonable proportional expenses at the 250% MPL become unreasonable at higher MPL's.

Insurer shareholders benefit

It is important to note that the government subsidy is not going to farmers but to insurer shareholders to cover their cost of risk capital. This cost of capital is an annual cost for exposing shareholders capital to loss. This is a legitimate requirement but the chance of losing the full $9 million in the example of the MPL of 1000% is still one in two hundred and fifty years provided the loss distribution calculations are correct, which it seldom is. However, a guaranteed 10% return on the assessed risk capital exposed is still a good result for insurers shareholders.

Insurers and distributors benefit

If we agree that a reasonable cost of distribution is 5% for an insurance product with a 250% MPL, is it still reasonable for the same product with a 1000% MPL? As the variability in expected portfolio losses increases, frictional costs that are established as a proportion of the premium, are likely to increase as well. If a fair value for distribution costs are 5%, loss adjusting costs are 5% and insurer administration costs are 10% and are determined at a normal level of variability of expected portfolio losses of say 250%, then why should these remain at the same proportion?

One of the primary reasons that insurers and distributors are supportive of premium subsidies is that they stand to make handsome margins for the work they do. Having established a proportional cost structure based on a normal portfolio of losses, it is very difficult to reduce it once established, so they continue to apply it to higher variabilities in the expected loss portfolio. This proportional cost structure generates excessive profits for insurers and distributors. This is due to the costs of distributing and administering the policies remains the same no matter what the level of variability of the portfolio's losses. However, only the need for risk capital increases with an increase in the level of variability of the portfolio's losses.

The table below looks at the likely profitability of insurers and distributors on a cost structure established for a normal level of variability of say 250% of the premium. If a reasonable profit margin of 10% is set when establishing the cost structure, then distributors and adjustors would make a profit of $71,875 on an income of $718,750 on a portfolio of expected losses of $10,000,000 with a 250% MPL. Insurers would only be expected to cover their expenses of $1,437,750.

Variabilty	Percentage	MPL 250%	MPL 500%	MPL 750%	MPL 1000%	MPL 2000%	MPL 3000%
Total Premium		14,375,000	17,500,000	20,625,000	23,750,000	36,250,000	48,750,000
Distribution	5%	718,750	875,000	1,031,250	1,187,500	1,812,500	2,437,500
Loss Adjusting	5%	718,750	875,000	1,031,250	1,187,500	1,812,500	2,437,500
Administration	10%	1,437,500	1,750,000	2,062,500	2,375,000	3,625,000	4,875,000
Distributor Profit	10%	71,875	87,500	103,125	118,750	181,250	243,750
Adjustor Profit	10%	71,875	71,875	71,875	71,875	71,875	71,875
Insurer Profit		-	328,125	343,750	359,375	1,359,375	1,421,875
Distributor Profit Margin		10%	12%	14%	17%	25%	34%
Insurer Profit Margin		0%	23%	24%	25%	95%	99%

As the variability of the expected portfolio of losses increase, the profits of distributors and insurers increases while their actual costs remain the same. However, the unchanging proportional cost structure is applied to a premium increased by the need for additional risk capital. At a variability of expected loss of 3000%, distributors profit margin increases to 34%. Insurers profit margin is 99% of their actual costs as the policy administrating and adjusting costs stay the same while they receive nearly twice as much as they need to pay the actual costs (adjusters are normally paid on an hourly rate plus expenses so they don't benefit from the proportional cost structure as insurers are not obliged to pass this on).

Little wonder then that insurers and distributors are so supportive of government premium subsidies as they offer excessive profit margins. Insurer shareholders lock in a 10% return on a significant amount of risk capital and stand to make a return on the administrative costs. Distributors stand to make higher profit margins as the higher premium amounts require no extra cost, but they receive higher remuneration.

The problem is compounded, as this type of government intervention overrides normal market pressures as no insurer or distributor has any incentive to manage these costs as they are being compensated through a premium subsidy. In fact, there is a perverse incentive to increase the portfolio losses, as the higher the variability in portfolio losses, the higher the justifiable risk capital costs become and more the premium subsidy can be argued to be increased, thus further increasing profit margins.

With the need for large amounts of risk capital for a climate risk insurance product, how can it ever be viable?

Viable climate risk insurance

For any insurance product, the amount of risk capital required is a pivotal factor for insurers being ability to price insurance at a level that provides the required return but remains cost effective for farmers to buy. As the amount of risk capital required increase, the ability to provide cost effective insurance for farmers reduces. If it is too capital intensive as in the MPL 1000% example, then the cost to cover the required return on the risk capital prices it out of the reach of farmers and introduces the need for a solution in the form of a premium subsidy.

