

Working Papers

Incentives, Information
and Drought Policy

Gary Stoneham, Arthur Ha,
Jane Harris, Bill Fisher
and Loris Strappazzon

December 2004

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Economics and Policy Research Branch
Strategic Policy Division
Department of Primary Industries¹

¹ The authors would like to acknowledge the substantial contribution of Leanne Sandwith in the preparation of this report.

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Dear Reader,

The attached paper 'Incentives, Information & Drought Policy' has been prepared by members of the Economics and Policy Research Branch of Department of Primary Industries Victoria. In this paper, the authors have analysed drought as an economic and political problem and identified some potential policy responses.

The views expressed in this Working Paper are those of the authors and do not represent Victorian Government policy.

Yours sincerely

A handwritten signature in black ink, appearing to be 'GS', with a long horizontal line extending to the right.

Gary Stoneham
Chief Economist



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Executive Summary

Drought is a common feature of our climate in Australia.

Droughts cause significant economic impact.

There is no economic efficiency case for governments to intervene however governments allocate significant public funds to drought assistance.

Under the National Drought Policy drought is regarded as a normal business risk except if circumstances are 'exceptional'.

There are generous programs to help farmers prepare for drought and assistance is provided once EC is declared.

Australia is subject to droughts that are caused by large-scale climatic influences, notably the 'El Nino Southern Oscillation' (ENSO) phenomenon. They can have profound financial impacts on agricultural producers that extend into regional, state and national economies. There have been eleven such droughts over the last 150 years.

Most economic assessments conclude that there is no economic efficiency case for governments to provide drought assistance. However, significant public funds are allocated to farmers during droughts. Around \$1b was paid to producers for the 1982-83 drought and the 2002-03 drought is estimated to result in payments of around \$2b.

In 1992, drought policy was fundamentally altered when a National Drought Policy (NDP) was agreed between the Commonwealth and the States. The NDP recognises that droughts are a normal part of the farm operating environment (rather than a natural disaster) to be managed like other business risks. However, it was considered there could be 'exceptional' droughts for which farmers could not be expected to prepare or manage and that Government assistance would be required during these "exceptional circumstances" (EC).

In exceptional, rare and severe events, farmers in EC-declared areas can apply for 'welfare assistance' and/or 'business assistance' (interest rate subsidies (50%) on new and existing loans). In addition, farmers also receive assistance before droughts to prepare, and the Australian Government alone has spent around \$1b on business preparation programs through the Agriculture - Advancing Australia (AAA) initiative since 1997.

In 2002-03 lobbying by farmer groups and public sentiment led to extra assistance provided outside NDP.

It is widely recognised that the NDP did not work well during the 2002-03 drought. Despite its principle of 'self-reliance and assistance only in rare and severe EC events', governments were pressured to provide assistance earlier than EC policy prescribed. For example, the NSW Government introduced transport subsidies in mid 2002, and the Victorian Government introduced Farm Business Support Grants (introduced in October 2002) in response to intense media interest, pressure from farm groups and the broader community.

Drought assistance is not targeted efficiently or equitably.

Drought assistance is difficult to distribute equitably and causes economic efficiency costs. Thus, although there is no economic efficiency reason to provide drought assistance there is a case to improve the way that a) governments interact with producers in times of drought (the mechanism design problem) and b) State and Commonwealth governments interact (the institutional design problem) in their response to drought.

There is a strong second-best case to improve drought policy mechanism and institutional arrangements

Drought policy design

Drought policy cannot be improved unless it deals with problems of:

Four problems need to be solved if governments are to improve the efficiency and effectiveness of drought policy: adverse selection, moral hazard, government commitment and incentive compatibility.

- *adverse selection*

Government needs to know some information about individual producers (eg. their financial 'viability') before it can target assistance fairly. This is private information but valuable to government and is referred to as the hidden information, or adverse selection, problem.

- *moral hazard*

Moral hazard refers to the fact that it is difficult to observe whether producers actively prepare for drought and manage drought, or take actions that make them eligible for drought assistance — the hidden action problem.

- *gov't commitment*

Government commitment refers to the problems associated with maintaining drought policy provisions (eligibility criteria, payouts etc.) when pressured by producers.

- *incentive compatibility*

Incentive compatibility refers to policies that provide incentives for producers to exert the right amount of effort (effort consistent with economy-wide rather than individual well-being) with respect to preparedness for drought, conservation of the environment and animal welfare.

The National Drought Policy fails each of these criteria.

These are useful criteria against which to assess current or proposed drought policies. The NDP fails each criteria. The key reason that the NDP is ineffective is that government attempts to find out about farmers' eligibility for assistance during the drought. In these circumstances farmers will be reluctant to reveal private information that would disqualify them from receiving assistance (adverse selection) and may even alter behaviour so that they become eligible for assistance (moral hazard). Farmers who invest in self-reliance are not rewarded for their efforts, at least in terms of drought policy, and there are incentives for farmers to lobby for more assistance and easier access to assistance. It is very difficult if not impossible to design an efficient and fair drought policy that relies on ex post revelation of information. A completely new approach to drought policy is needed.

A completely new approach is needed to solve the information problems.

HECS-style schemes for drought do not solve the underlying problems. Capital markets already operate efficiently for primary producers.

While the underlying justification for the HECS scheme is that capital markets have limited information about students on which to base lending decisions, this reasoning does not hold for farmers. Primary producers are able to secure finance at the prevailing market interest rate and financial institutions are generally willing to provide finance to producers considered profitable in the long term.

Multi-peril crop insurance is not viable. Systemic risk and moral hazard problems raise premiums.

Insurance is the logical risk mechanism to manage drought risk. However, multi-peril insurance has been shown to be unsuitable. Premiums will be high (demand low) because of the systemic nature of drought, making risk pooling difficult. Moral hazard and adverse selection problems leading to high transaction costs, have proven insurmountable for any crop insurance schemes attempted. In other countries the payouts from multi-peril insurance schemes are up to 4.5 times greater than premiums collected.

Rainfall insurance reduces scope for moral hazard but there are problems with basis risk.

Rainfall insurance reduces moral hazard and adverse selection problems lowering transaction costs (because the trigger is independent and reliable) but introduces basis risk (imprecise correlation between income and rainfall). Basis risk can reduce the attractiveness of rainfall insurance to farmers.

Weather derivatives and yield index insurance can reduce basis risk but more research is needed.

The private sector can provide these products efficiently.

Commercial risk management products alone will not fill the drought policy vacuum.

Broader welfare, structural adjustment, environmental and animal welfare considerations exist.

***Drought assistance contracts** are a useful context in which to frame drought policy. Key features include:*

Menu of contracts -one contract will not suit all producers.

Self-selection into relevant contracts

Incentives will be needed to induce farmers to self-select into efficient contracts

Weather derivatives and yield index insurance seem to offer scope to address the basis risk problem. Weather derivatives can be constructed from any climatic event including rainfall and temperature provided there are reliable data available. Transaction costs and systemic risk problems will be lower than rainfall insurance but weather derivative contracts may not eliminate basis risk. Yield index insurance contracts employ a non-linear relationship between rainfall and yield to estimate a yield function on which contracts are based. More research is needed to test whether this approach can reduce basis risk and to explore transaction costs. Nevertheless, weather derivatives/yield index insurance appear to be the best risk management products available provided they are offered by the private sector.

Although insurance products offer some interesting possibilities to manage risk, these products do not fill the policy vacuum. Farmers will continue to lobby for assistance and governments will respond which will destroy the feasibility of, and incentives for, commercial risk management products. A broader drought policy framework is needed to encourage farmers to use commercial risk management products and/or self-insure. Drought policy can be improved by a) improved policy mechanism design and b) better institutional arrangements to manage government commitment, structural adjustment and welfare considerations.

A more efficient and fairer drought policy framework can be developed by drawing on ideas from the economics of information. This framework can be used to specify the way farmers interact with government and the private sector to manage drought risk. Salient features of modern risk management contracts can be woven into drought policy.

The private insurance sector essentially faces the same information problems that confront drought policy. They deal with these problems by providing incentives for truthful revelation of type, self-selection into a menu of contracts rather than "one size fits all", and by offering incentive compatible contracts.

This paper provides a broad description of drought policy that utilises a menu of incentive contracts. One set of contracts for those farmers who consider they have long-run prospects of being profitable and another for those who consider that they are likely to be unprofitable in the

Government could offer inducements for:

- *Rainfall insurance*
- *Weather derivatives*
- *Self-insurance*

Viable producers would be attracted to a mix of these products according to needs...but would be excluded from other forms of drought assistance.

Government would also offer other forms of assistance attractive to non-viable farmers eg. adjustment assistance.

There are efficiency costs...but economic theory suggests that there are large gains from improved targeting of assistance, reduced moral hazard, and improved incentive compatibility.

Budgetary costs of drought assistance would be reduced.

long-run. Under this approach inducements would be provided to encourage farmers to self-select into efficient classes of contract. Well-designed incentives will induce farmers who consider themselves to be profitable in the long-run to self-select into contracts that make them better off. In this case the inducement could be either a subsidy on premiums for commercial risk management products (rainfall insurance/weather derivatives/yield index insurance) or a subsidy on self-insurance through a mechanism we have labelled a Risk Management Deposit (RMD). RMDs are similar in concept to Farm Management Deposits but specifically designed to offer the minimum inducement needed to attract relevant farmers into this form of risk management product. Farmers could choose a mixture of insurance products (offered by private firms) and RMDs according to life-cycle and business considerations. Long-run unprofitable producers will find this contract relatively unattractive and will self-select into a contract that offers exit or adjustment assistance through special welfare benefits or an exit grant. The selection of the contract reveals which type the producer is to government, allowing assistance to be targeted efficiently and equitably, thus solving the adverse selection problem. Viable farmers receive assistance to prepare for drought and other risks, and non-viable farmers receive assistance to adjust.

Incentive contracts also deal with moral hazard by providing incentives for profitable producers to save surplus funds using RMDs or by shifting some of the risk of drought onto unprofitable producers. In both cases, the contracts apportion risk between the government and the producer, providing farmers with an incentive to manage drought risk themselves. Furthermore, monitoring and enforcement is not required since producers have an incentive to self-insure some drought risk (this is despite the non-verifiability of moral hazard in the context of drought).

Although further quantitative analysis is required, economic theory suggests that the cost of offering inducements to farmers to self-select into efficient classes of contract will significantly lower the fiscal burden of drought. This approach should result in budget savings to government besides being more efficient and fairer.

Further analysis is needed and a pilot could be developed to test and demonstrate this approach.

Further analyses are needed to determine the minimum subsidies, and relative subsidies, required to provide inducements for producers to self-select into the appropriate contract. A pilot would be useful to test and demonstrate the approach.

Improving the way that government manages drought will be important. Institutional design must ensure credible commitment by government otherwise drought policy will fail.

Institutional design

Although improved drought policy mechanisms appear to offer many advantages they will be in-effective without credible government commitment. This paper provides a discussion of various strategies that could be employed to address this problem including legal and contractual constraints. These are not easy to design or implement. Further analysis will be needed to design these mechanisms and to understand community support and lobbying processes.

Further research is needed in this area.

Reform of drought policy also presents difficulties given public sentiment and the precedent of government support in times of drought. Processes that inform the community about the impact of current policies and the various options for reform will be needed.

The interaction between the taxation system, drought, the environment and animal welfare are also important considerations in designing drought policy.

Reform of the tax system is highlighted as necessary to remove perverse incentives against self-insurance. The environmental and animal welfare implications of drought are also important. The current approach to drought includes incentives that lead to degradation of the environment. Well-designed drought policy will reduce environmental damage because improved incentive structures will encourage farmers to incorporate all costs into farm management strategies.

1. Introduction

Australia is the only continent where the overwhelming influence on climate is a non-annual climatic change, the 'El Nino Southern Oscillation' (ENSO) (Flannery 1994). Severe 'droughts and flooding rain' have been observed from both geological and human records. For example, Lang (in Williams 1967) recorded a drought in the 1830s lasting nearly three years where "the heavens became as brass and the earth as iron". There have been eleven major droughts recorded since 1864 (Botterill and Fisher 2003). Drought events have had a profound influence on the Australian landscape and also on the size and structure of our primary industries.

ENSO events have a severe financial impact on both individual farm businesses and the economy as a whole; they expose soil to severe degradation and can dry-up rivers and lakes for extended periods. Agricultural producers bear much of the financial damage caused by drought and farmers manage the risk imposed by drought in a variety of ways using both on-farm and off-farm measures. However, over the latter half of the 20th century, governments have become increasingly drawn into providing assistance to farmers adversely affected by drought. In effect, governments now share some drought risk with primary producers. It is questionable, however, whether this assistance has been provided for the right purposes or to the right people. Lack of commitment to pre-existing policies has led to increased lobbying by farmers and has provided incentives for farmers to change their behaviour to attempt to gain extra assistance. It can also be argued that drought assistance has had adverse impacts on the environment and animal welfare.

The aim of this paper is to examine drought policy as an economic problem – to systematically tease out the key features of a more efficient and equitable response that governments could employ in preparing for future droughts.

2. Background

An important characteristic of droughts in Australia is that they occur on a systemic basis - often over large tracts of land rather than as isolated independent events. It has only been recently, however, that meteorologists have attributed many drought events to systemic climatic processes such as the 'El Nino Southern Oscillation' effect (ENSO). Table 2.1 (see Botterill and Fisher, 2003) shows that the eleven major droughts since 1864 have affected large tracts of land in Australia.

ENSO and other large-scale climatic events are largely borne by farmers but their impacts also show up in the national accounts. The 2002-03 drought, for example, caused average farm cash incomes in Australia to fall by 42 per cent in the broadacre industries and 72 per cent in the dairy industry (Martin *et al.* 2003). In Victoria these sectors experienced reductions in cash income of 43 and 82 per cent respectively. Adams *et al.* (2003) estimated that the drought caused regional income in the Mallee and Wimmera regions of Victoria to decline by 15.5% and 11.1% respectively, state income (GSP) to decline by 1.6% and national income (GDP) to decline by 1.2%. The drought reduced investment in Victoria by 0.5% (0.7% at the national level); caused employment to decline by 0.4% in Melbourne, 0.6% in Victoria and 0.8% nationally; and export volumes to decline by 4.3% in Victoria and 5% nationally.

Table 2.1 Incidence and severity of drought in Australia

Year	Distribution/Impact
1864-66	All states except Tasmania
1880-86	Southern and eastern states affected
1895-03	Affected most of Australia...sheep numbers halved and 40 percent loss of cattle
1914-15	South Australia, Tasmania, New South Wales 19 million sheep and two million cattle lost
1918-20	Only parts of Western Australia free from drought
1939-45	New South Wales, Victoria, Queensland, some parts of Western Australia...loss of nearly 30 million sheep
1963-68	Widespread drought. 40 percent drop in wheat harvest, 20 million sheep lost
1972-73	Mainly eastern Australia
1982-83	The most intense and widespread on record. Total loss estimated in excess of \$3,000 million. Eastern and southern Australia affected.
1991-95	Average production of rural Australia fell by 10 per cent. \$590m drought relief provided by the Commonwealth.
2002-03	Eastern and southern Australia

Source: Botterill and Fisher (2003), pp.40-43.

2.1 Current drought policy

In 1992 drought policy was fundamentally altered with the agreement of the National Drought Policy. The definition of drought changed from a “natural disaster” to a normal part of the farm operating environment to be managed like other business risks. However, it was considered there could be ‘exceptional’ droughts for which farmers could not be expected to prepare or manage and that Government assistance would be required during “Exceptional Circumstances” (EC).

Under the NDP, areas are EC-declared for two years by the Australian Government following applications from State Governments (collaborating with interested parties) and assessments by the independent National Rural Advisory Council. An EC event is defined as being ‘rare and severe’, resulting in a one in 20-25 year downturn in income amongst a significant number of farmers in an area over a period of greater than 12 months (Appendix 1 contains further details).

Farmers in EC-declared areas are eligible to apply for welfare assistance (equivalent to ‘Newstart’ welfare available to all Australians except farm assets are excluded from eligibility tests) and/or business assistance. Business assistance is offered in the form of interest rate subsidies (50%) on new and existing loans up to a maximum of \$100,000 in any 12-month period, with a cumulative maximum of \$300,000 over the previous 5 years (subsidies are given as cash – no obligation to use for interest payments).

In addition to assistance during droughts, farmers also receive assistance to prepare for drought, primarily through the Australian Government’s *Agriculture - Advancing Australia* (AAA) program that includes: FarmBis to promote new skills (State: Commonwealth funded); Rural Financial Counselling services to assist farmers assess their situations and consider their future (State: Commonwealth funded); FarmHelp to assist non-viable farmers leave agriculture (Commonwealth funded); Research on climate variability; and Farm Management Deposits to promote self-management of financial risks (funded via foregone taxation). Spending by the Australian Government alone on AAA is estimated at around \$1 billion since 1997.

It is widely recognised that NDP had a number of practical short-comings which became evident during 2002-03 drought. Despite the objective of ‘self-reliance and assistance only in rare and severe EC events’, governments were pressured to provide assistance earlier than EC policy prescribed. For example, NSW introduced transport subsidies in mid-2002 and Victoria introduced Farm Business Support Grants in October 2002 (see Appendix 2). These measures were in response to intense media interest and pressure from farm groups and the broader community. Similarly, the Commonwealth responded to this pressure by introducing measures (*prima facie* EC and ‘interim’ income support) before events were officially ‘rare and severe’ (see www.affa.gov.au - rural policy and innovation).

The resulting confusion amongst farmers, due to different types of assistance, and a general recognition that EC policy could be improved, led to a review instigated by the Australian Government (Woods 2004). New initiatives to enhance preparedness (combined with reduced emphasis on business assistance) are being developed through State/Territory/Commonwealth Ministerial forums. However, the key issue - governments acting outside NDP due to political pressure - is not being directly addressed. Rather, it is hoped that developing less cumbersome EC-declaration processes, so that assistance flows more swiftly, will remove the 'need' for governments to step in before rare and severe events are declared.

The push to strengthen the message that drought preparedness is a farmer's responsibility follows evidence from a review of AAA (DAFF 2004) that a significant proportion of farmers still do not prepare adequately for drought. The review notes (stating on pages 7 and 8) the following:

- "Of significant concern is the one third of farmers that perceive drought could have a significant impact on the viability of their farm but have done nothing about it".
- "Of greatest concern is that more than 75 per cent of farmers in this group are not planning to implement a drought management response in the next 12 months".
- "Overall, 63 per cent of farmers were found to have specific strategies to deal with a serious drought. Most of these strategies were production oriented, including stock piling of feed, decreasing stocking rates, improving irrigation practices or using water more efficiently, building additional water storage facilities, undertaking prudent financial management and using Farm Management Deposits (FMDs)".

In the 2002-03 drought, assistance was provided to Victorian farmers in the form of cash grants (called Farm Business Support Grants – FBSG). These grants were for up to \$20,000 per farm to assist individuals who met eligibility criteria (see Appendix 2). This assistance was provided because EC assistance was perceived, by interest groups, to be provided "too slowly". Even though cash grants are widely perceived to offer a more neutral form of assistance than interest and other input subsidies, there remain significant targeting and incentive issues with this form of assistance. DPI commissioned the Australian Bureau of Agricultural and Resource Economics (ABARE) to conduct a survey of the characteristics of farmers who received Farm Business Support Grants. The results of this survey are summarised in table 2.2, from which the following observations can be made:

Assistance was provided to farmers who did not prepare for drought - The survey results indicate that recipients of FBSGs had much lower levels of Farm Management Deposits (667%) than non-recipients. Those that received a grant appear to have higher numbers of stock and retained stock during the drought. As shown in table 1, the 'opening livestock value' of recipients of the FBSGs was on

average 4 per cent higher than non-recipients but their 'closing value' was 30 per cent higher. Non-recipients of support tended to sell stock 'early' and 'saved' money that may then have made them ineligible for the grant because they were assessed as 'not in need'.

Assistance was provided to farmers with higher net asset values - Recipients of cash grants had, on average, 50% more land than non-recipients and 24% higher total capital value of farm.

Assistance was provided to "risk-taking" farmers - Recipients of drought assistance tended to be less cautious or 'risk-averse' types. Their characteristics included: *lower equity* (recipients 7.4% lower equity than non-recipients); *lower liquid assets* - recipients had 217% lower total liquid farm assets, fewer public shares (200%) and lower bank savings (63%) than non-recipients; and *higher farm debt* - recipients had 33% higher farm debt prior to the drought than non-recipients.

Table 2.2 Analysis of Victorian Farm Business Support Grants

Parameter	Recipients		Non-Recipients		All	
	Estimated Mean	RSE	Estimated Mean	RSE	Estimated Mean	RSE
Population	3,025	.	18,929	.	21,953	.
Sample Size	52	.	262	.	314	.
Physical						
Area (ha)	746	14	498	4	532	4
Financial						
Total capital, closing (\$)	1,851,895	10	1,496,125	4	1,545,144	4
Land capital (\$)	1,392,587	9	1,180,195	5	1,209,459	4
Opening value of livestock	185,689	6	178,789	4	179,739	3
Closing value of livestock	159,749	6	123,326	6	128,344	5
Liquid assets (\$)						
Total farm liquid assets	42,550	21	135,174	26	121,295	25
Opening FMDs	2,357	70	18,438	18	16,028	18
Closing FMDs	2,090	50	21,012	15	18,176	15
Shares public company	21,963	18	65,804	53	59,234	50
Bank savings	12,122	36	19,661	19	18,532	18
Debt (\$)						
Total farm debt opening	279,675	17	157,569	8	174,944	7
Total farm debt closing	344,535	13	166,987	8	192,251	7
Land debt opening	149,906	19	94,103	12	102,043	10
Equity, closing (%)	81.4		88.8			

Source: ABARE unpublished data.

Note: RSEs are a measure of an estimate's sampling error as expressed as a percentage.

3. Should government intervene because of drought?

It is widely recognised that farmers, like other private firms or individuals, are not able to carry the financial impact of all contingencies. Generally, risk averse firms look for a risk neutral partner (such as insurance firms and other financial institutions) to share these risks. These large organisations can carry risk in a less costly way than small firms. Conventional economic wisdom suggests that markets, such as commodity markets, capital markets and insurance markets, can be relied on to efficiently allocate resources, if there is a complete and efficient set of these markets. While government may choose to intervene in the economy to influence the distribution of wealth across members of society, intervention for economic efficiency reasons is only warranted where:

- a) markets are inefficient or missing (the necessary but not sufficient condition); and
- b) benefits of intervention exceed costs.

3.1 Inefficient/missing markets

Markets operate efficiently under a specific set of conditions including when there is perfect information, low transaction costs and well-defined and enforceable property rights. For tradeable goods these conditions generally hold, leading economists to argue that a full set of efficient commodity markets will exist. Similar reasoning can be applied to assess whether capital, labour and risk markets are efficient.

In the past, most economic analysis of drought has concluded that the pre-conditions for efficient markets are not substantially violated, suggesting no case for government to intervene on economic efficiency grounds (see Freebairn 1983). Furthermore, past policy analysis has suggested that producers can insure against drought by purchasing insurance. In this world, producers will perfectly insure against drought if there is no government intervention. However, there are two factors that limit the scope for risk markets to be employed to manage drought:

Systemic risk - Systemic drought events (ENSO induced) will mean premiums for drought insurance will be high. Bardsley *et al.* (1984) explain that private insurance companies will not be interested in offering insurance contracts when there are limited risk pooling opportunities. Insurance works best where individual risk events are independent from each other (eg. if one house burns down this does not mean all houses burn down). Where all farms go into drought at the same time (because of ENSO) insurance may not be offered because premiums will be too high. On the other hand, if droughts were independent random events on different farms, it could be argued that efficient insurance markets should emerge and there would be no first-best case for government intervention.

Crowding-out - Governments have a history of providing assistance in times of drought which makes commercial risk management products relatively less attractive. In effect, governments bear some drought risk without cost to farmers.

Newbery and Stiglitz (1981) and Stiglitz (1988) argue that systemic risk and consequent incomplete markets for drought risk may constitute market failure because insurance markets are missing. Where relevant risk markets are missing, farmers use commodity markets to perform both an allocative and risk diversification functions. This imposes costs on the economy because commodity markets do not efficiently price risk. Whether because of systemic risk or crowding-out by government, drought risk markets are limited and premiums will tend to be high. This suggests that the first condition for government intervention - (that markets are missing or inefficient) can be observed.

3.2 Benefits and cost of intervention

The case for or against government intervention then rests on whether the benefits of intervention outweigh the costs, that is whether government can offer drought insurance at a lower price than private providers. This is unlikely for two reasons:

Ability to spread risk - Just as insurance firms have discovered systemic drought risk leads to high premiums and low demand for insurance, Newbery and Stiglitz (1981) note that this also precludes government from doing any better. Unless it can be argued that government has greater ability to spread risk than private companies, there are no underlying reasons to suggest government could lower the price of drought risk. International insurance companies are large, have scope to underwrite risks, and hold diversified portfolios unrelated to Australian drought. It is difficult to believe they have less ability to spread risk than government

Skills - Insurance is not generally the business of government and governments do not have better information systems, actuarial skills etc. (needed to efficiently price risk) than the private sector. Government is unlikely, therefore, to be capable of effective intervention in risk markets.

Despite the weak case for intervention, farmers are often successful in lobbying governments to provide financial assistance. The reasons for this are important but poorly understood. Wahlquist (see Botterill and Fisher 2003) cites notions about the romance of the bush, the battle against adversity, farmers as victims of circumstance, national interest etc. as reasons why governments are inclined to provide assistance in times of drought. Empirical survey analysis commissioned by the Queensland State Government (Wilson et al 2004) on attitudes to drought assistance found community members were more likely than farmers to support a case for taxpayer assistance to farm businesses in times of drought.

The economic efficiency arguments for government intervention in drought risk management are weak. While welfare is an important consideration it is difficult to argue that drought causes welfare problems that deserve special forms of

assistance over and above those generally available. There is a case, however, to review drought policy because primary producers are able to successfully lobby governments to provide assistance in times of drought. The way this assistance is provided can be shown to be poorly targeted; reduce economic performance generally in the economy; and provide disincentives for self-reliance. In the remainder of this paper we examine the economic concepts needed to understand drought from a policy design perspective, review alternative drought policy mechanisms, propose an alternative approach and discuss the institutional design problem.

4. Economic ideas relevant to drought policy

There are a number of economic concepts that provide a framework for analysing drought policy. These are briefly reviewed in the following sections as a basis on which to assess the current and alternative approaches to drought policy.

4.1 Risk

Like the rest of the population, farmers have different attitudes to risk. Some are very cautious when it comes to farm management and investment decisions whereas others will be more inclined to risk taking. Risk-averse producers will only accept a risky alternative if they are paid a *risk premium* above the expected value of the proposition. To a risk-neutral producer, risk is irrelevant, what matters is the expected value of the gamble. This means risk-neutral producers do not require a risk premium to accept a gamble.

Risk-sharing occurs when two parties spread risk between themselves. In drought, risk can be (theoretically) shared between farmers and another party, such as an insurance company. The fundamental reason why insurance products are offered is that large diversified organisations, eg. insurance companies, have a lower 'price' of risk than individual firms. According to the statistical phenomenon called the *law of large numbers*, if the insurer has a portfolio of diversified risks that are uncorrelated, then the insurer's risk in holding this portfolio is zero because of *risk-pooling*. When these conditions occur, firms or individuals can share the risk burden with these large organisations at a lower price than self-insurance. In Australia, at least, droughts often occur as a result of systemic influences, such as ENSO, making risk-pooling more difficult/costly.

Government can also share risk with producers through a social insurance approach where premium rates are not charged but where risk is shared. Natural disasters, such as wide-spread flood and fire tend to attract government support. Yet another approach is to pay each drought-affected producer an amount according to some measure that is correlated with the severity of drought.

4.2 Asymmetric Information

Where government does become involved in providing assistance some explicit or implicit agreement forms the basis of risk sharing between individuals and government. Economic frameworks have been developed to investigate the way parties interact and how contracts and agreements are negotiated. This is referred to as *principal-agent* theory: the principal (eg. the insurance firm) wants to make some arrangement with an agent (eg. a firm) that defines the way risk is shared and priced. It is also possible to use this framework to think about how government (the principal) might formulate an agreement with farmers to define how drought risk is managed. Government will have specific goals including economic

efficiency, equity and fiscal considerations. The question is what kind of incentives will achieve the principal's goals and how should these incentives be offered?