To put this into context, the premium in our example above at a 250% MPL was $14.375 million. The premium at a 1000% MPL would have to be $23.75 million to cover the increase in risk capital from $8 million to $90 million to cover the increased loss distribution variability—a premium increase of 65%. This level of premium increase is likely to price the insurance beyond the reach of farmers.

The contention here is that the government should be providing a subsidy directly to pay for farmers losses rather than insurer shareholder returns. This can best be done through a government reinsurance pool that reduces the need for private sector risk capital and therefore reduces the cost of capital that needs to be paid by farmers.

For this to work, insurers must be able to rely on government risk capital to remove the need for insurers to commit excessive levels of risk capital to cover the possibility of catastrophically severe drought durations. The proposed government reinsurance pool would remove the need for insurers to capitalize for these rear events and to be able to provide a price that farmers could afford as the cost of capital embedded in the premium could be held at affordable levels.

A discussion of the government reinsurance pool concept is in the last section of this submission but before this a discussion of the insurers ability to manage a portfolio of climate risk policies to further reduce the viability of climate risk insurance is worthwhile as it improves its viability.

The historical context

A sceptic would argue that the MPCI experience shows that climate risk is uninsurable. However, any experienced agricultural underwriter will know that the reason for the failure of MPCI was that it was exposed to fatal adverse selection. This was predicted in 2016 in an IPART submission.

At the risk of going over old ground, the fatal structural flaws of MPCI are set out below. Included with them are the reasons for the optimism that the climate risk ecosystem proposed will solve these structural flaws.

Asymmetry of information

The developers of MPCI tried to overcome this by requiring a five-year accounting history of the individual farming enterprises performance. Obtaining individual farmer data was a sensible step, as it focused on the individual farmers risk profile, but it was shown to be inadequate to the task of eliminating the asymmetry of information.

Accounting records are a poor risk assessment tool. Agronomic risk factors would also have needed to be collected to acquire enough information about the individual farmers exposure to climate risk. The underlying challenge with asymmetry of information is that it exists because it is too time consuming and costly for a city-based underwriter to bridge the information gap.

What has been proposed with climate risk provisioning effectively introduces a delay period between when the cover is taken out and the effective commencement of cover. This extension of the forecasting horizon rebalances the symmetry of information.

If the farming enterprises is self-funding the risk through climate risk provisions, then the first time an insurer is exposed to full climate risk is the following season. In practice, if climate risk provisioning is commenced as soon as a farmer comes out of drought, then the farmer should have a couple of good years to set aside provisions and the climate risk insurer will collect premium through these years before they are exposed to climate risk claims through the exhaustion to the farmers provision.

The effective introduction of an extension of the forecasting horizon of years between when the insurance is taken out and the cover effectively starts, removes any asymmetry of information as both the farmer and the insurer have equal information on the exposure to risk—the unknowable risk exposure in three plus years' time.

Adverse selection

Providing an annual policy for a systemic risk can at best be described as courageous. Allowing farmers to delay insuring until after planting can at best be described as imprudent. These structural flaws allowed farmers to adversely select against insurers based on an asymmetry of information about the agronomic conditions they faced when it came time to elect to insure or not.

The climate risk provision would effectively remove the asymmetry of information through what amounts to a waiting period of a year or more. The climate risk insurance policy period of five-years once the farmer starts drawing down form provisions removes the ability of the farmer to move in and out of insurance. These two elements prevent the type of selection against the insurer that destroyed MPCI.

Moral Hazard

The risk of fraud for climate risk insurance will be like any other form of insurance. However, the risk from farmers insuring based on superior agronomic knowledge, greatly increased the exposure to claims for MPCI. Again, this was due to the structural flaw that allowed farmers to insure too late in the season.

The existence of a climate risk provision together with the fact that the variable costs of planting a crop are not covered, eliminates the increased moral hazard that was associated with MPCI.

Morale Risk

For farmers who had insured under MPCI the potential to change planting intentions was high. In a marginal season, once insured, a farmer could decide to plant the rest of the farm. Without the insurance they would likely have been more prudent and only planted a proportion of the farm area.

All annual MPCI products suffer from morale risk and managing this was problematic as described above. By only insuring fixed costs, the morale risk is remediated.