The major impediment to the development of efficient and fair agreements between these different parties is that the principal does not have access to all the information it needs to satisfy its objectives. This is referred to as the *asymmetric information* problem. Information asymmetry complicates drought policy design by introducing the problems of adverse selection and moral hazard. If government knew the private information of each producer (such as their true financial situation) it could target drought payments perfectly to the desired groups and adverse selection would not be a problem. Similarly, if the government could observe every action of the producer then the government could take steps to prevent producers engaging in moral hazard. Clearly this is not possible but it is possible to explicitly take account of adverse selection and moral hazard as part of the policy design process.

4.2.1 Adverse selection (hidden information)

Farmers hold private information about the financial impact of drought on their business, their capacity to withstand drought, the precautions taken to offset droughts etc. Government does not know this information. When these two parties (farmer and government) seek to make some agreement, such as to provide drought assistance, it is difficult to formulate this agreement because one party is uninformed. The consequence of this hidden information problem is that the uninformed party is likely to make bad decisions. In the case of drought, the uninformed party is government who does not know the private circumstances of farmers and provides the wrong farmer with the wrong type of assistance. This is called *adverse selection*. It is exaggerated when individuals have incentives to misrepresent the group they belong to (their "type") or their private information in order to gain some advantage. This is referred to as an *information rent*. The greater the information rent the greater is the incentive for individuals to misrepresent their type. Economic theory and experience, particularly in the insurance industry, has shown that it is possible to provide incentives that encourage individuals to reveal their type. This information is so valuable to the uninformed principal that it is worth "bribing" individuals (with the information rent) to reveal this information. In this way revelation of an individual's "type" improves allocative efficiency by allowing the principal to target resources towards desired types. In other words, it may be worth paying (bribing) individuals to reveal their type if this improves the allocative efficiency of the policy mechanism. Certainly, setting payments with little or no consideration of incentive effects will not deliver efficient outcomes

4.2.2 Moral hazard (hidden action)

In addition to the hidden information problem and its impact on targeting assistance, the principal may not have information about the private actions that

individuals take in order to gain a pay-out. This is called the *moral hazard* or *hidden action problem*. Moral hazard is a problem with most contractual arrangements because the principal is not able to monitor the actions of the agent and cannot reward (penalise) individuals who do (do not) complete the actions contracted. Moral hazard is likely to be particularly important where agents operate in remote, unsupervised situations (farms may fit this category).

In an insurance context, moral hazard refers to situations where an individual purchases insurance but then changes their behaviour (this is hidden from the insurer) to qualify for benefits. This could mean, from an insurer's perspective, that insurance distorts the individual's risk profile from being an *actuarially fair* risk (where the insurer bears some risk that maximises their profit) to becoming actuarially unfair (the insurer bears more risk than is profitable).

Moral hazard is likely to be an important consideration in developing an efficient drought policy, particularly in designing incentives for individuals to undertake 'preventative actions' (eg drought preparation) which are difficult to observe. For example, a farmer may deliberately run down cash reserves during drought if this means that they would then qualify for government assistance.

Typically, moral hazard is addressed by designing incentives that force the agent to share some risk or by increasing monitoring and enforcement activities. If motorists, for example, are required to bear some of the risks of accidents, they will tend to drive more carefully than if they were fully insured. Similarly, when farmers bear some of the risk of drought, they would have incentives to take necessary actions to limit the costs of drought. Moral hazard problems will be magnified if drought assistance is provided with little or no consideration of whether or not producers have implemented drought preparation measures. Also, if producers take less care in preparing for drought, there is a higher likelihood of them seeking drought assistance. Government expenditure on drought assistance will, therefore, tend to be greater if policy design does not incorporate measures to minimise moral hazard.

4.3 Information revelation, monitoring, enforcement, transaction costs and verifiability

With all agreements and contracts, there are problems with how well the principal is able to confirm whether or not individuals are engaging in adverse selection or moral hazard. One way of seeking truthful *information revelation* is by observing the actions or choices of individuals. In a well-structured process, these actions can reveal private information about the agent that assists with the development of fair and efficient contracts or agreements. It has been possible, particularly in the insurance sector, to provide individuals with incentives to truthfully reveal their private information for the purpose of minimising adverse selection problems. Moral hazard can be partially dealt with through *monitoring and enforcement* if the principal is able to do so at relatively low cost. Monitoring could be based on

explicit measures specified in the contract, such as output or inputs, but will always be difficult where actions are not readily observable and if there are no *verifiable* measures of producers' actions. For example, there may be no way to prove a producer did or did not undertake preventative drought mitigation actions.

When the principal finds verifiable evidence that the agent is in breach of contract, the principal can choose to *enforce* penalties against the producer or not. The decision to proceed with enforcement depends on whether *transaction costs* of enforcement are prohibitive. Transaction costs are the costs (eg administrative or legal) of undertaking actions such as enforcing contracts through law courts. In some cases these costs can outweigh the expected benefits of enforcement actions.

These problems mean that enforcement may not be *credible*. If an individual, such as a farmer, believes that government will not enforce contracts even if breaches occur, then there is no expected cost of engaging in moral hazard behaviour. Under these conditions, incentives to violate the terms of the contract become even stronger.

Information revelation is an important way of improving the efficiency of a policy. Truthful revelation of information reduces costs associated with adverse selection, but weak monitoring and enforcement regimes can potentially offset these benefits by increasing the likelihood of moral hazard behaviour.

4.4 Moral Hazard and Risk

Risk specifically affects the design of contracts or agreements through its link with the potential for moral hazard behaviour. If individuals are risk-neutral, government has greater scope to achieve allocative efficiency because it can exploit indifference to risk. It can reward individuals who undertake risk minimisation actions and penalise those who do not. A more realistic case is to assume that individuals are risk-averse. In this case risk-sharing procedures can be employed to lower (but not completely eliminate) risk to the individual to ensure that they undertake risk minimisation actions. This entails the payment of risk a premium to the individual to bear some risk.

4.5 Government Commitment

Commitment is defined as the ability of an individual, firm or government agency to ensure that future actions comply with the terms of an agreement (Salanie 1997). In the context of drought policy, government commitment means government being able to refrain from intervening in the implementation of ad hoc policies in the face of political pressure. Government commitment can affect the outcome of drought policy through *credibility* in both enforcing the policy and in implementing a more efficient drought policy. Botterill (2003) provides an account of how government commitment collapsed during recent drought events.

In economic theory, it is often assumed that governments are benevolent social planners - they will always act to maximise society's welfare. This may not, however, always be a safe assumption because governments can be seen to be rational by choosing policies that maximise their re-election probability (governments are groups of individuals acting in a self-interested way).

Commitment may be difficult to maintain because of incentives to abandon commitment. When such incentives exist, economists say commitment is *non-credible*. For example, if producers as a whole do not believe the government can make a credible commitment to maintain a particular drought policy, then producers will lobby for more advantageous drought policy payments. Without credible commitment to maintaining drought policy, producers may act in a seemingly irrational manner by not investing in drought preparation, instead believing that government will be generous when a drought occurs. These behaviours have been observed with the National Drought Policy during the 2002-03 drought.

4.6 Incentive compatibility

Well-designed policy will take account of all incentives that lead individual producers to make decisions and take actions that are aligned with broader objectives of drought policy, specifically encouraging 'self-reliance' in managing drought risk — hence the term incentive compatibility. Drought policy cannot be considered in isolation but also needs to account for incentives producers face from the tax system (eg for environmental protection), with respect to structural adjustment, and any other areas where governments intervene.

4.6.1 Incentives within the taxation system

A number of studies have shown that the taxation system has perverse incentive effects on the economic behaviour of producers — it is not incentive compatible. Douglas (2002) summarises key problems with elements of the taxation system that are relevant to drought. Besides a general bias in the income tax system to provide agricultural producers with concessionary tax treatment, there are many specific concessionary provisions. He highlights perverse incentives for resource conservation in natural increase, averaging, and livestock election provisions (which can discourage de-stocking as a farm management option during drought); in investment incentives for conservation and conveyance of water; and in investment incentives for the horticulture and viticulture industries. Some provisions encourage more income risk than would be chosen if there were no penalties for off-farm income.

4.6.2 Incentives, environment and animal welfare

Most damage caused to the natural resource base occurs episodically. Extreme events, such as prolonged lack of rainfall followed by torrential rainfall, cause the most degradation of soil and water resources. For example, droughts reduce

surface vegetation cover exposing soils to wind and water erosion. These risks to the resource base can be accentuated by the stocking and cropping strategies adopted by farmers, which in turn, are influenced by the incentives embodied in government policy.

Drought policy may provide perverse incentives to degrade the natural resource base through rule based eligibility criteria. Sometimes these criteria are liable to be manipulated in order to receive drought assistance and, as well as leading to allocative inefficiencies, the environment and animal welfare could also be adversely affected. Drought policy can also compound the environmental costs of drought if it discourages the exit of marginal producers. For example, the livestock elections and natural increase provisions may provide disincentives to de-stock livestock enterprises during drought, increasing the risk of land degradation. These provisions penalise abnormally high sale of livestock either in the current year (natural increase) or in future years (livestock elections) by increasing tax liabilities. Because of these provisions, livestock producers may choose to retain livestock despite the reduced carrying capacity due to the drought. Decisions made in this environment may also have implications for animal welfare.

5. Mechanism design

The problem of drought policy design is essentially similar to other policy issues facing government. For example, there are many similarities with the problem of allocating social security payments to those in genuine need rather than those who appear to be in need. As with most policy problems, there are two substantial issues that require investigation: *mechanism design* which involves consideration of mechanisms needed to resolve the problems of adverse selection; moral hazard, and incentive compatibility; and *institutional design* (discussed in section 6) which deals with the problem of government commitment.

Drought policies that do not systematically address the problems of adverse selection, moral hazard and incentive compatibility will be inefficient, inequitable and costly. To overcome these problems, government would need to know a lot of information about the financial circumstances of individual farmers, their investment in preparing for drought and their plans for the future (whether individual farmers intend to exit or remain in business). This information is held by farmers (it is private information) and they will be unwilling to reveal this information to government because it might reduce the likelihood of receiving drought assistance (the adverse selection problem). Some farmers may even take actions that make them appear eligible for drought assistance (the moral hazard problem).

One way to minimise the problems of adverse selection and moral hazard is to employ policies that require farmers to assess their own circumstances, consider their own intentions and make intelligent tradeoffs between different strategies. Farmers are the only ones who really know how often they are likely to incur drought conditions, the real financial impact of droughts and the full range of self-insurance options open to address droughts. A large range of self-insurance options are available to farmers including: off-farm employment, off-farm investment, more conservative farm management practices etc. Drought policy that does not utilise this private information to allocate assistance will fail because assistance will be provided to the wrong people and will induce individuals to change behaviour to gain access to assistance.

5.1 National Drought Policy

The problems arising from uneven distribution of information between farmers and government explains why the National Drought Policy (NDP) is inherently inefficient and inequitable. Under the NDP government attempts to find out about farmers' eligibility for assistance during the drought (*ex post* assessment) or uses some other proxy (such as regional Exceptional Circumstances declarations) to trigger assistance for groups of farmers. As summarised in table 5.1, hidden information results in the wrong farmers receiving assistance (adverse selection) and the also creates an environment where there are incentives for farmers to disguise their real situation or to change their actions to make them eligible for

assistance (moral hazard). In particular, asset and income eligibility criteria set up incentives for farmers to disguise their real financial situation so that they remain eligible for assistance. In some cases, this might mean there are incentives for farmers to take actions not consistent with good drought management (the incentive compatibility problem). The NDP also establishes incentives for farmers to lobby government to have their region declared under Exceptional Circumstances, to change the eligibility criteria and the benefits available once drought occurs (government commitment). In general, drought policy mechanisms that rely on *ex post* evaluation of farmers' needs and circumstances, or that employ regional triggers will result in adverse selection, moral hazard and government commitment problems. These problems occur because information is not shared between the different parties involved and results in costly and unfair policy outcomes.

It is very difficult, if not impossible to design policy mechanisms that resolve information problems where *ex post* revelation of information is employed. An alternative approach is to design policy mechanisms that deal with relevant information *a priori*. It is interesting to note that private risk markets have developed mechanisms that take this approach. These are considered briefly below.

5.2 Insurance

Insurance is a logical risk management strategy widely used by the commercial sector to manage risk. Two types of insurance have been considered to manage drought risk: multi-peril insurance (eg. crop insurance) and rainfall insurance (including weather derivatives).

Multi-peril insurance – Under this type of insurance, payouts are triggered by agreed yield shortfalls. Previous analysis of multi-peril insurance indicates that it is not a viable approach to drought (see Ernst and Young (2000), Hertzler (2004)). The key reasons are that premiums for insurance will be high (therefore, demand is low) because of the systemic nature of droughts (Bardsley *et al.* 1984) and that multi-peril insurance is plagued by adverse selection and moral hazard problems (see Goodwin and Smith (1995)). Hertzler (2004) argues that farmers know more about expected yields on the farm than the insurance company and this puts the farmer in an advantageous situation with respect to the insurance firm and the contracts that would be developed. With multi-peril insurance, farmers can also take actions that are unobservable to insurance companies (eg. reduce inputs so that crops fail) to exaggerate the effects of drought and thereby receive an insurance payout. The cost of dealing with this moral hazard problem destroys the viability of multi-peril insurance. Sigurdson and Sin (1994) estimate that Canada's crop insurance program costs 3 times more than the premiums collected and Hazell (1992) show that this ratio is around 4.5 for the multi-peril schemes in Brazil and Japan. This discussion is summarized in table 5.2.

Rainfall insurance - Rainfall insurance and weather derivatives are often suggested as a means of minimising the moral hazard problems associated with multi-peril insurance because weather can't be manipulated by individuals. Rainfall insurance relies on a predetermined rainfall event to trigger a payout. Adverse selection is unlikely because rainfall data is collected by an independent third party, eg. the Bureau of Meteorology, and is known to both insurers and farmers. Transaction costs associated with writing contracts are low because standardised contracts can be used and assessing crop damage is unnecessary. Hertzler (2004) argues that systemic risk is manageable through reinsurance, but that rainfall insurance suffers from *basis risk* which makes it less attractive for farmers. Basis risk refers to situations where yield is imperfectly correlated with rainfall so insurance payouts are imperfectly related to actual damages. This discussion on rainfall insurance and weather derivatives and yield index insurance is summarized in table 5.3.

Weather derivatives and yield index insurance – One approach to reduce basis risk is through weather derivatives. Weather derivatives are currently available to firms or individuals whose business/costs are directly influenced by inclement weather events, such as excess rainfall. They can be derived from any event, including too little rainfall or extreme temperature recorded at weather stations. Hertzler (2004) notes that reliable data series allow premiums to be calculated with confidence and the transaction costs and systemic risk problems will be lower than rainfall insurance. These contracts may not, however, eliminate basis risk.

Yield index insurance is another approach that warrants consideration, see Quiggin (1994) and Skees (1999). The key difference between yield index insurance (YII) and rainfall insurance is that YII contracts employ a non-linear relationship between rainfall and yield. Instead of receiving a set payout when rainfall is less than some defined trigger, YII employs a contract that translates rainfall into yield based on non-linear increments. By specifying insurance contracts in this way, the payout received by a farmer might increase as rainfall decreases. Further investigation of these risk mitigation mechanisms is required to determine whether basis risk can be reduced to acceptable levels and contracts specified whilst avoiding excessive transaction costs.

5.3 Drought assistance contracts

Although insurance products offer some interesting possibilities for risk management, these products do not fill the policy vacuum. Farmers will continue to lobby for assistance, and governments will respond, damaging the feasibility of, and incentives for, commercial risk management products. A broader drought policy context involving both improved policy mechanism design and better institutional arrangements is therefore needed to manage government commitment, structural adjustment and welfare considerations associated with drought. In this section we draw on ideas developed in the field of information economics in an attempt to define a drought policy framework. This framework specifies the way farmers interact with government and the private sector to

manage drought risk. Salient features of modern risk management contracts, developed principally to deal with the problems of adverse selection, moral hazard and incentive compatibility, are woven into this approach to drought policy.

5.3.1 Drought assistance contracts and adverse selection

The survey of recipients of drought assistance (see table 2.2) illustrated that it is very difficult to target assistance to those in need. The first task of an efficient drought policy is to overcome this problem. Analysis of the NDP above illustrated that it is not possible to deal with the targeting problem using regional declarations and eligibility criteria applied during the drought. With *ex post* eligibility assessments, individuals have clear incentives not to reveal private information that would make them ineligible for assistance.

The first problem for an efficient drought policy is to identify the different "types" of producers and assign them to efficient classes of agreements or contracts - one agreement will not suit all. Sen (1995) argues that targeting must take into account the incentive and informational aspects of the problem by linking assistance to a measure that is correlated with the need of applicants. Those in need will then 'self-select' by participating in such programs. Besley and Coate (1995) apply this idea of self-selection showing how a work requirement to receive social assistance reduces adverse selection problems - those who are in need are more likely to complete work requirements than those who are not.

There are significant advantages, therefore, to be gained if government can know whether individual farmers consider that they are *viable* (those that have long-run prospects as primary producers) or *non-viable* (those likely to exit from farming). As noted above, the information needed to make this assessment is held privately by farmers who are unwilling to reveal this information to others. One approach to the adverse selection and moral hazard problems inherent in drought policy is to construct a set of incentives that induce farmers to reveal or signal relevant information rather than have an external agent make this assessment. Once farmer "type" is known different farmers can be offered drought assistance that is appropriate and relevant to each individual's circumstances.

The insurance industry does this by offering a menu of contracts together with carefully constructed incentives so that individuals use their private information to *self-select* into the right (or efficient) contract. Translating this idea to drought policy would see the government offering farmers a menu of contracts each with a different bundle of benefits and eligibility requirements. A producer self-selects by choosing the contract that provides them with the highest net benefits where each contract would involve actions that are not costless. By offering a menu of contracts and incentives that facilitate self-selection, the government saves on administrative costs by not collecting farm-level data while improving the quality of information needed to target specific groups (Sen 1995). Instead, producers voluntarily reveal this information by their choice of contracts. They reveal their type out of self-interest, thus dealing with the problem of adverse selection.

5.3.2 Drought assistance contracts and moral hazard

When producers are risk-averse, a straightforward way of mitigating moral hazard is through risk sharing. That is, the principal does not perfectly insure farmers against the risk in question. Instead, the principal limits the amount of benefits paid in an effort to force the insured to bear some of the risk. The purpose of this strategy is to align the incentives faced by the agent (the farmer) with the incentives of the principal so that the farmer takes measures to reduce the impact of the risk in question – thus avoiding moral hazard.

The full insurance level depends on whether the aim of drought assistance is to insure the business cost of drought (and, therefore, to transfer subsidies to producers from taxpayers), or to assist producers in smoothing their consumption levels during drought. If drought assistance is used to transfer business assistance, then the full insurance level will be different between producers because of difference in enterprise type, severity of the drought, condition of the natural resource base, etc. As a result, determining the full insurance level may be administratively costly because of the need to collect cost, price, production and agronomic data. Some of this information will be private information and so will require the use of a menu of contracts approach to truthfully elicit it in a lower cost way. However, while the use of incentive contracts to provide inducements for producers to truthfully reveal private information may be a second-best approach compared with using surveys or eligibility criteria to target business assistance, it may require the use of a large number of contracts to accurately elicit private information.

If the aim of drought policy is to assist producers in smoothing their consumption level, determining the full insurance benefit level may be less complex. This is because consumption patterns are generally similar between producers. Instead of fully guaranteeing to protect producers' consumption, the government can instead guarantee producers a subsistence level of consumption. This provides producers with an incentive to self-insure against drought to ensure consumption does not fall during drought. However, subsistence may not be politically feasible.

Eliminating moral hazard when producers are risk-neutral depends on the extent of liability producers have for managing drought risk. It is likely that producers will not bear the full risk of drought because of lobbying arguments already presented. Even though risk-neutral producers are impartial to risk, this does not mean they are not better off from exerting political pressure to gain more drought assistance. Given this, the relevant question is how to eliminate moral hazard when the producer bears limited drought liability.

According to the economic literature, a limited liability rent could be paid to eliminate moral hazard when risk-neutral producers face limited drought risk (Laffont and Martimort 2002). This is because the producer has less incentive to self-insure through costly investments because of limited liability. Applied to

drought policy, this suggests that the government could pay a limited liability rent to create an incentive for producers to self-insure.

One further implication of economic literature on information, incentives and behaviour is that there are significant efficiency implications associated with the sequence in which adverse selection and moral hazard are addressed (see Laffont and Martimort 2002). In other words, it may be possible to significantly improve the efficiency of drought policy by addressing moral hazard prior to adverse selection or visa versa. The relevant question is: can the government structure contracts so that moral hazard is solved before adverse selection? If it is possible, then it is also possible to design second-best efficient contracts.

5.3.4 Drought assistance contracts in practice

In this section of the paper, the concepts developed by economists to deal with risk, adverse selection and moral hazard are incorporating into drought policy. Key features of this approach include:

Menu of drought assistance contracts offered to farmers – Menus of contracts designed to encourage self-selection according to type are commonplace in risk markets. A good example is with motor car insurance where modern insurance contracts provide incentives (discounts on premiums) for individuals to reveal their type and to self-select into a contract that is relevant to their type. These insurance contracts offer a "bribe" or information rent to induce individuals to reveal information about themselves and their behaviour. For example, one contract may offer a reduction in the premium if the insured agrees to pay a proportion of the cost of repair (the excess). The motorist is then faced with a calculation that involves estimating the probability of them having an accident, the severity of this accident etc. and choosing the contract that offers them the highest net benefit. In doing so, the motorist reveals what sort of driver they are to the insurance company.

In the drought context we know that some farmers will be risk averse, some risk neutral, all are at different stages of the business life-cycle, each has different farm and financial structures and each will have a range of risk mitigation possibilities each with an implied price. A range of different drought policies will be needed to suit these different types and a menu of drought assistance contracts will be needed if drought policy is to be more efficient and effective. These contracts would need to be offered in such a way that farmers, acting in self-interest, self-select into contracts that are efficient for their "type". To explain this concept, we examine a simple case where two types of contract could be offered:

Contract 1: An agreement with long-run viable farmers. This contract offers those farmers who believe that they are viable in the long-run an inducement to either:

- *contract 1A* - purchase commercial risk management products such as rainfall insurance, weather derivatives or yield index insurance (YII), and/or

- *contract 1B* - self-insure against drought.

Some viable farmers will be just starting a career in farming, they may have sound business prospects but have not had sufficient time to accumulate the "optimum" level of liquid assets to survive a drought or other contingency. These farmers may find that rainfall insurance/weather derivatives/YII offered by private insurance firms are an attractive option and will therefore choose contract 1A. Other viable farmers may conclude that self-insurance is a better option and will self-select into contract 1B. Any mixture of contracts 1A and 1B could accommodate the individual circumstances of farmers between these two extremes.

To gain information about each farmer, government offers a bribe or information rent and farmers self-select into the optimum mix of rainfall insurance/weather derivatives/YII and self-insurance. Contract 1A offers a subsidy on the premiums for rainfall insurance/weather derivatives/YII offered by private firms and contract 1 B offers a subsidy on savings for contingencies such as drought - we have labelled these Risk Management Deposits (RMD). RMDs are a similar concept to the existing Farm Management Deposits but with a different set of incentives specifically designed to ensure that farmers' contract choice matches their "type". Election of either contract 1A or 1B would disqualify farmers from any welfare or adjustment assistance other than those generally available to other members of society.

Contract 2: An agreement with long-run non-viable farmers – A second class of contracts could be developed for farmers who consider that they are not viable in the long-run. This contract would offer just enough incentive in the form of welfare or adjustment assistance to induce this class of farmer to reveal that they are unlikely to remain in business in the long-run. This bribe or information rent could be in the form of special social security payments or an exit grant.

The objective of drought policy is then to design an efficient set of incentives that will induce farmers of different "type" into selecting their efficient class of contracts. Some of the important issues relevant to this problem are addressed in the following sections on incentive design and sequencing.

Incentive design - There are a number of important incentive design issues relevant to these contracts. Incentives are offered to lure different farmer "types" into the appropriate type of drought policy (contract). Although there are economic efficiency costs associated with offering incentives (these are often called dead weight losses) these would only be offered where the economic efficiency gains from better drought policy out-weigh the losses.

It is beyond the scope of this paper to provide estimates of the optimal incentive or inducement for the different contracts (this is a task for further research), but the structure of incentives is crucial to the success of this approach. It is also appropriate to offer only the minimum incentive needed to elicit self-selection according to type. Offering the minimum inducement will maximise the efficiency

gains and minimise the dead weight losses associated with the inducement, or subsidy, offered.

Sequencing - Another important element in the design of these contracts concerns the problem of sequencing. As noted by Laffont and Martimort (2002) there are significant efficiency implications associated with the sequence of adverse selection and moral hazard. If moral hazard precedes adverse selection, the moral hazard stage involves the producer choosing the type of production strategy and the amount of management effort to exert and this (imperfectly) determines how viable the enterprise is. The adverse selection stage is where the producer decides which policy to accept. Assuming the producer is rational and intelligent, he/she will understand the implications of choosing contract 1 or 2. That is, he/she will know that choosing contract 1 reveals viability and ability to manage through drought. Conversely, choosing contract 2 reveals that the producer is a marginal or non-viable producer, unable to survive drought without assistance.

This two-stage problem is solved by use of backwards induction - adverse selection is solved first. The producer will choose the contract that will make him/her better off. However, this decision depends on the moral hazard stage: is the producer better off operating a viable or non-viable enterprise? If the producer is viable, choosing contract 1 is best because of benefits from limited liability rent (if risk-neutral) or risk premium (if risk-averse) plus an information rent. A viable producer will not choose contract 2 because there are no rents. Conversely, if a producer is non-viable he/she will choose contract 2 to receive partial insurance against drought. Either contract 1A or 1B requires the investment of a producer's surplus cash to purchase an insurance contract or RMD in order to receive any benefits, but by definition, non-viable producers do not generate sufficient surplus cash, so they cannot benefit from contract 1.

Working our way backwards, we now consider the moral hazard stage, in which the producer decides on the value of exerting costly effort to become viable, or not doing so. The producer's choice depends on whether or not they can become a viable producer, which of course depends on many factors and may be impossible for some. Some producers may be marginally viable but may not generate enough surplus cash to warrant the use of RMDs or rainfall insurance/weather derivatives/YII; these producers will probably choose contract 2. Some producers may be viable enough to generate substantial surplus cash and so will find it viable to use RMDs and or rainfall insurance/weather derivatives; these producers gain from generating profits and gaining rents, they will choose contract 1. In summary, we can predict the following:

- Non-viable producers: cannot make a profit even with contract 2 and will cease production.
- Marginally viable producers: do not generate substantial surplus cash flow and will choose contract 2.

- Viable producers: make a profit at or above commercial rates of return and also generate substantial surplus cash flow. They will choose contract 1.

The moral hazard problem is solved because these drought assistance contracts provide incentives for viable producers to either purchase rainfall insurance/weather derivatives or to self-insure against future drought risk by exerting management effort to maintain viability and to generate the surplus cash to invest in RMDs or to purchase insurance. Furthermore, non-viable producers can choose to exit the industry or stay in the industry and remain non-viable. Figure 5.1 summarises this discussion.

The adverse selection problem is solved because there are incentives for producers to truthfully reveal their types. Viable producers are unambiguously better off with contract 1. Marginally viable producers are unambiguously better off with contract 2. Non-viable producers are clearly better off exiting the industry but may choose to continue producing for lifestyle and other non-economic reasons.

What are the overall efficiency effects of these contracts? Laffont and Martimort (2002) argue that in a game where moral hazard is followed by adverse selection, the result is second-best. This means that there is an improvement in welfare but does not necessarily maximise welfare gain. Rents are still paid by the government but the producers make efficient self-insurance decisions.

In the real world, the menu of contracts has incentives for producers to first solve the moral hazard problem and then the adverse selection one. This is because each type will have the information to know if they can be viable or not by solving the moral hazard problem first. Some will already know and can solve for the adverse selection problem. Either way, there are incentives for producers not to engage in moral hazard or adverse selection as explained above. Therefore, it is possible for a menu of contracts approach to produce a second-best outcome in drought policy. This implies that the allocative efficiency of drought policy may be improved if certain actions are used as a signal to reveal a farmers' "type". In simple terms, this means that we look for some action that a farmer might take, out of self-interest that signals their "type". Purchase of RMDs, or rainfall insurance/weather derivatives are actions that could reveal whether a producer is viable and interested in preparing for contingences, such as drought.