Systemic Risk

The systemic risk was not addressed at all through the structure of MPCI. This facilitated farmers ability to adversely select against insurers and only insure in years or regions exposed to greater risk. The core multi-year structure of the proposed climate risk insurance is designed to remediate the systemic risk through spreading the risk temporally and removing the ability of farmers to adversely select against insurers by entering and exiting the insurance at will.

Comparing the structural differences between MPCI and the proposed climate risk provides the basis for optimism that the proposed insurance can be viable. Another aspect to consider is portfolio management.

Portfolio management

An underwriter's primary task is portfolio management. This involves developing underwriting criterion that selects a portfolio that has an exposure to risk that is equal to or lower than the population of all exposures to risk—portfolio selection. The underwriter's objective is to write a portfolio with the lowest variability of loss possible. The lower the variability, the lower the amount of risk capital that will be at risk and the lower the premium that can be charged in a competitive marketplace.

Portfolio selection

For the proposed climate risk insurance, the heavy lifting in portfolio selection has already been done as only lower risk profitable farmers are able to fund climate risk provisions. High exposure to risky non-viable farmers will be excluded from the portfolio by virtue of them being unable to fund climate risk provisions. This focus on the innovative and profitable agricultural sub-set of all farmers performs a vital portfolio selecting role for the underwriter—the provisioning structure is self-selecting a lower variability to climate risk portfolio.

A comparison between the example of an *ideal portfolio* as outlined on page 24 and the likely makeup of the climate risk portfolio can further demonstrate whether the optimism that climate risk insurance as proposed is warranted. A discussion of the other elements of portfolio management are set out below.

Concentration risk

Limiting climate risk provisioning to majority family owned farming enterprises limits participation to a subset of farmers that will tend to consist of smaller more homogeneous farming enterprises. There will still be variability in the sum insured but this will be lower than the variability would be if corporate farming enterprises were also able to participate.

Although a long way short of an ideal portfolio, it is an improvement to the general population of farming enterprises. This will self-select a lower sum insured policyholder, thus reducing the concentration of risk associated with individual policyholders.

Accumulation risk

The job of managing the accumulation of exposure to risk will still fall to the underwriter under the proposed climate risk insurance. However, avoiding an accumulation of exposures to risk in any one location is a primary concern of any underwriter's portfolio selection. Developing a good geographical spread of risk is essential to limiting the variability of any insurance portfolio and is a risk shared by all classes of insurance portfolios.

Correlation risk

One portfolio management task for the underwriter is to select a portfolio of policyholders who have a low correlated exposure to loss. Climate risk is a systemic risk so there is a positive correlation between policyholder losses. This is unavoidable but more manageable in the context of multi-year policies.

The proposed climate risk insurance will be based on a rolling multi-year policy structure. At any point in time the policy has a minimum policy period of five years. If the climate risk deteriorates, the insurer is locked into the next five years of the farmers exposure to risk. Conversely, if climate risk improves, the farmer is locked into continuing to pay premiums for five years.

The temporal spread of risk broadens the portfolio premium pool to compensate for the policyholders correlated risk.

The inherent structure of the climate risk ecosystem improves the risk portfolio selection opportunities for underwriters. Combined, the level of risk that insurers would be assuming should be limited enough for them to be prepared to offer climate risk insurance in the absence of government subsidies beyond the need for a government reinsurance pool. It would be helpful if there was an incentive for farmers to buy climate risk insurance. This can be achieved with minimal intervention in the market by government.

Farmer incentives to insure climate risks

The take up rate by farmers of climate risk insurance will be critical to the success of this product, so creating an environment that encourages farmers to take up climate risk insurance will be essential. There are only two steps that would need to be taken by the government to incentivize the take up rate.

1. All government relief should be withdrawn from farmers in regions that come out of drought. Once farmers in these regions can start funding their climate risk provisions, this should be the end of direct government relief.
2. Access to indirect government support through catastrophe climate risks should be limited to farmers with climate risk insurance. As the name suggests, the government reinsurance pool should only be accessible by insurers that insure climate risk insurance and have claims from farmers that exceed their cover limits—five years or the farmers climate provision limit. This would limit government assistance to prudent farmers with climate risk insurance.

This minimal government intervention should provide the necessary incentive for farmers to take up climate risk insurance.

As discussed, the ability to minimise variability across an insurance portfolio through portfolio selection is a primary objective of the underwriter. A secondary objective of the underwriter is to protect the portfolio against unacceptable variability through sharing the risk with other risk capital providers.