5.4 HECS approach to drought policy

One other approach to drought policy that has been considered recently is based on the Higher Education Contribution Scheme (HECS), see Botterill and Chapman (2002), Botterill (2003), Chapman *et al.* (2004) and Kelly *et al.* (2004). HECS is an *income-contingent loan* (ICL) in that the amount of debt repaid by the student each year depends on the level of income earned. The debtor does not have to pay the HECS debt until his/her income reaches a threshold level called the 'deferred payment option' (HECS 2004). The amount of debt repaid is an increasing

proportion of the debtors' income above the threshold level (HECS 2004) and is repaid through the income tax system.

In applying the ICL mechanism to drought policy Botterill and Chapman (2002); Botterill (2003); Chapman *et al.* (2004); and Kelly *et al.* (2004) suggest the following changes:

- gross farm receipts to determine repayment instead of income;
- constant rate of repayment when threshold is reached;
- ICLs invoked when EC declared; and
- banks to administer ICLs - banks provide a third of the credit on commercial terms and the government will provide the rest interest free and on an income contingent basis for repayment.

While the underlying justification for the HECS scheme is that capital markets have limited information about students on which to base lending decisions, this reasoning does not hold for farmers. Freebairn (1983) notes that producers are able to secure financing at the prevailing market interest rate and DPTF (1997) provides anecdotal evidence that financial institutions are willing to provide finance to producers that they consider profitable in the long term. Table 5.4 provides a more detailed analysis of the HECS-style approach to drought policy based on the criteria of adverse selection, moral hazard, government commitment and incentive compatibility.

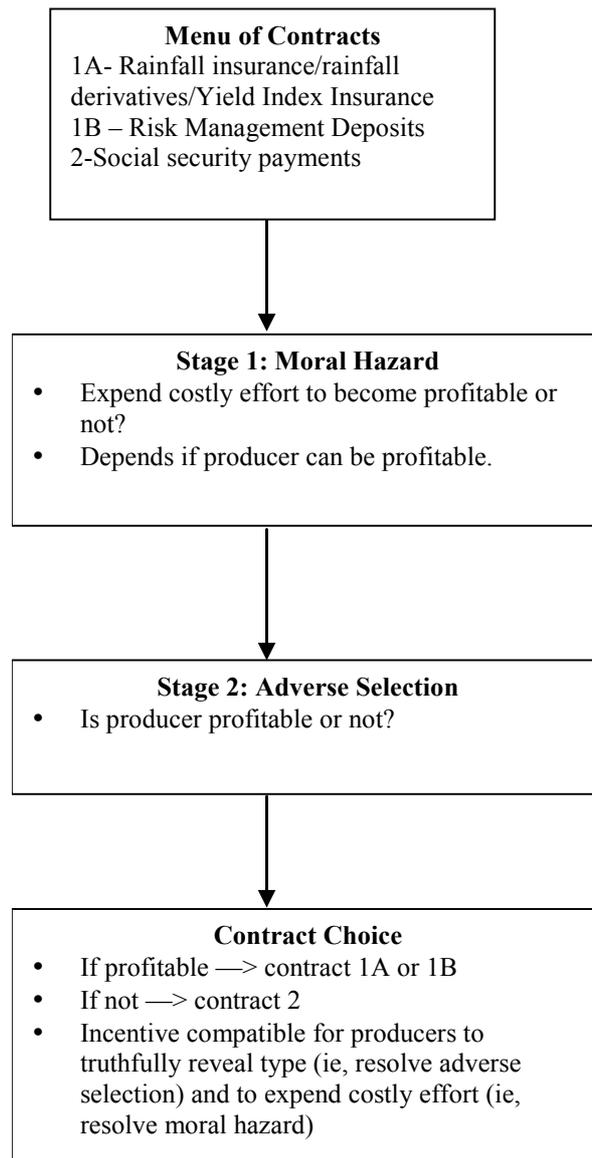


Figure 5.1 Summary of a Producer's Choice of Contract

Table 5.1 National Drought Policy

Assessment criteria	National Drought Policy (also known as Exceptional Circumstances policy)
Description	Assistance provided for "exceptional circumstances" including special welfare payments and business assistance. Areas are EC-declared for two years by the Australian Government following applications from State Governments (collaborating with interested parties) and assessments by the independent National Rural Advisory Council.
Adverse selection	<p>Poor</p> <ul style="list-style-type: none"> • The current policy relies on <i>ex post</i> assessment of private information (to assess "need") by a third party. This is done using information on the each farmers' financial circumstances. The term "need" is subjective. It may be difficult to fully elicit or evaluate "need", leading to adverse selection. • Geographic location, as determined under the EC criteria, is not a good indicator of whether any individual producer is actually affected by drought. Some producers within the EC boundary will not be affected by drought while some producers outside of the boundary will be drought affected; ie, the 'line on the maps' controversy (Botterill 2003).
Moral hazard	<p>Poor</p> <ul style="list-style-type: none"> • The EC eligibility criteria create incentives for producers to take actions that improve their eligibility for drought assistance. This provides disincentives for farmers to become self-reliant, by not adequately preparing for drought. • The EC eligibility criteria create perverse incentives for drought-affected producers to use political pressure to gain assistance within and outside the policy. • Farm viability tests tend to reward poor managers and penalise those that save and otherwise prepare for drought. • Different treatment of asset classes (eg. off-farm assets are treated differently than on-farm assets for eligibility for special welfare payments) distorts decisions that farmers make about investment in each type before and during droughts.
Government Commitment	<p>Poor</p> <ul style="list-style-type: none"> • Successive Commonwealth & State Governments have been unable to credibly commit to the 1992 National Drought Policy. The onset of drought has triggered political pressure from producers' lobbies and the community for more generous assistance. In 2002-03, the Commonwealth Government introduced <i>prima facie</i> EC income support (Botterill 2003) as well as <i>interim</i> income support, and State Governments continued or re-introduced direct business payments.
Incentive compatibility	<p>Poor</p> <ul style="list-style-type: none"> • <i>General</i> - Incentive problems associated with the tax system, and other forms of assistance by governments has undermined the effectiveness of the National Drought Policy. • <i>Specific</i> - Provisions in the Australian tax system encourage investment in agriculture, and discourage agricultural producers from diversifying their risk by diversifying their income sources into non-agricultural investments. For example eligibility for Farm Management Deposits is restricted to producers with less than \$50,000 in taxable off-farm income. This may prevent producers from smoothing their income to the extent needed during times of drought by using non-agricultural income to maintain living standards. This is contrary to the self-reliance principle of National Drought Policy. • Drought policy should aim to provide appropriate incentives to prepare for drought, care for the environment and animal welfare.

Table 5.2 Multi-peril Crop Insurance

Assessment criteria	Multi-peril crop insurance
Description	Payouts are triggered by agreed yield shortfalls.
Adverse selection	<p>Poor</p> <ul style="list-style-type: none"> • Systemic risk makes multi-peril crop insurance attractive to bad drought risks since these "types" benefit from multi-peril insurance whereas good drought risks do not (Goodwin and Smith 1995). This stems from the asymmetric information nature of drought - if the insurer is unable to discern between good and bad drought risks, the premium charged will discourage good risks from purchasing multi-peril insurance but will still provide the bad risks an expected gain.
Moral hazard	<p>Poor</p> <ul style="list-style-type: none"> • Producers can reduce management effort (and influence yields) in order to gain an indemnity payment. This problem stems from the largely non-verifiable nature of farm management and therefore the difficulty in enforcing or monitoring multi-peril crop insurance contracts by the insurer.
Government Commitment	<p>Poor</p> <ul style="list-style-type: none"> • The existence of any ('free') government drought assistance reduces the likelihood that multi-peril crop insurance will be viable in the private sector (Quiggin 1986). • The higher a producer's assessment of the likelihood of effective lobbying for extra assistance, the less interest he will have in private alternatives.
Incentive compatibility	<p>Poor</p> <ul style="list-style-type: none"> • Non-credible government commitment renders private multi-peril crop insurance incompatible with producers' incentives. This is because producers can reasonably expect government to provide at least some degree of free drought assistance. • The opportunity cost of purchasing private multi-peril crop insurance is costly relative to the alternative risk-management strategy of relying on (probable) government assistance during drought - it is not incentive compatible for most producers to purchase unsubsidised multi-peril crop insurance.

Table 5.3 Insurance (Rainfall Insurance, Weather Derivatives, Yield Index Insurance (YII))

Assessment criteria	Weather derivatives
Description	<p>Rainfall insurance: uses a predetermined rainfall event to trigger a payout.</p> <p>Weather derivatives: payout determined from an agreed climatic event, including too little rainfall or extreme temperature recorded at weather stations. Sold by financial institutions (eg, banks) rather than insurance companies.</p> <p>YII: employs a non-linear relationship between rainfall and yield. Instead of receiving a set payout when rainfall is less than some defined trigger, YII employs a contract that translates rainfall into yield based on non-linear increments.</p>
Adverse selection	<p>Good</p> <ul style="list-style-type: none"> • Climatic data forms the basis of premium calculations. Provided there are climatic data for specific areas over a sufficient time, these premiums will be actuarially fair.
Moral hazard	<p>Good</p> <ul style="list-style-type: none"> • No scope for producers to alter behaviour (or "type") to qualify for insurance payment.
Government Commitment	<p>Poor</p> <ul style="list-style-type: none"> • The existence of any ('free') government drought assistance reduces the likelihood that insurance will be viable in the private sector (Quiggin 1986). • The higher a producer's assessment of the likelihood of effective lobbying for extra assistance, the less interest he will have in private alternatives.
Incentive compatibility	<p>Poor</p> <ul style="list-style-type: none"> • Non-credible government commitment renders private insurance incompatible with producers' incentives. This is because producers can reasonably expect government to provide at least some degree of free drought assistance. • The opportunity cost of purchasing private insurance is costly relative to the alternative risk-management strategy of relying on (probable) government assistance during drought - it is not incentive compatible for most producers to purchase unsubsidised rainfall insurance.

Table 5.4 A HECS - type Scheme for Drought

Assessment criteria	A HECS-type Scheme for Drought
Description	HECS-type schemes are income-contingent loans (ICL). The amount of debt repaid by the farmer each year depends on the level of gross farm receipts.
Adverse selection	<ul style="list-style-type: none"> • Poor • ICLs may reward farmers who do not prepare for droughts. If these loans are provided at concessional rates of credit, they will provide assistance to a particular type of producer. • Income contingent loans would provide no incentive for producers to reveal capacity to invest in drought preparation (loans would be provided on the basis of gross farm receipts).
Moral hazard	<p>Poor</p> <ul style="list-style-type: none"> • Producers in Exceptional Circumstance declared areas would receive income contingent loans regardless of circumstances. This weakens incentives to self-insure. • Income contingent loans have perverse incentives in that they discourage producers to become more efficient and, hence, develop a greater capacity to self-insure. • The sources of this moral hazard are: <ul style="list-style-type: none"> (a) <i>the repayment threshold</i>- the higher the threshold, the greater the incentive to ensure receipts are below it. (b) <i>the use of gross receipts</i>- such a measure may accentuate moral hazard inefficiencies by providing an incentive for debtor producers to understate gross receipts. Again, this depends on the threshold level. Alternatively, debtor producers may be less diligent in farm management, leading to lower gross receipts to avoid repayments. (c) <i>the use of banks to monitor and enforce income contingent loans</i>- the use of banks introduces another moral hazard problem. The government now has to provide banks with incentives to monitor and enforce income contingent loans after the banks have had their loans repaid.
Government Commitment	<p>Poor</p> <ul style="list-style-type: none"> • The combination of an income contingent loans scheme and the current system of EC declaration is unlikely to strengthen government commitment to maintain income contingent loans as stated. Instead, it may accentuate the problem because producers would have incentives to lobby for more attractive terms and less rigorous monitoring and enforcement. • Successful lobbying efforts would undermine any positive efficiency gains from using banks to monitor and enforce income contingent loans and may even discourage their participation.
Incentive compatibility	<p>Poor</p> <ul style="list-style-type: none"> • The non-commercial terms of income contingent loans provide producers with perverse incentives. They dampen incentives to self insure against drought.

6. Institutional design

Institutional design is the second major problem with the current approach to drought. Unless government can ensure that farmers will only receive previously stated assistance (in terms of the type and quantity of assistance) farmers will not take responsibility to actively prepare and manage drought because they know government will provide assistance. Institutional structures can guard against this outcome (the credible commitment problem). It has been argued previously that non-credible government commitment is likely to impose greater budgetary costs and may lead to a higher tax burden for the rest of society². In the worst case, lack of credible commitment is likely to result in adverse selection and moral hazard, which accentuates the budgetary cost.

Commitment is credible when it is in the government's interest not to behave opportunistically. One way of ensuring this is by imposing legal constraints on the government to restrict how it can react to a drought. This follows from Boyer and Laffont (1999) who argue 'constitutional constraints' are needed to prevent governments using environmental policy to transfer rents to political supporters. Constitutional constraints are restrictions written into the constitution that restrict the actions of governments; examples are a bill of rights or defining the responsibilities of each level of government in a Federal system. It is unlikely that the Australian Commonwealth constitution can be rewritten to restrict government's actions in regard to drought because of long, costly and uncertain constitutional reform process. Instead we will consider *legal constraints* that are written into legislation or regulations; *contractual constraints* (clauses in the incentive contracts); the possibility of *reputation* in signalling government commitment in drought policy; and *institutional structures* that might be appropriate.

6.1 Legal Constraints

The government can restrict its future actions in regard to drought policy by legally forbidding specific actions. This means either current legislation has to be amended or new laws have to be introduced to restrain government actions. In effect, legal constraints make it illegal for government to perform some actions, such as providing assistance in addition to that provided through the contracts, the *ad hoc* responses that have been a feature of past drought responses. However, legal constraints in themselves do not guarantee government commitment - a credible monitoring and enforcement mechanism is also needed to make the legal constraints binding. Although there are independent government agencies that do monitor government actions such as the Auditor-General, it is difficult to see how these might be effective mechanisms to control lobbying by farmers. According to

² See Appendix 3 for a technical description on why non-credible government commitment is more costly for government and society.

Tirole (1994), low-powered incentives such as these can improve credibility and commitment but it is rare for the government to impose such constraints over the ability of executive (government).

6.2 Contractual Constraints

A less costly way for governments to constrain its future actions is by including a clause in the incentive contracts that explicitly states the government will not provide any further drought assistance to a producer. This makes credible government commitment an issue between the government and the producer rather than between the government and the industry. This makes it easier for the government to maintain credible commitment since if the government deviated from the terms of the contract, it could be sued for breach of contract. However, like legal constraints, this option requires credible monitoring and enforcement mechanisms. In addition, contractual constraints may be more difficult to monitor because of commercial confidentiality and the increased costs of monitoring a large number of possible contracts. One proposal to reduce monitoring and enforcement costs could be to engineer prohibitive penalties within the taxation system to remove the incentive to lobby. For example, farmers who accept the information rent associated with RMDs (they self select into the viable farmer category) could be severely penalised if they accept drought assistance.

6.3 Reputation

How a government designs and implements drought policy determines what kind of reputation it has in this area. As previously discussed, government has so far been unable to credibly commit to stated drought policy in Australia because the political incentives to deviate are strong. Another reason is the short-term nature of the game; most governments only make decisions that are likely to have a positive impact in a parliamentary term. This is contradictory to the design and implementation of an efficient drought policy; drought is a recurring risk that requires government commitment for producers to bear some of the risk of drought.

Because of the short-term nature of government drought policy-making, governments are known to be unable to credibly commit to an efficient drought policy. This is the essence of *reputation*; players of the game observe the other players past behaviour and decide their strategies based on this. In the drought context, government (both State and Federal) have developed a reputation for being unable to credibly commit to an efficient drought policy. The nature of the 'EC game' is biased against commitment plus the government has no credible way to signal commitment.

With current drought policy the government is unable to use reputation to signal credible government commitment. Instead, it has the opposite reputation. The government can solve this reputation problem by establishing credible constraints on its drought policy-making ability as discussed above. This suggests that

reputation is not a tool of drought policy but is instead an *outcome* of drought policy.

6.4 Institutional Structures

In the past, governments have repeatedly tried to reform drought policy but have failed to do so from an efficiency viewpoint. We will argue below that one of the key reasons for this is that in times of drought there are no effective public lobby groups that are in favour of drought reform. Mostly, calls for drought reform come from bureaucrats. In times of drought, groups such as producers and the general community may be strongly in favour of the payment of assistance.

In the next few sections we examine some of the key players involved in drought assistance, their incentives, and why any institutional structure that successfully implements drought reform would probably require public support. Our focus will be on raising issues associated with drought reform and the associated institutional arrangements.

6.4.1 The Players

We consider 4 key players in terms of drought reform. These are: The Australian Government, State Governments, The General Community and Producer Groups. Environmental groups are not considered as one of the key player groups because they have been more concerned with water policy - systems of allocating and pricing water. They have not as yet focused on connections between water policy and drought policy.

This set of players is a considerable simplification. For example, a 'state government' is actually comprised of ministers and public servants. Within this group there could be considerable variation in terms of opinions and approach; there could be anti- and pro- reformers in either sub group. The organisation, leadership, culture, and approach of bureaucracies - that is, their institutional structure — will clearly impact on government decisions.

Government - At a time of drought a government is torn between two competing arguments. On the one hand a government realises that the general community in large measure has sympathy for farm groups and supports the need to provide assistance (Wahlquist 2003). On the other hand government assistance places strain on the budget. Since funds that are used to pay drought assistance cannot be used for other purposes, drought assistance necessarily mean some other government programs are forsaken. Further, budgetary costs are not the only cost: the incentive effects mean that land, labour and capital are not used as productively as they otherwise could — 'economic' costs are different to 'budgetary' costs.

Economists within government have often argued that the payment of drought assistance will provide the wrong incentives to producers in terms of managing drought risks. However, economists are only one part of the government machinery. Other policy officers may well argue that paying drought assistance

out of the budget is beneficial for the community. Further, budgetary considerations may affect the level of assistance more than the decision to pay or not. In times of budgetary strain, governments may still decide to pay drought assistance, but to do so in smaller measure.

Commonwealth Government - Given that assistance is going to be paid, the Commonwealth and the States face a game shaped by the current arrangements. A State government needs to make a submission to request that EC be declared; then if the Commonwealth declares EC it can pay monies to those in the relevant area. The Commonwealth can pay (and has paid) '*prima facie*' assistance - the payment of monies where a State has placed a submission but EC has yet to be declared in the relevant region.

State Government - A State Government has two basic avenues in a time of drought - to pay assistance or not. However, a State government does this in the context of the Commonwealth decision of whether to declare EC (and pay assistance) or not.

Note that decisions in other States also influence a State Government. For example, if there is drought along the eastern coast then decisions made in NSW and Queensland may affect the pressure placed on Victoria's government to make drought payments, as occurred in 2002-03.

The General Community - As discussed in section 3, the general community, for reasons not properly understood wishes to provide drought assistance to farmers. Recognising the incentive and environmental effects associated with such assistance may be straightforward to many economists, but not to the general community. Although there are a number of subtle arguments about the incentive effects of drought assistance, it is unclear to what extent the general community would change their attitudes if these and other arguments (such as the relative asset wealth of many farmers) were understood. However, we would expect these arguments *would* need to be understood for the general community to support drought reform. This may be a critical factor in affecting drought policy, as argued below.

Producer Groups - Wahlquist (2003) has argued that some producers are wary of being labelled as a group that spends most of its time complaining and are cognisant of this in a time of drought. During times of drought different producer groups can often argue about whether to lobby for drought assistance or not. Some rural residents may argue against drought assistance because a 'drought declaration' over a certain area may have some negative effects, eg on credit organisations.

However, producers are clearly the prime beneficiaries of drought assistance and their incentives are to attempt to show that they personally (or people in their regional area) are suffering hard financial circumstances due to drought. Although this is clearly not the opinion of every producer, if the majority did not

comprise/support the prime lobby group it is hard to see why any drought assistance would be paid.

Most of the important points with regard to drought policy can be made with regard to figure 6.1. This diagram is a decision tree, read from left to right. At each circular point or *decision node* one of the players makes a decision. At a diamond-shaped point or *terminal node*, the game ends.

At the far left drought policy is potentially set in motion with a producer group lobbying. The producer group is shown to lobby to the State government to initiate the EC declaration process.

The State can react by choosing in the first instance to pay assistance or not. If it pays assistance at this node it does so irrespective of the Commonwealth. There may be considerable pressure on a State to pay at this stage because the EC process takes some time to implement. If the relevant State and Commonwealth are different political parties then a State's decision to pay may put political pressure on the Commonwealth to pay as well. Alternatively a state can decide to not pay immediately and submit to the Commonwealth.

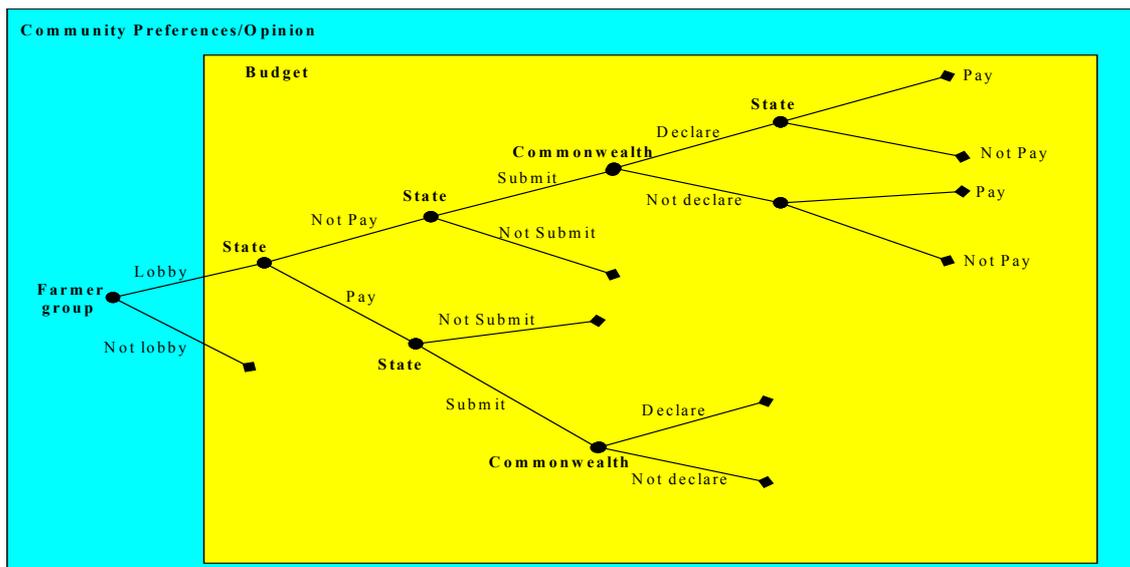


Figure 6.1 Schematic of current National Drought Policy (NDP) and players

If the State makes a submission the Commonwealth can decide to accept the submission and declare EC (implying funding commitments) or not.

In the case where the State has already paid outside NDP it is unlikely to pay again (outside NDP) and we have represented this by ending the game at the Commonwealth's decision to declare EC (in the bottom half of the diagram). If the State has not yet paid and the Commonwealth declares EC then the State may decide to pay in response to this or not (the top half of the diagram).

The two boxes that encapsulate either all or part of the game show the impact of community preferences and budget.

The large outer 'community preferences' box shows that community preferences affect the decisions of all players at every step. Producers and both types of government will consider community reactions to their decisions.

The inner box represents the impact of government budgetary considerations. This will affect all government decisions to some extent, but is less likely to affect producers' decision to lobby.

6.4.2 Options for Progressing Drought Reform

It is clear that reform of drought policy is needed on economic efficiency, equity and budgetary grounds. There are a number of ways this might be progressed.

National Inquiry - In the past some Australian policy reforms have been driven by national inquiries. For example, the history of the Productivity Commission is in undertaking analysis of policy issues of national importance through a consultative process that has led to substantial policy reforms (eg, tariff reductions). Such an inquiry in drought could tease out all of the efficiency and equity issues via a process that raises public awareness.

Independent Agencies - We have already mentioned the need for independent agencies to monitor government commitment for legal and contractual constraints. Another way independent government agencies could ensure credible government commitment is by government delegating the responsibility of drought policy to it, to remove government's discretion in this area and give the responsibility to public servants. This removes the opportunity for the government to intervene in drought policy, at least overtly. However, by delegating policy responsibility to government agencies, there is a risk that regulatory capture would occur.

Regulatory capture is especially problematic when the industry being regulated has a powerful lobby group such as agriculture. The regulating agency may face intense political pressure during drought to provide additional drought assistance. In addition, this does not necessarily eliminate political pressure on the government because the producers' lobbies can use government as an additional avenue to pressure the agency. A number of strategies could be adopted to improve the effectiveness of this approach against lobbying including:

- strictly defining a set of rules for an independent body (Tirole 1994);
- incorporating competing interests in the oversight of the independent agency (Tirole 1994); and
- establishing governance powers, voting rules etc. *ex ante* (Boyer and Laffont 1999).

Commonwealth Governed Incentives - States receive a large part of their funding from the Commonwealth. Therefore if the Commonwealth were committed to drought reform it could apply some sort of sanctions to States that did not implement drought reform, in the form of withheld payments. This may seem

unlikely in the current environment, but could be considered along with or after some general community engagement.

The Hilmer 'Competition Policy' reforms were a process where the Commonwealth enforced compliance amongst states of a national agenda. In that case, the Commonwealth gave financial punishments to States that did not comply with the reform agenda.

Hence, one way to get drought reform instituted in a consistent way across both tiers of government may be to use a mechanism akin to the Hilmer process: one where the Commonwealth monitors activity and punishes 'non-complying' States.

However, the Hilmer institutional process is but one way to get consistent policy across States and the Commonwealth. There may be other approaches and these should be examined in more detail. A particular challenge here is, again, the incentive of the Commonwealth government to drive a pro-reform agenda.

7. Summary and Conclusions

Drought policy is a complex problem for which there are no simple solutions. In this paper it has been argued that the role of government with respect to drought is problematic. Whilst a complete set of risk markets do not exist, this does not automatically justify government involvement. The main reason for government intervention is on a second-best basis. In other words, if the government does not establish a formal drought policy, there will always be political pressure from producers to provide drought assistance. By formalising drought policy, government can define the 'rules of the game' to reduce the economic costs of drought policy and to improve the distribution of any assistance given. To achieve these objectives it is imperative that Australian governments design drought policy to provide producers with incentives to prepare for drought and to provide governments with incentives to credibly commit to a second-best policy.

Past (and proposed) solutions to drought policy have been (and are), inefficient and inequitable because they do not take explicit account of asymmetric information and the implications for adverse selection, moral hazard, systemic risk, uncertainty, credible government commitment and the perverse incentives of the Australian tax system. The current NDP arrangements fail on all of these criteria because it has not been designed to deal with the information problems that pervade risk management. The NDP does not employ mechanisms to reveal private information (about farmers' needs, capabilities and preparation for drought) instead it relies on *ex post* assessment and regional classifications of need (Exceptional Circumstances). This approach provides farmers with incentives to lobby government to declare droughts and increase assistance, to change behaviour so that they remain eligible for drought assistance, and to avoid truthful revelation of financial information where this reduces eligibility for assistance. The outcome is that assistance is provided to the wrong people and induces individuals to change behaviour to gain access to assistance.

A HECS-style approach employing income contingent loans can also be discounted because unlike students, capital markets have good information about the credit rating of farmers and government does not need to intervene in this area of the economy. The incentive effects of income-contingent loans do not deal with adverse selection and moral hazard - instead, it appears that this mechanism actually accentuates the costs of adverse selection and moral hazard.

Although insurance is the logical solution to risk management, multi-peril insurance is not a viable policy option. Dealing with moral hazard and adverse selection problems, through increased monitoring and/or higher premiums, and high transaction costs, quickly destroys the viability of multi-peril insurance. Rainfall insurance does not have these problems and is attractive to insurance companies but in some regions may suffer from imprecise correlation between rainfall and income (basis risk is introduced as an additional problem to be solved). Weather derivatives and yield index insurance, offered by the private sector, are

policy mechanisms that could address basis risk. More research is needed into the extent of basis risk problems and possible solutions.