This involves assessing the most efficient use of the available risk capital. The final part of this submission addresses this issue of efficient risk capital utilization. This is primarily achieved through the Government Reinsurance Pool and discussed in the next section.

Government Reinsurance Pool

The last section identified the primary objective of an underwriter as the need to manage the composition of the portfolio through portfolio selection. An underwriter's secondary objective is to determine the best way to allocate risk capital between the available sources to support the portfolios loss distribution. This involves determining the level of risk capital required and then determine the most efficient source of risk capital.

Determining the level of risk capital required

Returning to the *ideal portfolio* example on page 24, it was shown that the higher the variability in the expected loss distribution, the more risk capital was needed and the higher the proportional of the premium is required to cover the cost of risk capital. This is shown in the table below where the cost of capital proportionally increases for higher variability in loss distributions as represented by expected Maximum Probable loss (**MPL**).

	Variability in Expected Result represented as a Maximum Propable Loss (MPL)						
Variability	MPL 180%	MPL 250%	MPL 500%	MPL 750%	MPL 1000%	MPL 2000%	MPL 3000%
Claims	74%	70%	57%	48%	42%	28%	21%
Expenses	20%	20%	20%	20%	20%	20%	20%
Cost of Risk Capital	6%	10%	23%	32%	38%	52%	59%
Total Premium	100%	100%	100%	100%	100%	100%	100%
Expected Losses	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000
Cost of Capital	$ 800,000	$ 1,500,000	$ 4,000,000	$ 6,500,000	$ 9,000,000	$ 19,000,000	$ 29,000,000
Expenses	$ 2,700,000	$ 2,875,000	$ 3,500,000	$ 4,125,000	$ 4,750,000	$ 7,250,000	$ 9,750,000
Total Premium	$ 13,500,000	$ 14,375,000	$ 17,500,000	$ 20,625,000	$ 23,750,000	$ 36,250,000	$ 48,750,000
Cost of Capital	6%	10%	23%	32%	38%	52%	59%

Underwriters rely on actuarial analysis to determine required capital. This will be based on the expected portfolio loss distribution together with the predetermined level of confidence and probability of loss that are set by the insurer management and the regulator. The systemic nature of climate risk means that the expected variability in losses is going to be high in comparison to other classes of insurance.

The uncertainty associated with a new product is going to mean that any actuarial assessment of the expected portfolio loss level and expected variability in the result will be loaded for uncertainty to protect the insurers risk capital from early loss. Once the variability in result is assessed to be in the thousands of percent, the product would not be financially viable. Confirmation of this can be seen at the MPL of 3000%. At this level of expected variability, frictional costs represent 79¢ in each $1.00 of premium—a claims payment return for farmers of one dollar of claim for each five dollars of premium.

The complexities of finding a solution to squaring the circle on cost effective risk capital allocation for a climate risk transfer product for farmers, is the reason it has not been done before, other than through a premium subsidy.

If the governments objective is to subsidize farmers losses, then subsidizing the premium is an extremely inefficient way to do it.

Allocating risk capital

It would be far more efficient for the government to reduce the variability in the portfolio by reducing the need for private sector risk capital. This could be done by providing risk capital for the catastrophe climate events through a government reinsurance pool. This would allow the private insurance sector to operate where it is efficient—between the primary climate risk provisioning of the farmer and the catastrophe government reinsurance pool.

Before the government reinsurance pool is exposed to climate risk losses, the private sector risk capital should be allowed to be allocated where it is efficient to do so. Allowing the private insurance sector to develop a product and pricing model that is based on a capped variability in portfolio losses is essential to the efficient allocation of the available risk capital.

Determining the level of risk capital required is achieved by developing appropriate portfolio selection criteria and determining the remediated portfolio variability. As previously discussed, there are underwriting portfolio selection methods available to reduce the variability. These reduce the need for risk capital by:

- Limiting the exposure to a concentration risk by insuring only small farmers or spreading the risk of large farmers by reinsuring them or by co-insuring them with other insurers—out of fashion locally but an integral part of insuring difficult risk at Lloyds;
- Limit exposure to an accumulation of risk by ensuring that the portfolio is well spread geographically;
- Limit exposure to systemic risks by spreading the risk temporally over a multi-year period; and
- Limit exposure to catastrophes through the transfer of variability to reinsurers.

These methods for reducing the variability of the portfolio's losses should be utilized to reduce the need for risk capital so that a financially affordable pricing model can be developed. The first four of these have been discussed above. It is the reinsurance method that needs further discussion here.

Under the proposed climate risk ecosystem, private sector reinsurer risk capital would be employed by insurers to limit the need for their own risk capital. Reinsurance is used in all forms of insurance as the cost of reinsurer risk capital is lower than insurer risk capital. This is due to the reinsurers ability to aggregate the experience of many insurers both regionally and globally. This aggregating provides a superior geographical spread of risk that lowers the variability of the combined global portfolio.

Reinsurance has developed because it is an efficient use of the available global private sector risk capital because their geographical spread of risk is significantly broader and their risk volatility significantly lower, than an individual insurer. This means their cost of capital will be lower than the individual insurer. Insurers who enter the climate risk insurance market should be free to access the reinsurance market to maximise the efficient use of available private sector risk capital.

In the absence of a detailed actuarial assessment of this proposal but with the benefit of experience with agricultural risk, it is conceivable that with:

- the structure of the primary climate risk provision;
- a sum insured limited to two seasons fixed costs;
- a five-year policy period; and
- utilizing the reinsurance risk capital,

that the risk capital requirement could be limited to MPL of 250%. At this level, farmers would receive 70¢ in the dollar, which would represent reasonable value—like existing crop insurance.

However, to achieve this it will be necessary for the government to take the risk of losses from more severe drought with a lower frequency. Again, without a detailed actuarial assessment of this proposal, the sum insured limit of double the annual fixed costs of the farm enterprise and five-year coverage limit should already limit insurers exposure to losses with a frequency in the order of one in fifty years. Under this proposal the government reinsurance pool would cover loss frequencies of less than one in fifty years, thus limiting the required private sector risk capital to 250% of the premium.

How each individual insurer splits the risk capital requirement between shareholders and reinsurers would be a matter for the individual insurer. APRA already has the appropriate regulatory controls to manage this. All that is proposed is that the government establishes a farmer's climate risk reinsurance pool to allow for the efficient use of private sector risk capital.

The climate risk being covered by the reinsurance pool would be a catastrophe level of climate risk with an expected frequency of less than one in fifty years. The nature of a climate risk with this frequency would currently be expected to be funded by the government. The benefit of the proposal is that the government is only being asked to fund known levels of loss with an uncertain frequency.

This funding would be after the farmer has exhausted their own provisioning and the insurance sector has utilized the efficient level of risk capital. This proposal vastly improves the government's ability to manage climate risk for an innovative and profitable agriculture sector.

Conclusion

The thumb nail sketch of the proposal in this submission could appear complex but all it requires from the government is to:

- allow climate risk provisioning by farmers, an evolution of the existing Farm Management Deposit scheme; and
- formalise the ad hoc funding of extreme weather events through a government reinsurance pool.

Of course, this submission does pre-suppose that the insurance industry will have the ability and inclination to provide climate risk insurance to all the majority family owned farming enterprises that want it. The alternative of premium subsidies is far more attractive for insurers. As outlined above, except for the availability of enough available risk capital, there is no technical reason why providing climate risk insurance isn't feasible. The availability of willing risk capital to participate in agricultural insurance is not infinite.

The staged introduction of climate risk provisioning by virtue of the difference in timing of the ending of the drought in different regions should help by reducing the immediate demand for risk capital. However, there is no getting around the fact that this represents significant deployment of additional risk capital. For this to be occurring at a time when investors are chasing the level of investment returns that insurance can provide is an advantage that should not be underestimated.

What is being proposed is not easy, but it is too good an opportunity not to be investigated further.

About the Author

The author has over forty years of insurance experience both in the Australian insurance market and at Lloyds. For over twenty-five years' he has specialized in agricultural insurance. Having created the Agricultural Underwriting section at GIO Australia in 1995 he introduced several innovative new product and coverage features. After a stint as Senior Underwriter at Agricola Underwriting Management, he setup his own specialist crop insurance broking business and successfully advised farmers on crop insurance for thirteen years. In 2014, Dutch agricultural insurer, Achmea appointed him as their Australian Chief Operating Officer. In this role he had the dual responsibility for insurance operations and underwriting results.

Since 2015 he has joined with other insurance professionals to establish and agricultural underwriting agency, AgInsure, to develop climate risk financing solutions. AgInsure is 50% owned by Innovative Risk Transfer.

He holds a Master of Business in Financial Services majoring in General Insurance and is a Fellow of the Australian and New Zealand Institute of Insurance and Finance.