In this paper we have proposed a drought policy framework that explicitly accounts for the information problems that plague drought policy. This approach has been developed by drawing on the techniques developed in commercial risk markets and embedding these into drought policy. We provided a broad description of drought policy that utilises a menu of incentive contracts for farmers who consider that they have long-run prospects of being profitable and another for those who consider that they are likely to be unprofitable in the long-run. This approach would involve incentives to encourage farmers to self-select into efficient classes of contract. Well-designed incentives will induce farmers who consider themselves to be profitable in the long-run to self-select into contracts that make them better off. Farmers who select this type of assistance would not be eligible for other forms of assistance. In this case the inducement could be either a subsidy on rainfall insurance/weather derivatives/yield index insurance premiums (offered by private firms) and/or a subsidy on self-insurance through a mechanism we have labelled Risk Management Deposits (RMDs). RMDs are similar in concept to Farm Management Deposits but specifically designed to offer the minimum inducement to attract relevant farmers to this form of risk management. Farmers could choose a mixture of rainfall insurance/weather derivatives and RMDs according to life-cycle and financial considerations. Farmers who consider they are not viable in the long-run will find this contract relatively unattractive and will self-select into a contract which offers exit or adjustment assistance. Self-selection into relevant contracts effectively reveals "type" allowing assistance to be targeted efficiently and equitably, thus solving the adverse selection problem.

Incentive contracts also deal with moral hazard by providing incentives for profitable producers to save surplus funds using RMDs and by sharing some of the risk of drought. In both cases, the contracts apportion risk between the government and the producer, providing farmers with an incentive to manage drought risk themselves. Furthermore, monitoring and enforcement is not required since producers have an incentive to self-insure some drought risk (this is despite the non-verifiability of moral hazard in the context of drought).

Although further quantitative analysis is required, economic theory suggests that the cost of these inducements should be more than offset by the efficiency gains associated with improved drought policy and could be expected to reduce the fiscal burden of current drought policy. In other words, this approach should result in significant savings to government besides being more efficient and fairer. A pilot of the ideas developed in this paper would be informative to both government and private sector interests.

Although these mechanisms, in principle appear to offer many advantages, they will be ineffective without credible government commitment. This paper provides a discussion of various strategies that could be employed to address the

government commitment problem. These are not easy to design or implement but there are a number of alternatives that deserve closer examination. Further analysis will be needed to design these mechanisms and to understanding community support and lobbying processes.

Reform of the tax system is highlighted as necessary to remove perverse incentives against self-insurance. The environmental impacts of the proposed drought policy are also positive because of the removal of incentives to overstock and remain on marginal land and generally improved incentives to take longer-term approaches to drought-management.

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Appendix 1: Exceptional Circumstances Policy and Criteria

Principles of current policy

The introduction of the National Drought Policy (NDP) on 24 July 1992 fundamentally altered the definition of drought, from a “natural disaster” to a normal part of the farm operating environment to be managed like other business risks. However, it was also recognised there could be ‘exceptional’ droughts for which farmers could not be expected to prepare or manage and that Government assistance would be required during “exceptional circumstances” (EC).

Areas are EC-declared for two years (after which extensions can be sought) by the Australian Government following applications from State Governments (collaborating with interested parties) and assessments by the National Rural Advisory Council (NRAC). An EC event is defined as being ‘rare and severe’, resulting in a one in 20-25 year downturn in income amongst a significant number of farmers in an area over a period of greater than 12 months (further detail provided below).

Farmers in EC-declared areas are eligible to apply for:

- Exceptional Circumstances Relief Payments (equivalent to the Newstart allowance), or ‘**welfare assistance**’ but without the normal assets tests on business (farm) assets – this is why it is sometimes referred to as ‘special’ welfare assistance; and
- Interest rate subsidies on new and existing loans, or ‘**business assistance**’.

It is widely recognised that NDP did not work well *in practice* during the 2002-03 drought. Part of the reason is that governments were pressured to provide assistance earlier than EC policy and practice prescribed. For example, NSW introduced transport subsidies which further exacerbated pressures in Victoria (because they raised already high fodder prices) and Victoria then introduced Farm Business Support Grants (see Appendix 2). The Commonwealth’s *prima facie* and interim assistance³ arrangements were also political responses to the perceived long delays in EC assistance becoming available.

³ On 9th December 2002 the Commonwealth announced a one-off additional drought assistance package (6 months of interest subsidies and welfare) for eligible farmers and small businesses in severely drought-affected areas (where rainfall deficiency was one in 20 years over a nine month period from March to November 2002). This was not linked to EC policy and provided no pathway to an EC declaration.

Details⁴

National Drought Policy based on Exceptional Circumstances (EC) is the primary drought assistance package available to farmers experiencing drought conditions, and as such it provides substantial and long-term assistance through instruments such as interest rate subsidies and income support. It also contains provisions for small business assistance.

There are two parts or stages to the current EC arrangements:

1. Full Exceptional Circumstances
2. *Prima facie* Exceptional Circumstances

Full EC: This is the primary assistance mechanism for severely drought affected areas. It is extremely difficult to achieve full EC status. Detailed applications compiled by affected areas in collaboration/cooperation with the State Government have to be submitted to the Commonwealth Government.

Prima facie EC: *Prima facie* literally means ‘based on first impressions’, so an area that has *prima facie* EC status has been recognised by the Commonwealth Government as having a case for full EC status. *Prima facie* EC status is granted when a strong application has been submitted. Many of the full EC assistance measures are immediately provided to the area whilst the application is thoroughly assessed.

Criteria for Exceptional Circumstances

EC submissions are assessed on the basis of specific criteria. There are three key indicators that are used to determine EC applications.

Indicator 1: The event must be rare and severe

A *rare* event is one that occurs on average *once in every 20 to 25 years*.

A rare event is *severe* if it is of a significant scale. It must also affect a significant enough proportion of farm businesses in a region to warrant government intervention. This is measured by assessing the impact on the sector, number of producers, size of area overall and overall value of production.

EC applicants may wish to demonstrate several factors combining to form an event.

EC applications need to provide the following evidence about the event:

- that it is, on average, a *one in 20 to 25 year* occurrence;
- its sustained effect on income levels (lasting for more than 12 months);

⁴ Notes in the following sections of this Appendix are from the website of the Australian Department of Agriculture, Fishing and Forestry. See [www.affa.gov.au/Rural Policy and Innovation/Drought Assistance](http://www.affa.gov.au/Rural%20Policy%20and%20Innovation/Drought%20Assistance).

- description (for example) meteorological conditions, agronomic conditions, environmental conditions;
- location;
- timing and duration;
- impacts on (for example) crop yields, stock returns, water supplies, farm viability;
- scale - impact on (for example) sector, number of producers, size of area, value of production; and
- any other relevant material.

Indicator 2: The effects of the event must result in a severe downturn in farm income over a prolonged period

Eligibility for EC support arises when a rare and severe event is linked to a rare and severe income downturn, which cannot be managed by farmers as part of normal risk management. The impact must extend beyond 12 months, as it would not seem unreasonable to expect farmers to manage one year of difficult seasonal conditions.

In assessing the impact on incomes, the Commonwealth Government has access to general information collected by its economists and statisticians. In particular, ABARE and BRS provide expert advice. ABARE provides information regarding the financial position of farmers before the event as well as analysing the impact of the event on income. The BRS provides analysis on the event itself and the impact it has or will have on the region. Additional information needs to be included in the EC application.

EC applications need to provide financial information that answers the question “Is such a downturn rare – on average a one in 20 to 25 year event?” This information should include: any information that will help develop a historical comparison (e.g. production and yield information):

- any available information on the average cash income levels of farms in the region, separating out cash receipts and cash outlays, highlighting the impact of any forced sale of livestock;
- impacts on (for example) crop yields, stock returns, farm viability compared with historical trends;
- the *forecast* impact of the event on these cash figures;
- average debt levels for the region and the forecast effect of the event on these; and
- any other financial information which will assist the assessment of the event (e.g. costs of production).

Where absolute figures are not available, verifiable data indicating the change in these measures over time will suffice.

If there is not enough information to develop a case for EC assistance, the chances of an application's success are reduced. However, NRAC has extensive experience in making assessments of exceptional circumstances and it will use its expert opinion to form a view on the merits of an application.

Indicator 3: The event must not be predictable or part of a process of structural adjustment

The philosophy underpinning the provision of EC assistance to otherwise viable farmers suggests EC support should not be available to farmers whose problems have arisen from the fundamental need for structural adjustment.

The rural sector has evolved considerably over time and it will continue to experience change in the future. Structural adjustment is about managing these changes, and the evolution of Australian agricultural practices. As such, the provision of EC assistance is not intended to interfere with, or impede, ongoing and necessary structural adjustment.

EC support is also not provided for foreseeable change. An example might involve policy changes that would affect an industry and which farmers have known about for some time.

EC applicants will need to provide a case that:

- the event is a discrete event;
- their income downturn is not part of longer term change (e.g. part of a long-term downturn in commodity prices);
- their income downturn is not fundamentally driven by structural adjustments issues; and
- the changed circumstances were not foreseeable and could not be managed through normal risk management strategies available to farmers.

Important Exclusions

EC is not intended to be available for all adverse events, particularly those covered by existing assistance mechanisms or those which responsible farmers are expected to be able to manage under normal risk management strategies. Therefore insurable events, events covered under the Natural Disaster Relief Arrangements (NDRA), or events covered by existing Commonwealth/State assistance agreements would normally be ineligible as EC events.

While there are potential links between disaster relief and EC policy, EC is not generally available as an immediate response to an emergency situation. Rather, EC is more likely to become a consideration some time after the "exceptional" event

and indeed, under the EC guidelines, can not be considered until a prolonged downturn in income becomes evident.

Insurable events generally cover the farm dwellings and contents, personal and farm property including stock, additional working expenses, machinery breakdown, public liability and personal incapacity. Insurance generally excludes drought, frosts, mice plagues, locust, prolonged rain and extreme temperatures.

Eligible natural disasters under the NDRA include bushfires, cyclones, earthquakes, floods and storms.

How does the Commonwealth Analyse Exceptional Circumstance Applications?

There are a number of sources from which the Commonwealth Government gathers data to analyse an EC application:

- the application/submission;
- locally supplied information;
- observations made during inspection of the region;
- available year by year data for the region (e.g. silo takings); and
- local and national survey data.
- Once an application is received, ABARE will assist with analysis of financial information. It will investigate what trends are occurring regarding incomes and other circumstances surrounding the event. ABARE will look for the following indicators:
 - farm cash receipts;
 - farm cash outlays;
 - farm cash income;
 - average debt;
 - liquid assets; and
 - capital additions.

BRS will assist with analysis of the nature of the event, particularly issues relating to natural phenomena (e.g. weather, rainfall, temperature patterns and other implications).

Appendix 2: Farm Business Support Grant Guidelines 2002-03

Each case is to be assessed on its merits by the Rural Finance Corporation in accordance with the following criteria:

1. Farm must be located within a defined municipality.
2. Farm is of commercial scale.
3. Farming operation has been profitable in the past and has the potential to return to profitability in the future.
4. Farmer is primarily reliant on farming for his or her livelihood.
5. Farmer has demonstrated a need for financial assistance.
6. Farming operation does not have off farm assets (excluding Superannuation) in excess of the equivalent of one year's operating expenses for the business in a normal year.
7. Farm has experienced significant impact from dry seasonal conditions to the extent that there has been or is projected to be a 33% adverse turnaround relative to gross income in the 02/03 financial year. The turnaround is caused by additional expenditure or reduced income, both as a result of dry seasonal conditions, or a combination thereof.

and

8. There is an actual or projected loss in the year's trading results (income received through implementation of drought management strategies is to be ignored for assessment purposes eg livestock sales).
9. The farmer has practised risk management activity in the past 3 years. Evidence of this would be demonstrating that at least two of the following risk management measures had been completed:
 - a) prepared cash flow budget
 - b) developed a business plan
 - c) developed a whole-farm plan
 - d) established cash reserves in Farm Management Deposits or other accessible cash management deposits
 - e) Attended Farmsmart or FarmBis course focused on risk management
 - f) Established on-farm improvements to assist in managing climate-related risk eg. laser grading, increase fodder storages, improved farm water supply systems, irrigation recycling dams

- g) Sustainable environmental management improvements
- h) other similar measures that justifications can be provided for.

Grant

If the above guidelines are satisfied the farmer is eligible for a grant of 1/3 of the loss identified in Guideline 8, up to a maximum of \$20,000 grant and payable upon approval.

If guideline 9 is not satisfied but farmer agrees to undertake risk management in the next 12 months the grant will be paid to 80% on approval and the balance upon submission of evidence of implementing appropriate risk management practice.

Appendix 3: A Producer's Choice of Contracts

In this appendix, we use decision trees to analyse how farmer's choose an incentive contract given a menu of incentive contracts. This appendix will assume that producers are rational and intelligent when making economic decisions. For the moment we will consider that the government can credibly commit to the menu of contracts drought policy and that the tax system does not incorporate any distortionary taxes (except for a progressive income tax schedule). These assumptions are obviously unrealistic without justification. We make these assumptions for simplicity and to focus on the producer's choice of contracts. Later on in this appendix, we will relax these assumptions to ask how the menu of contracts approach needs to be modified to minimise non-credible government commitment and a distortionary tax system. We also assume for simplicity that there are only two types of producers.

We will consider the following menu of contracts:

1. Allow the opening of Risk Management Deposits (RMDs). RMDs are a similar concept to the existing Farm Management Deposits (FMDs) but with a different set of incentives specifically designed to ensure that farmers' contract choice matches their "type". These incentives could be tax benefits or some form of subsidy. In this example, we assume RMDs confer a tax benefit per dollar of pre-tax income deposited. RMDs also do not have restrictions on deposit size and off-farm income (unlike FMDs).
2. Social security payments over six months.

A3.1 Menu of Contracts with Credible Government Commitment and Non-distortionary Tax System

Figure A.3.1 is a decision tree for the case of credible government commitment and a non-distortionary tax system. The analysis starts at the top of the decision tree at the node labelled 'Farmer's choice'. At this node, the producer has a choice of either contract 1 or contract 2. Let us examine the contract 1 branch first. If the producer chooses contract 1, the next decision (at the 'Contract 1 (RMD)' node) is to determine how much cash to invest in an RMD. We assume for simplicity that the producer can invest a 'high' amount of \$ x or a 'low' amount of \$ y and assume x and y are positive numbers; algebraically, this means $x > y > 0$. Of course, the producer in reality has a continuous choice of deposit amounts rather than the binary choice we have assumed. This assumption was made to make the decision tree as simple as possible while highlighting the importance of the producer's decision in this policy proposal.

After the producer has made the investment decision, the next decision occurs during drought in the 'Drought' space (indicated by the dotted semi-circle).

During drought, a producer can choose to withdraw all or none of their RMD deposit; again we have assumed that the choice is a binary one for simplicity. Note that the producer is under no obligation to withdraw any cash from his/her RMD; this will depend on the individual circumstances of each producer. Recall that the RMDs encourage deposits during high taxable income years and withdrawals during low taxable income years. Not all producers will suffer low taxable income years during drought especially if they de-stock; these producers may choose to deposit *more* during drought. The point is that RMDs give producers flexibility to manage their farm response during drought according to individual circumstances.

Once the producer has decided to withdraw or not, the next decision is to choose whether or not to lobby. By lobbying, a producer can receive more government funds than he/she otherwise would. We assume lobbying is costless but this is probably unrealistic. However, with credible government commitment, governments would not reward lobbying efforts so payoffs are unaltered.

Payoffs are given at the bottom of the decision tree. The payoff from withdrawing is multiplied by whatever the initial deposit amount was (ie, either x or y), where t is the tax benefit from withdrawing funds during a low-income year. In other words, the producer receives a gross payoff equal to the principal of his/her investment *plus* the tax benefit of withdrawal, but the net payoff is the tax benefit of the withdrawal. Note, t is negative if the producer withdraw funds during a higher-income year than when the funds were deposited. However, this would only occur if the producer was irrational and since this contradicts our original assumption of producers' behaviour, t can never be negative given our assumptions. The payoff from not withdrawing is \$0 since the payoff is dependent on how much is withdrawn.

Now we describe the contract 2 branch of the decision tree in figure A.3.1. A producer who signs on to contract 2 only has to decide whether or not to apply for social security at the 'Drought' space. The producer can also choose to lobby but since there is no benefit from lobbying, the lobbying decision is irrelevant to the producer's payoffs. The payoff from choosing to apply for social security benefits is $\$s$ (assume $\$s$ is a positive number) but otherwise the producer receives \$0.

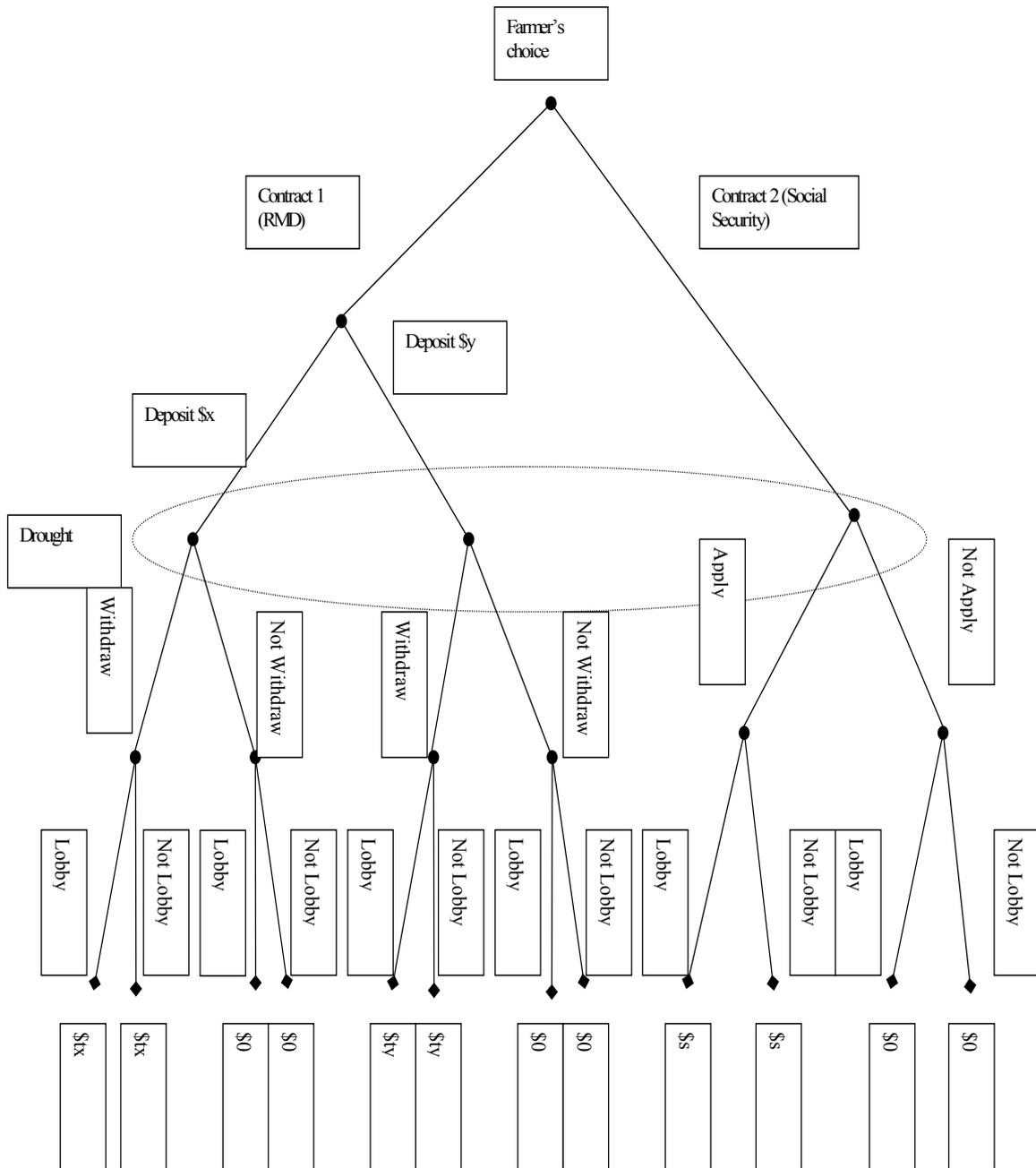
This menu of contracts approach can solve adverse selection and moral hazard but it depends on the values of x and s ; y is irrelevant as we shall see. Consider two type of producers, a 'rich' producer who can deposit $x > y > 0$ in RMDs and a 'poor' producer who cannot invest any funds into RMDs (ie, $x = y = 0$). Adverse selection is solved if the payoff from investing in RMDs is greater than the payoff from social security payments; ie, $tx > ty > s$. If this is the case, rich producers will choose contract 1 whereas poor producers will choose contract 2; hence, adverse selection is solved. This is called a *separating equilibrium* in economics (Tirole 1988). If payments from social security exceed tx , then even rich producers will choose contract 2 and no one will choose contract 1; this is called a *pooling equilibrium* (Tirole 1988). There may exist some values of x and s where there is a hybrid of

separating and pooling equilibria where some rich producers choose contract 2 (Potters and Van Winden 1990). As a result, truthful revelation of the menu of contracts policy is possible depending on the values of x and s .

Is it possible for this menu of contracts to reduce the incentives of moral hazard? In the decision tree, moral hazard is when the rich producers choose to invest y rather than x under contract 1. This is because the rich producer can invest more and therefore bear more drought risk. But the producer gains most when he/she invests x because the tax benefit is increasing in the deposit size. Therefore, the producer will always gain the most by investing x rather than y and will always choose to invest x and never chooses to invest y . Notice, that y is irrelevant because a rich producer will always choose to invest x . As a result, moral hazard is eliminated because the producer has an incentive to invest as much as possible under contract 1.

Another moral hazard may be eliminated if we take a dynamic perspective; that is if we add another choice to the producer's decision. We do not show this diagrammatically but only outline the argument here. Imagine the producer can choose to manage their farm efficiently or inefficiently. If the farm can be managed efficiently, the producer generates a profit; efficient producers will have an incentive to choose contract 1 over contract 2 if the gains from RMDs are greater than $\$s$. Conversely, if a producer chooses to be inefficient, there is an incentive for these types to choose contract 2. Assume there are no costs from choosing to be efficient or inefficient, producers in general will choose to be efficient if $t_x > s$. Therefore, a menu of contracts approach can provide producers with a dynamic incentive to adopt more efficient practices. This eliminates the incentive for some producers to choose inefficiency. However, this depends on the relative costs of farming practices which in turn depends on many factors such as the quality of the land, education level of the producer, etc.

Figure A.3.1 Producer's Contract Choice with Credible Government Commitment and Non-distortionary Tax System



A3.2 Menu of Contracts with Non-credible Government Commitment

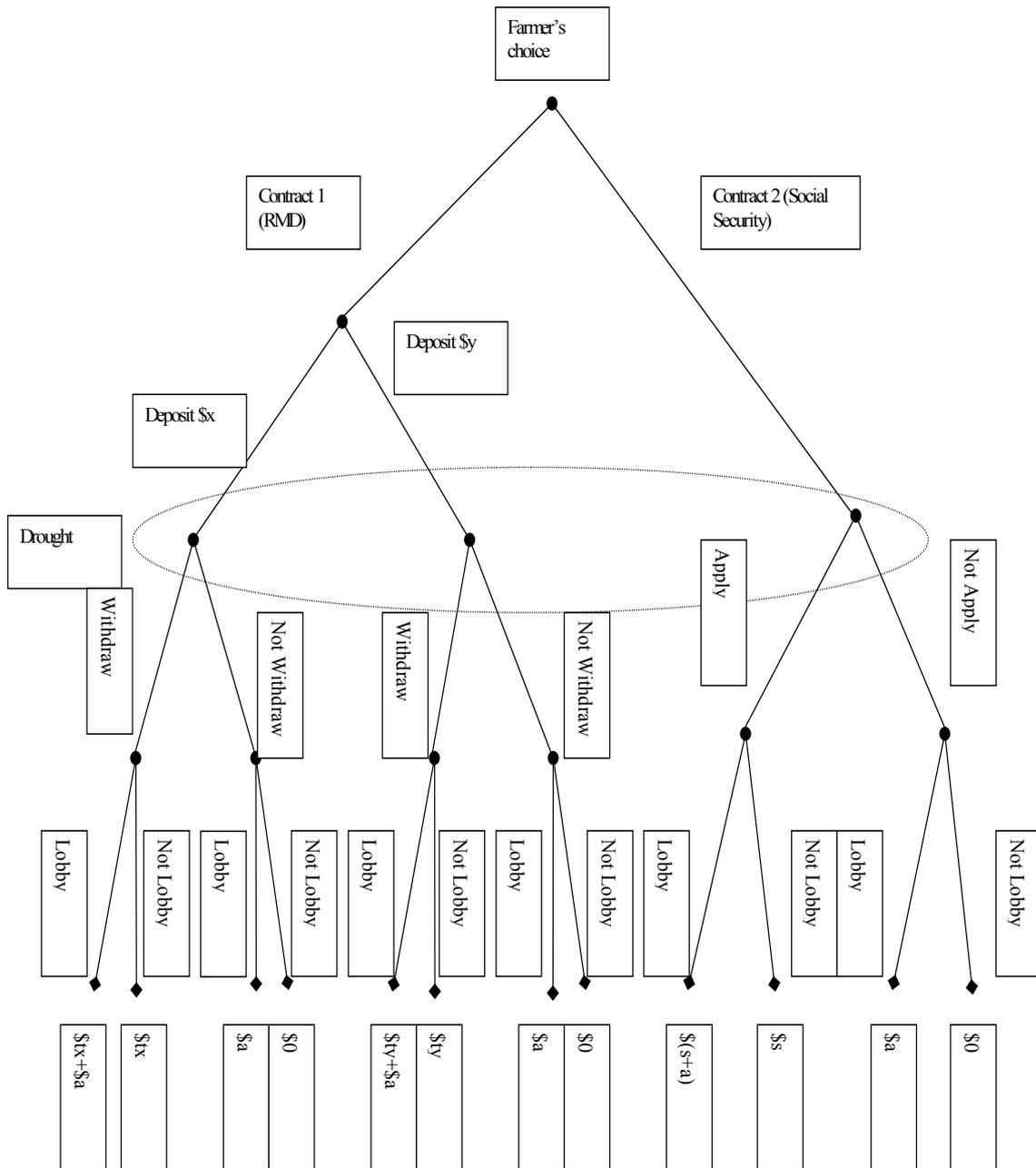
We have shown that a menu of contracts can be designed to provide incentives for producers to truthfully reveal their private information and for producers to not engage in moral hazard. However, this result hinges on our assumption of government credibility. In this section we will explore the implications of non-credible government commitment on the design of a second-best menu of contracts.

Figure A.3.2 is similar to Fig. A.3.1 except that the payoffs from lobbying and not lobbying are now different. If a producer lobbies, they will receive a positive amount of $\$a$ in addition to their payoffs given their contract and decisions made at each decision node. Lobbying is assumed to result in a certain payoff of $\$a$ which is unrealistic since the amount a government may pay is dependent on the budget situation, sensitivity to lobbying, etc. We make this assumption for convenience. Regardless of the realism of the payoffs from lobbying, the point is that if there is no credible government commitment, then the producer has an incentive to lobby regardless of the choice of contract. Notice that the choice of contracts does not change, just the decision to lobby. This is because the producers still have an incentive to reveal their type and to refrain from engaging in moral hazard, but they are unambiguously better off from lobbying regardless of the choice of contract.

Payoffs from lobbying may change if they differ given contract type. We do not show this here but only sketch the reasoning. For example, the government may engage in ratcheting behaviour by using the information gained from the choice of contracts to refuse to give funds to producers who choose contract 1 but give $\$a$ to producers who choose contract 2. If producers expect the government to behave this way, this may encourage adverse selection by encouraging rich producers to choose contract 2 if $s+a > tx$. As a result, contract choice can be distorted if the government rewards lobbying one type of producers over another type.

In summary, non-credible government commitment is likely to impose greater budgetary costs and may lead to a higher tax burden for the rest of society. In the worse case, lack of credible commitment may result in adverse selection and moral hazard, which not only accentuates the budgetary cost but also harms the long-term future of the industry. This implies that credible government commitment is required to maximise the benefits of drought policy reform.

Figure A.3.2 *Producer's Choice of Contract with Non-credible Government Commitment*



A.3.3 Menu of Contracts and a Distortionary Tax System

What happens if an introduction of menu of contracts approach does not coincide with comprehensive tax reform of primary producer provisions? We will discuss this qualitatively since the tax system could be reformed a number of different ways.

An unreformed tax system is likely to bias producers towards contract 2. Only the most profitable producers are likely to accept contract 1. This is because the current tax system has similar benefits to RMDs without requiring the producer to bear any drought risk. Adoption rate of RMDs is likely to remain unchanged with the introduction of menu of contracts approach.

The implication of the above discussion suggests that an introduction of a menu of contracts approach requires comprehensive tax reform to maximise the benefits of drought policy reform. Without tax reform, adverse selection and moral hazard will still be a problem. This may mean no drought policy reform may be less costly than drought policy reform with no tax reform.